Appendix H: Traffic Data

Traffic Projections and Methodology Memo

Traffic and Safety Analysis Memos

VMT/VHT Memo

Historical Crash Memo

Traffic Memo

Person-Carrying capacity

Traffic Projections and Methodology Memo

Texas
Department
of Transportation

MEMO

March 7, 2022

To: Adam Kaliszewski, P.E.
TxDOT Austin District

DocuSigned by:
Adam Kaliszewski
BFF850AAEEFE420...

Through: Michelle Cooper, P.E.
TxDOT Austin District

Through: James Kratz, P.E., PTOE
Mobility35 GEC

From: Matthew G. Best, P.E., PTOE
HDR

DocuSigned by:
Matthew G. Best
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Subject: Mobility35 Capital Express Central: Traffic Projections Methodology Memorandum

Introduction

As part of Mobility35 Capital Express project development, daily, AM, and PM traffic volume forecasts are being generated along I-35 in Hays, Travis, and Williamson Counties. The I-35 corridor is being reconfigured to accommodate future managed lanes and other improvements between State Highway (SH) 45 N in Round Rock/Williamson County and SH 45 SE in Austin/Travis County, approximately 27 centerline miles in length. Due to the complexity, cost, and regional impact of implementation (Ref. 1), the Capital Express project is divided into three segments: South segment (from SH 45 SE to US 290W/SH 71), Central segment (from US 290W/SH 71 to US 290E), and North segment (from US 290E to SH 45 N).

Opening Year (2030) and Design Year (2050) daily traffic volume forecasts were developed for the Central segment of the corridor, taking historical growth and Capital Area Metropolitan Organization (CAMPO) 2045 forecasts into account. The traffic analysis will be developed using Texas Department of Transportation (TxDOT) Option C delivery method: District Solely Responsible for Development and Review of Traffic Analysis and Signs/Stamps Final Project (Ref. 2) as part of the Corridor District Exemption Process and Documentation.

Existing 2019 24-hour traffic volumes and AM and PM peak period intersection turning movement counts were collected in April and May 2019 along I-35 to provide a basis for future volume forecasting. Seven-day mainlane counts were collected to obtain a general trend of traffic over a week and to utilize the peak weekday counts for forecasting. The purpose of this memo is to document the methodology used to develop the forecasted traffic projections for the Capital Express Central project.

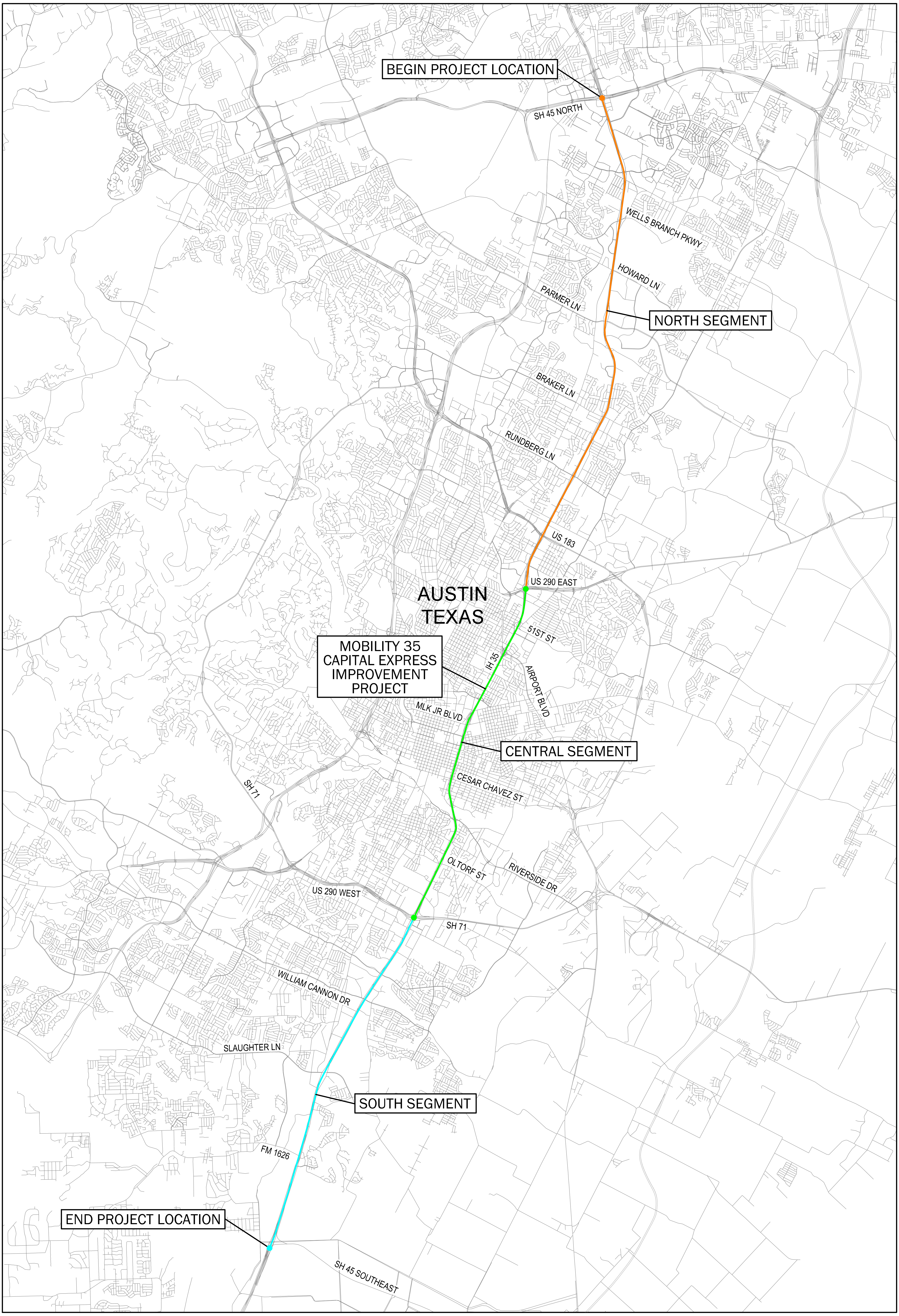
Study Area

The overall Capital Express project study area consists of the I-35 segment between SH 45 N and SH 45 SE. The project was divided into three segments:

- South: From SH 45 SE to US 290W/SH 71
- Central: From US 290W/SH 71 to US 290E
- North: From US 290E to SH 45 N

New managed lanes, in the form of separated high occupancy vehicle/transit lanes, and geometric improvements are proposed for the corridor as a part of the Capital Express project. The location of each project segmentation of the I-35 project is depicted in Figure 1. The project's area of influence extends beyond the strict project limits to determine effects on cross streets and upstream/downstream interchanges.

This memo is to document the methodology used to develop the forecasted traffic projections for the Central segment only. Traffic projection methodology memoranda for each the North and South segments will be submitted separately.



PROJECT LOCATION MAP
INTERSTATE 35

Texas
Department
of Transportation

FIGURE 1

Seven-day mainlane counts for the study area were collected in April and May 2019 and are provided in Table 1. The counts were collected for the Central segment (between 7th and 8th Street, upper and lower decks between Manor Road and MLK Jr. Boulevard) along I-35. Traffic volumes, weather conditions, and the speed heat map data provided by INRIX Traffic and Road Speed Service were reviewed to get critical insight on the "representative" day of data from Tuesday through Thursday and to avoid weather and incident impacts. As a result, the data from Wednesday was not considered due to rainy field conditions. Tuesday was used as the "representative" day for the I-35 lower deck. Traffic volumes on the I-35 upper deck and between 7th and 8th Streets were adjusted to compensate for an incident—Tuesday volumes from 12:00 AM - 8:30 PM and Thursday volumes from 8:30 PM - 12:00 AM were used as "representative" volumes for these locations.

Table 1: Study Area Traffic Volumes

Location	Existing 2019 Volumes (veh/day)
I-35, between 7th and 8th Street*	146,656
I-35, Upper Deck*	72,956
I-35, Lower Deck**	98,197

* Adjusted to account for incident/weather impacts (Tuesday, April 23, 2019 volumes from 12:00 AM - 8:30 PM, Thursday, April 25, 2019 volume from 8:30 PM - 12:00 AM)
** Representative Count Date: April 23, 2019

Traffic Forecasting Methodology

Existing (2019) traffic volumes were used to develop traffic forecasts for Central Segment for the following future year scenarios:

- Opening Year 2030
- Design Year 2050

Forecasted Growth Rates

The traffic volume forecasting incorporates traffic growth trends in the immediate study area. The Statewide Traffic Analysis and Reporting System (STARS II) (Ref. 3) provided historical average annual daily traffic (AADT) counts along I-35 Central segment. Table 2 provides the historical AADTs provided by Texas Department of Transportation (TxDOT) from 2014 to 2018 and the calculated annual average growth rates (AAGR). The counts (2014 – 2018) below indicate the sum of mainlane and frontage road counts at each location. The average annual growth rate on I-35 along the Central segment study area from 2014 to 2018 was computed as 1.2 percent. The historical AADT data from 1998 to 2018 was reviewed to calculate the 20-year annual average growth rates. (The 1998 AADT, unavailable on STARS II, is presented in the Complete Corridor Analysis Package for IH 35 Capital Express (Ref. 4).) In addition, historical 10-year and 15-year growth rates were also reviewed. Table 3 provides the historical 10-year, 15-year, and 20-year AAGRs along the Central segment. The AADTs for the past 20 years and the calculated AAGRs are provided in Appendix A for reference. The historical 20-year average annual growth rate for the Central segment is 0.3 percent.

Table 2: Historical AADTs (Source: STARS II)

Location Along I-35	Station ID	2014	2015	2016	2017	2018	AAGR	Segment AAGR
North of Oltorf Street	227H92A	185,424	180,449	185,578	175,717	175,580	-1.4%	1.2%
South of Holly Street	227SP132	216,040	252,075	202,378	204,235	198,084	-2.1%	
South of 7th Street	227H115A	168,432	176,455	182,216	178,918	178,106	1.4%	
North of 15th Street	227H116	204,528	210,000	215,955	207,725	218,960	1.8%	
North of 41st Street	227H117	205,748	222,006	227,942	224,401	230,443	2.9%	
North of Airport Boulevard	227H118	212,123	232,011	237,937	235,688	237,275	2.8%	
South of US 290E	227H119	214,739	235,863	241,704	231,256	239,347	2.7%	

Table 3: Historical Average Annual Growth Rates

Historical Count Years	AAGR
2008 – 2018	0.4%
2003 – 2018	0.0%
1998 – 2018	0.3%

CAMPO provided traffic volume projections for 2025 and 2045 along I-35 (Ref. 5). Table 4 provides the 2025 and 2045 traffic volume projections by CAMPO for multiple locations along I-35. A simple exponential regression model, represented by a “best-fit equation,” was utilized to compute the growth rates for the CAMPO projections. This methodology uses the model rather than a process of selecting two specific years, so all available data is used to influence the resultant growth rate. Using CAMPO traffic projections, the average annual growth rates from 2015 to 2045 were computed to be 1.49 percent for the Central segment.

Table 4: CAMPO 2025 and 2045 Traffic Projections

Location	2015	2025	2045	Best Fit Line Growth Rate	Average Growth Rate
I-35, at Woodward Street	151,624	166,870	246,257	1.66%	1.49%
I-35, at Oltorf Street	153,808	166,923	243,815	1.59%	
I-35, at Woodland Avenue	163,866	164,359	238,852	1.34%	
I-35, at Riverside Drive	154,655	163,821	237,170	1.49%	
I-35, at Holly Street	175,174	184,559	262,501	1.41%	
I-35, at Cesar Chavez Street	175,174	184,559	262,501	1.41%	
I-35, between 6th and 8th Street	162,811	168,267	240,408	1.37%	
I-35, between 11th and 12th Street	195,100	205,301	283,617	1.30%	
I-35, at 15th Street	172,072	183,296	262,098	1.46%	
I-35, at MLK Jr. Boulevard	172,072	183,296	262,098	1.46%	
I-35, at Manor Road	196,881	211,624	315,269	1.63%	
I-35, at Dean Keeton Street	199,952	214,874	319,040	1.62%	
I-35, at 38 ½ Street	214,282	227,728	336,776	1.57%	
I-35, at Airport Boulevard	196,189	203,345	296,247	1.45%	
I-35, north of 51st Street	110,037	126,661	184,968	1.75%	
I-35, at US 290E	177,225	188,563	258,580	1.30%	

The TxDOT Statewide Planning Map (Ref. 6) provided the forecasted 2037 AADTs for locations along I-35. The 2037 projections and the calculated annual growth rates are illustrated in Table 5. The growth rates utilized by TxDOT for the 2037 AADT projections were calculated to be 2.0 percent on I-35.

Table 5: TxDOT AADT Projections (Source: TxDOT Statewide Planning Map)

Location	2017	2037	Annual Growth Rate
I-35, south of Riverside Drive	152,367	213,310	2.0%
I-35, north of Riverside Drive	142,766	199,870	2.0%
I-35, south of 8th Street	157,878	221,030	2.0%
I-35, north of 8th Street	176,987	247,780	2.0%
I-35, south of Dean Keeton Street	201,974	282,760	2.0%
I-35, north of Airport Boulevard	195,900	274,260	2.0%
I-35, south of US 290	193,522	236,100	2.0%

I-35 Volume Forecasts

Alliance Transportation Group (ATG) provided a forecasting methodology memorandum in 2018 as a supplement to the I-35 Capital Express corridor package (Ref. 4). The memo proposed growth rates for the Central project segment, and these growth rates were approved by TxDOT. The recommended growth rates were derived from the data specific to the Central segment and tailored to account for patterns associated with each forecast year, as indicated by the historical AADTs and CAMPO forecasts. Table 6 provides the approved growth rates towards the Opening Year (2030), Design Year (2050), and any study years beyond Design Year (2050), utilizing 2016 as the Base Year. A linear annual growth rate of 1.5 percent was proposed to be applied to the Base (2016) volumes to forecast the Opening Year (2030) and Design Year (2050) traffic volumes for the I-35 Central segment. The ATG forecasting memorandum with the approved growth rates is provided in Appendix A for reference. The forecasted line diagrams for the Existing, No-Build, Alternative 2, and Alternative 3 MOD configurations are also in Appendix A. The Alternative 3 MOD depends on direction of travel changes along 8th Street (from westbound to eastbound) and 7th Street (from eastbound to bidirectional), west of I-35. An email confirming Austin Transportation Department's support of the model assumptions regarding 8th and 7th Streets is in Appendix B.

Table 6: I-35 Proposed Growth Rates (Approved by TxDOT)

Period	Recommended Growth Rate
2016 – 2030 (14 Years)	1.5%
2016 – 2050 (<=34 Years)	1.5%
2050+ (>=34 Years)	1.0%

Table 7 provides the existing daily volumes along I-35 mainlanes (shown previously in Table 1) along with 2030 and 2050 daily traffic volume forecasts (Ref. 4).

Table 7: I-35 Daily Traffic Volume Summary

Location	Existing 2019 Volumes (veh/day)	Opening Year 2030 Volumes (veh/day)	Design Year 2050 Volumes (veh/day)
I-35, between 7th and 8th Street	146,656	191,000	238,350
I-35, Upper Deck	72,956	90,300	112,650
I-35, Lower Deck	98,197	121,100	151,050

Table 8 provides the calculated growth rates from the Existing Year (2019) to Opening Year (2030) and Design Year (2050), based on the proposed growth rates by ATG using 2016 as the Base Year.

Table 8: Calculated I-35 Growth Rates from Existing Year to Opening Year and Design Year

Period	Calculated Growth Rate
2019 – 2030 (11 Years)	1.4%
2030 – 2050 (20 Years)	1.2%

Although the 2030 and 2050 forecasts use a 2016 Base Year, the 2019 traffic counts show that the approved forecasts are not significantly out of line with current trends. Linear growth rates (with a 2019 Base Year) from existing 2019 counts to the 2030 and 2050 forecasts are generally lower—between 1.2 percent and 1.4 percent—than those (with a 2016 Base Year) listed in Table 8. Due to capacity constraints along I-35, however, the existing 2019 counts may be lower than the demand, resulting in higher linear growth rates with the 2019 Base Year.

Conclusion

Based on a review of historical trends, 2019 traffic counts, and CAMPO forecasts, the growth rates (with a 2016 Base Year) provided by ATG (in Appendix A to this memorandum) and approved by TxDOT are still valid and will be utilized to forecast Opening Year (2030) and Design Year (2050) daily, AM peak, and PM peak volumes. Existing (2019) traffic volumes were used to develop traffic forecasts for the Opening and Design years. The proposed growth rates were derived from the data specific to Central Segment and tailored to account for patterns associated with each forecast year, as indicated by the historical AADTs and CAMPO forecasts.

An annual growth rate of 1.5 percent is recommended to be utilized to project the Opening Year 2030 traffic volumes (2016 – 2030) and to project the Design Year 2050 volumes (2016 – 2050), and 1.0 percent is recommended to be utilized to project the Horizon Year (2050+) volumes along the I-35 Central section (SH 71 to US 290) for this study. The recommended annual growth rates translate to an approximate increase of 15 percent traffic volumes between 2019 and 2030 and 45 percent between 2019 and 2050 for the central segment.

References

1. Capital Express IAJR Approach Considerations, Memorandum from Don Holloway, P.E., to Dwayne Halbardier, P.E., Texas Department of Transportation, Austin, Texas, December 2, 2020.
2. Corridor Analysis Standard Operating Procedures, Transportation Planning and Programming, Traffic Analysis Section, Texas Department of Transportation, Austin, Texas, May 1, 2017.
3. Statewide Traffic Analysis and Reporting System (STARS II), Texas Department of Transportation, Austin, Texas, http://txdot.ms2soft.com/tcds/tsearch.asp?loc=Txdot&mod=, accessed 2019.
4. Complete Corridor Analysis Package for IH 35 Capital Express (CSJ 0015-13-388, etc), Alliance Transportation Group, Austin, Texas, October 24, 2018.
5. Capital Area Metropolitan Planning Organization 2045 Traffic Projections, Capital Area Metropolitan Planning Organization, Austin, Texas.
6. Statewide Planning Map, Texas Department of Transportation, Austin, Texas, https://www.txdot.gov/apps/statewide_mapping/StatewidePlanningMap.html.

Appendix A

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MEMORANDUM

DATE: October 24, 2018
TO: Adam Kaliszewski, TxDOT-Austin District
CC: Janie Temple, TxDOT-TPP; Brandon Marshall, TxDOT-Austin District
FROM: Mike Chaney, Alliance Transportation Group, Inc. (ATG)

RE: Complete Corridor Analysis Package for IH 35 Capital Express (CSJ 0015-13-388, etc)

This memo provides the Complete Corridor Analysis 2018 Existing Configuration Package for Interstate 35 (IH 35) Capital Express (CSJ 0015-13-388, etc) and background information designed to support a review of the analysis.

The subject project consists of IH 35 from State Highway 45 (SH 45N) in Round Rock, Texas to State Highway (SH 45SE) terminus near Buda, Texas, a distance of approximately 27 miles. The project was divided into three segments that are being developed by three project teams:

- North: From SH 45N to US Highway 290 (US 290)
- Central: From US 290 to State Highway 71 (SH 71)
- South: From SH 71 to SH 45SE

To support the analysis of air and noise this forecast of 2018 traffic volumes was developed from the TP&P provided 2016 base year counts and delivered to TxDOT ahead of other forecast years. This forecast includes the existing geometric configurations for 2018 and is referred to as 2018 Existing.

Below is a list of projects, opened to traffic between 2016 and 2018, and included in the 2018 Existing forecast:

- 51st Street Roundabout and Ramp Improvements
- Slaughter Creek Overpass Bridge Replacement

The following documents are included in the IH 35 Capital Express corridor package:

- Directional Traffic Volume Diagrams depicting 2018 Existing forecasted volumes
- Appendix A: Forecast Methodology Memo
- Appendix B: District Traffic request and previous projects provided for this analysis

After TxDOT's review and cutline selection, Corridor Analysis Worksheets and Traffic Analysis for Highway Design (TAHD) forms for each section will be created and submitted with an updated final package. The TAHD form contains, for each cutline, the percentage of trucks, K-factor, direction distribution, data for air and noise analysis, and ESAL's.

It should be noted that the mainlane volumes along US 290/Koenig Lane are forecasted off 2016 counts that are considered still under review. These forecasted volumes are subject to change due TxDOT's Transportation Planning and Programming division review of the 2016 counts available in the STARSii database

Growth Rate Analysis Results

Alliance Transportation Group (ATG) utilized historical annual average traffic growth rates (AAGR) calculated by TXDOT and provided in the corridor analysis information packet for this project and relative growth conveyed in forecast year scenarios conducted with the MPOs' travel demand model (TDM) to determine the rate of growth in traffic volumes on IH 35. This information is described below.

As shown in **Table 1**, ATG utilized growth rates derived from data specific to each of the three project segments and tailored to account for patterns associated with each forecast year. Further discussion of growth rate analysis is included in the methodology memo (**Appendix A**).

Table 1. Growth Rates Utilized in IH 35 Traffic Projections

Segment	Growth Rate (AAGR)			
	2016 - 2018	2016 - 2030	2030 - 2050	2050 - 2060
North: From SH 45N to US 290	2.0%	2.0%	2.0%	1.0%
Central: From US 290 to SH 71	1.5%	1.5%	1.5%	1.0%
South: From SH 71 to SH 45SE	2.0%	2.0%	2.0%	1.0%

Table 2 below displays the rate of traffic growth derived from historical count information and the traffic volumes from the TDM at matching locations. The table compares annual historical growth observed in the corridor and the growth forecasted in the No Build and Build TDM scenarios. This growth comparison is duplicated in map form in **Figure 1**. The TDM and historic count data both indicate more growth in the northern and southern sections of the project area, compared to the central section. Similarly, because of increased capacity, the Build scenario shows slightly higher traffic volumes compared to the future No Build Scenario.

Table 2. Historical Count Growth (AAGR) and TDM Volume Growth (AAGR)

Segment	Location	Historical Count Growth (AAGR)			TDM Volume Growth (AAGR)				
		Count Station ID	Historical Count Years	Historical Traffic Growth (AAGR)	2015 TDM Traffic Volume	2040 TDM Traffic Volume (No Build)	2040 TDM Traffic Volume (Build)	2015-2040 TDM Traffic Volume Growth (AAGR) (No Build)	2015-2040 TDM Traffic Volume Growth (AAGR) (Build)
North	Picadilly Dr	227H5	1996-2016	1.3%	167,073	200,448	213,034	0.8%	1.1%
North	Korman Dr	227H4	1996-2016	1.3%	165,453	209,266	227,496	1.1%	1.5%
North	E Rundberg Ln	227H13	1996-2016	0.7%	179,651	208,229	205,073	0.6%	0.6%
Central	Reinli St	227H119	2001-2016	0.2%	261,392	287,478	328,519	0.4%	1.0%
Central	E 41st St	227H117	2001-2016	0.8%	242,217	289,913	328,824	0.8%	1.4%
Central	Mariposa Dr	227H92A	2001-2016	0.4%	202,157	234,812	275,695	0.6%	1.5%
South	Shelby Ln	227H94	1996-2016	1.3%	199,722	255,680	290,438	1.1%	1.8%
South	Foremost Dr	227H95	1996-2016	2.2%	174,525	197,318	215,568	0.5%	0.9%
South	Onion Creek Pkwy	227SP4	1996-2016	2.1%	161,268	197,334	211,907	0.9%	1.3%

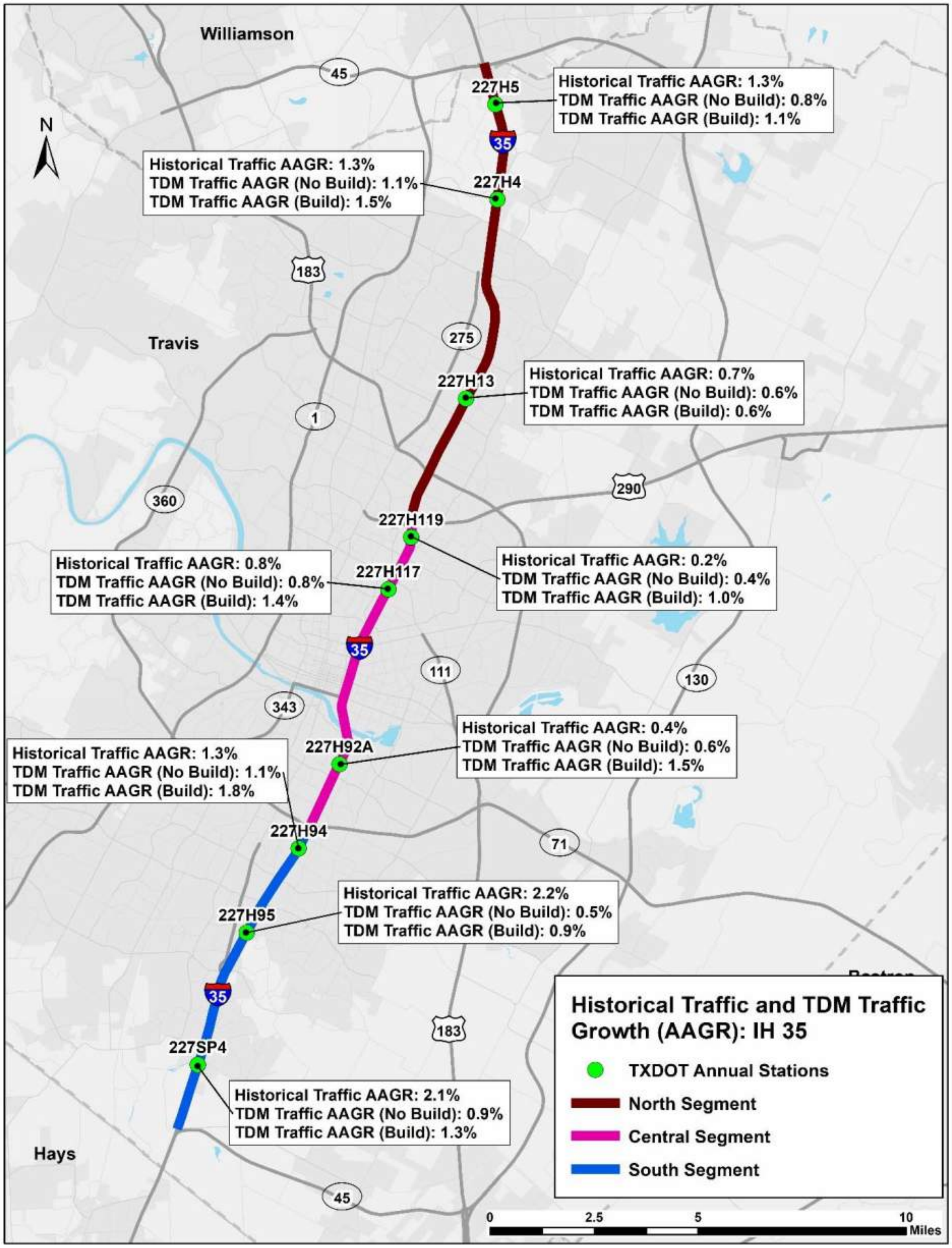


Figure 1. Historical Traffic Growth (AAGR) & 2015-2040 TDM Traffic Volume Growth (AAGR)

Figure 2 depicts the average annual TDM population and employment growth (AAGR) in the neighboring areas along the north, central and south segments of the IH 35 project corridor as presented in **Table 3**.

Table 3. Demographic Growth (AAGR) in the CAMPO TDM (2015-2040)

Segment	Average Annual Growth Rates (AAGR)	
	Population	Employment
Neighboring Areas along North Segment	2.0%	5.7%
Neighboring Areas along Central Segment	2.2%	2.4%
Neighboring Areas along South Segment	2.3%	4.0%

The areas along the central segment are well developed compared to the areas along north and south segments, where more undeveloped land will lead to more significant growth in the future.

IH 35 within the project area is expected to continue to serve as a major corridor and provide connectivity to the project area that is experiencing consistent and sustainable growth. The analysis of historic counts, planned demographic growth and TDM volumes revealed that growth is higher in the north and south segments of the project corridor compared to the central segment which runs through the Downtown Austin area. The central segment includes the highest traffic volumes currently and a lower growth rate results in significant absolute gains in traffic volumes.

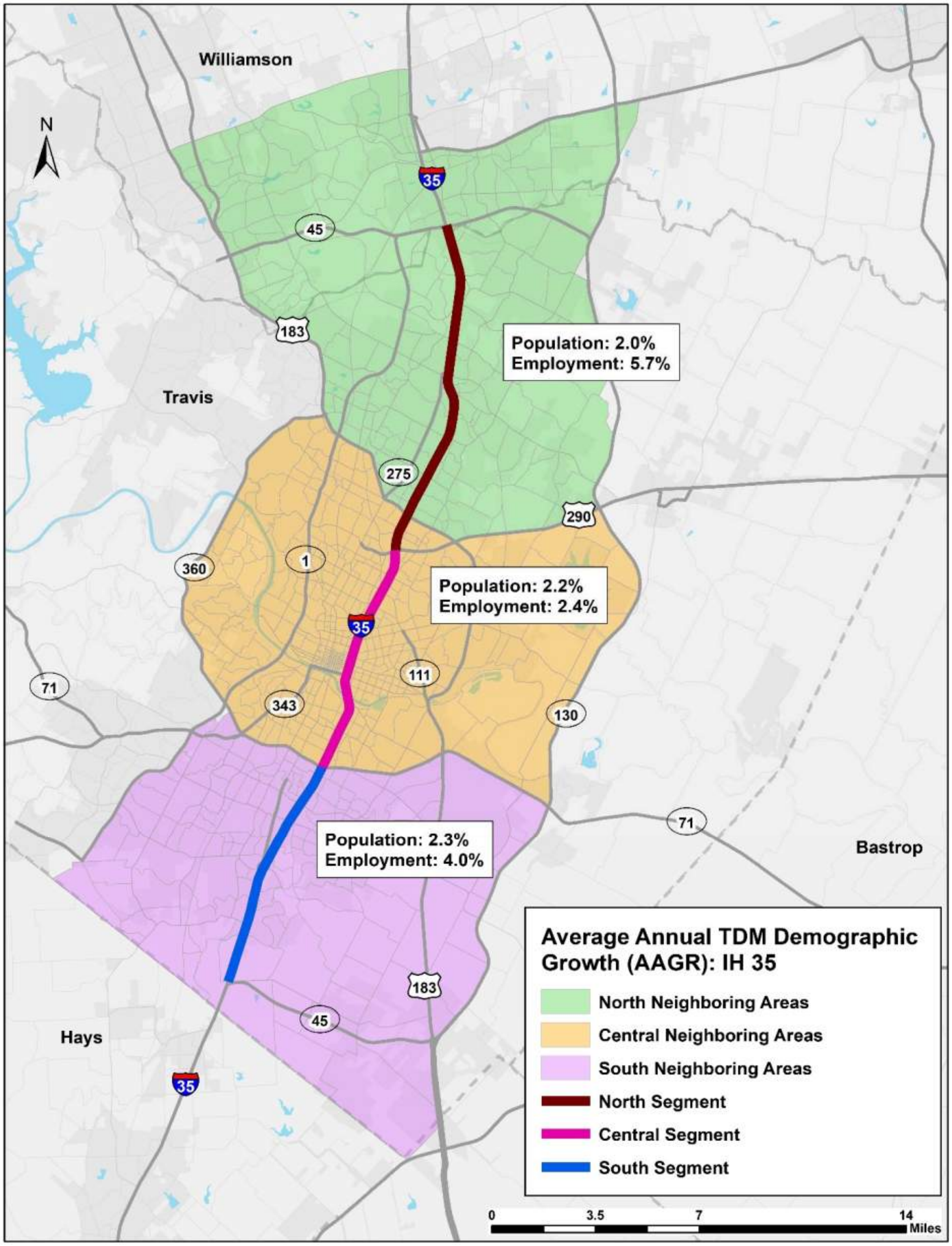
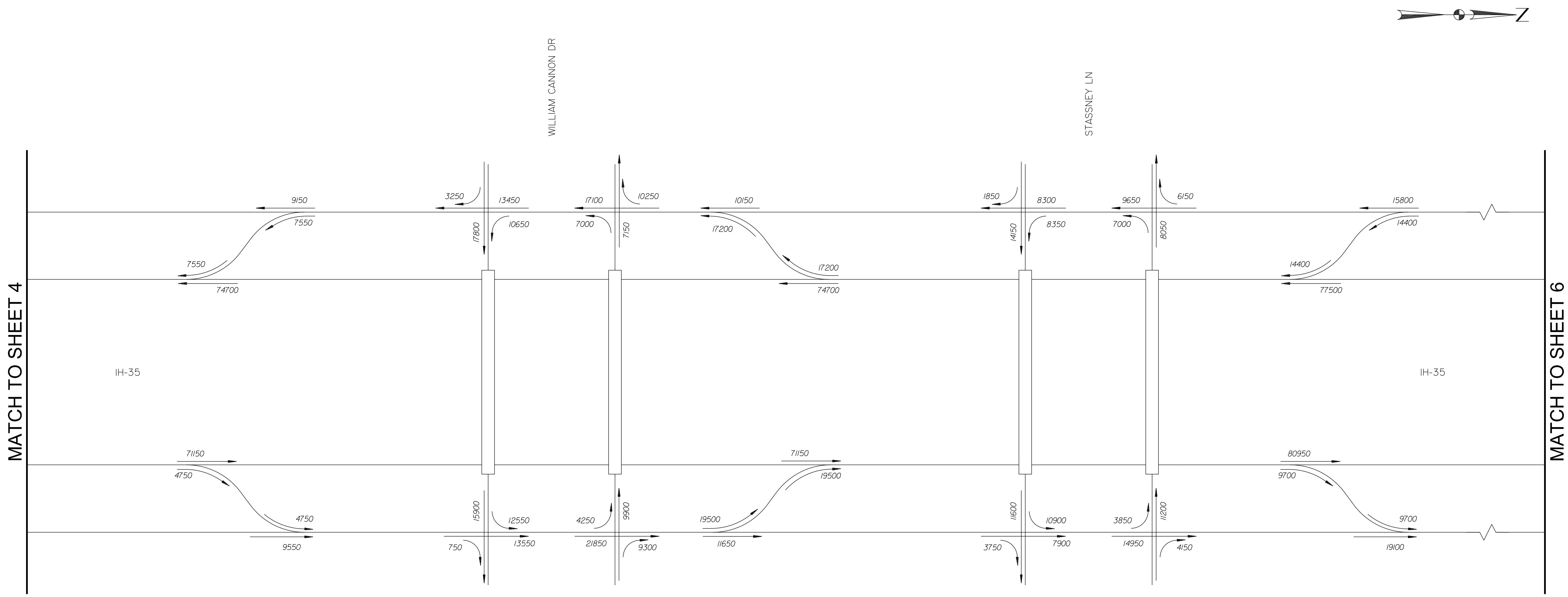


Figure 2. 2015-2040 TDM Demographic Growth (AAGR) Along the IH 35 Project Corridor

Effects of Corridor Improvements

The recently opened 51st Street and Slaughter Creek improvements are included as a part of the 2018 Existing forecast and have shifted travel patterns as new routes have become more attractive and traffic volumes have changed along the project corridor. ATG utilized CAMPO's travel demand model, recent counts, and engineering judgement to forecast the effects of these improvements. The process detailed in TxDOT TP&P's Corridor Analysis Standard Operating Procedure (SOP) was followed to complete the diversion necessary to build up traffic to reflect a 2018 with improvements condition.

2018 EXISTING CONFIGURATION



2018 FORECASTED AVERAGE DAILY TRAFFIC VOLUMES
AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
IH-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2018 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
2018 EXISTING CONFIGURATION
24 HOUR VOLUMES
(SHEET 5 OF 28)

SCALE : N.T.S.		PROJECT NO.		
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
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CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
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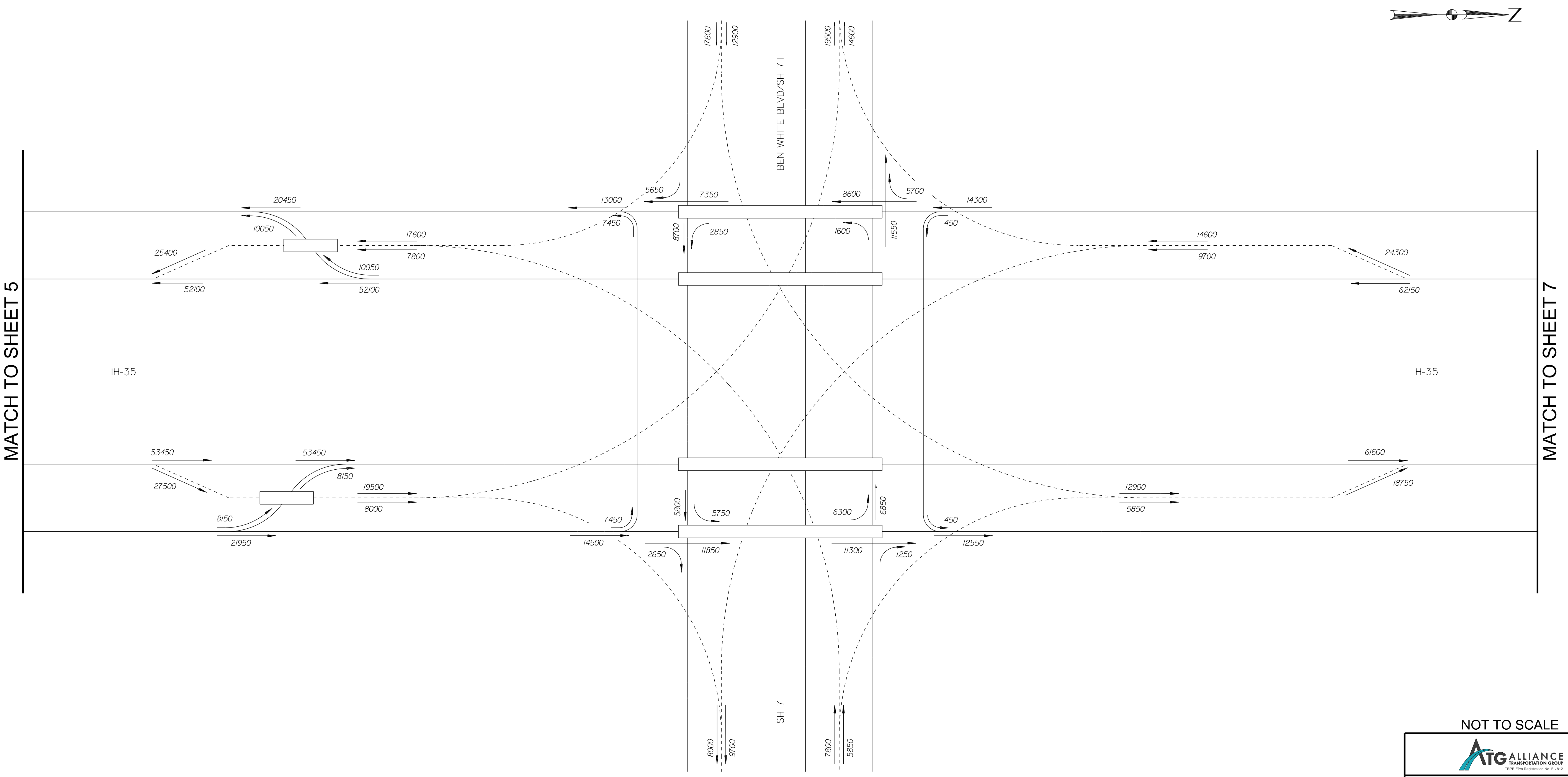
2018 EXISTING CONFIGURATION



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2018 FORECASTED AVERAGE DAILY TRAFFIC VOLUMES
AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
IH-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2018 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

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TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
2018 EXISTING CONFIGURATION
24 HOUR VOLUMES
(SHEET 6 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
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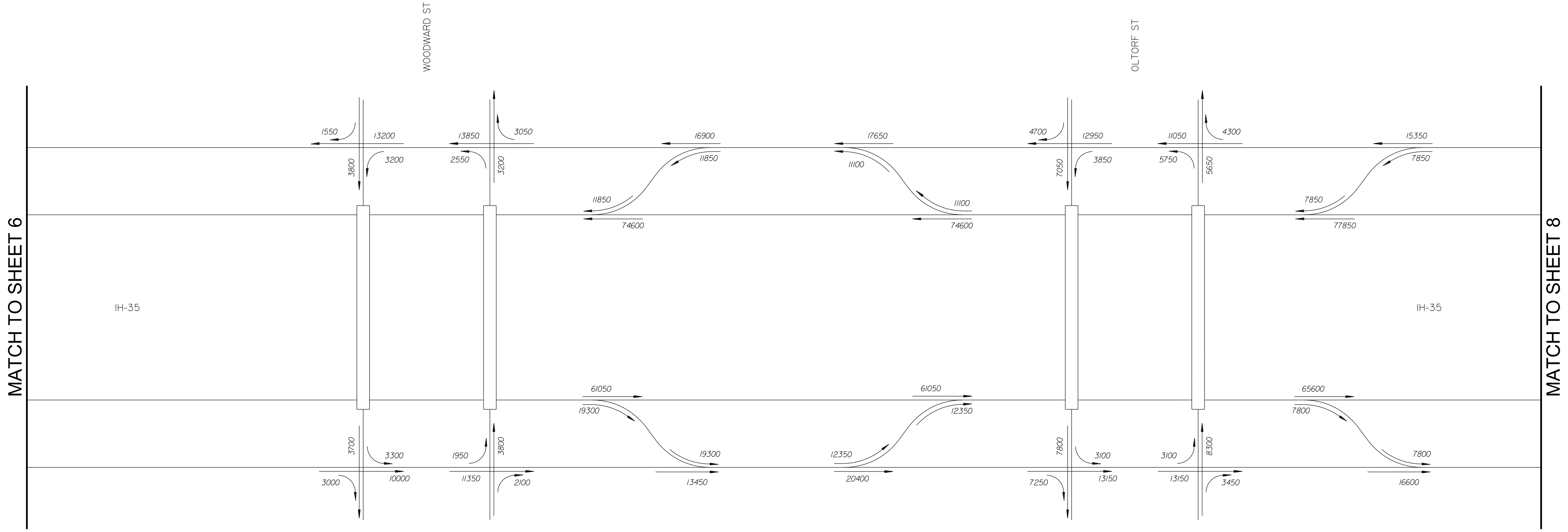

2018 FORECASTED AVERAGE DAILY TRAFFIC VOLUMES
AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
IH-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

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→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP

Texas Department of Transportation

CAPITAL EXPRESS
2018 EXISTING CONFIGURATION
24 HOUR VOLUMES
(SHEET 7 OF 28)

SCALE : N.T.S.			PROJECT NO.	
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CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
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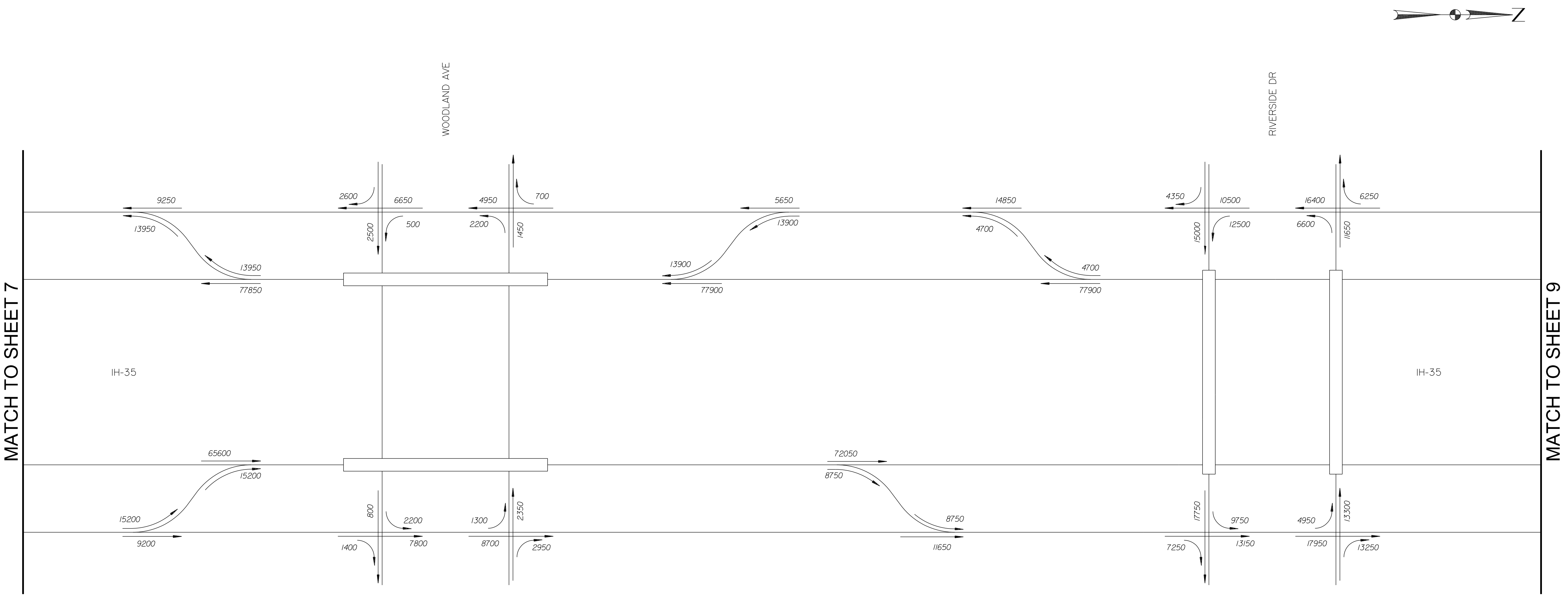

2018 FORECASTED AVERAGE DAILY TRAFFIC VOLUMES
AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
IH-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

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LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F - 812

Texas Department of Transportation

CAPITAL EXPRESS
2018 EXISTING CONFIGURATION
24 HOUR VOLUMES
(SHEET 8 OF 28)

SCALE : N.T.S.			PROJECT NO.	
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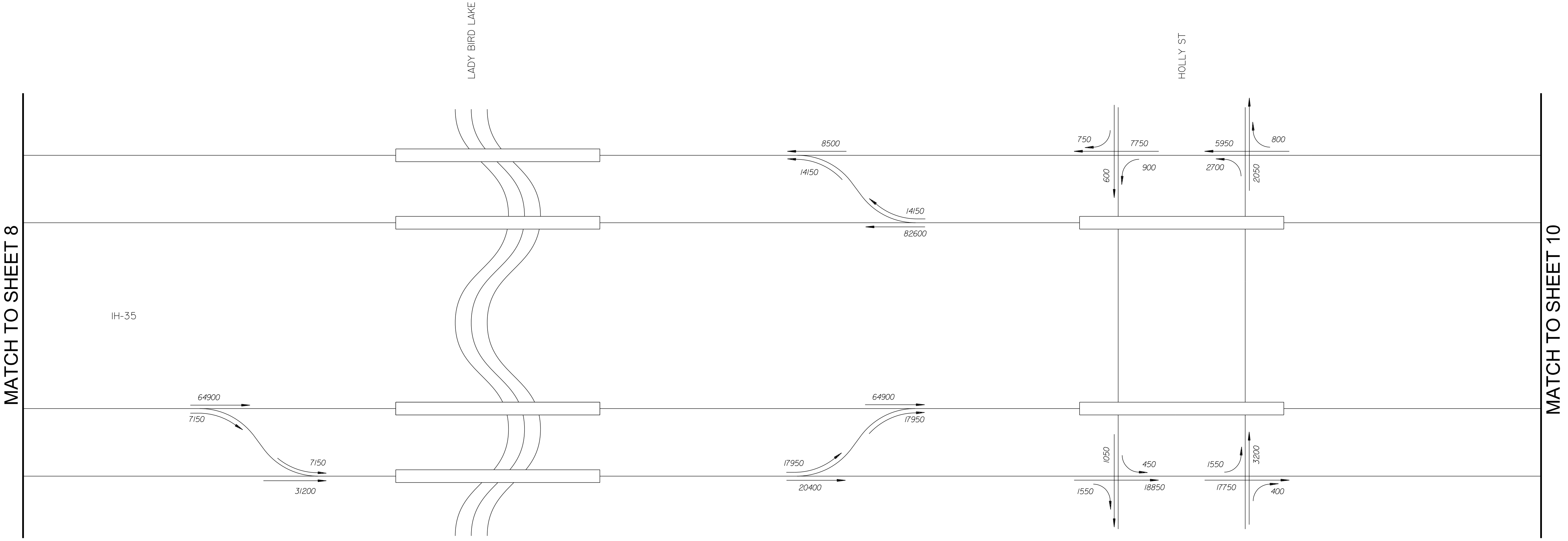
2018 EXISTING CONFIGURATION



NOT TO SCALE

2018 FORECASTED AVERAGE DAILY TRAFFIC VOLUMES
AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
IH-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2018 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

ATG ALLIANCE TRANSPORTATION GROUP

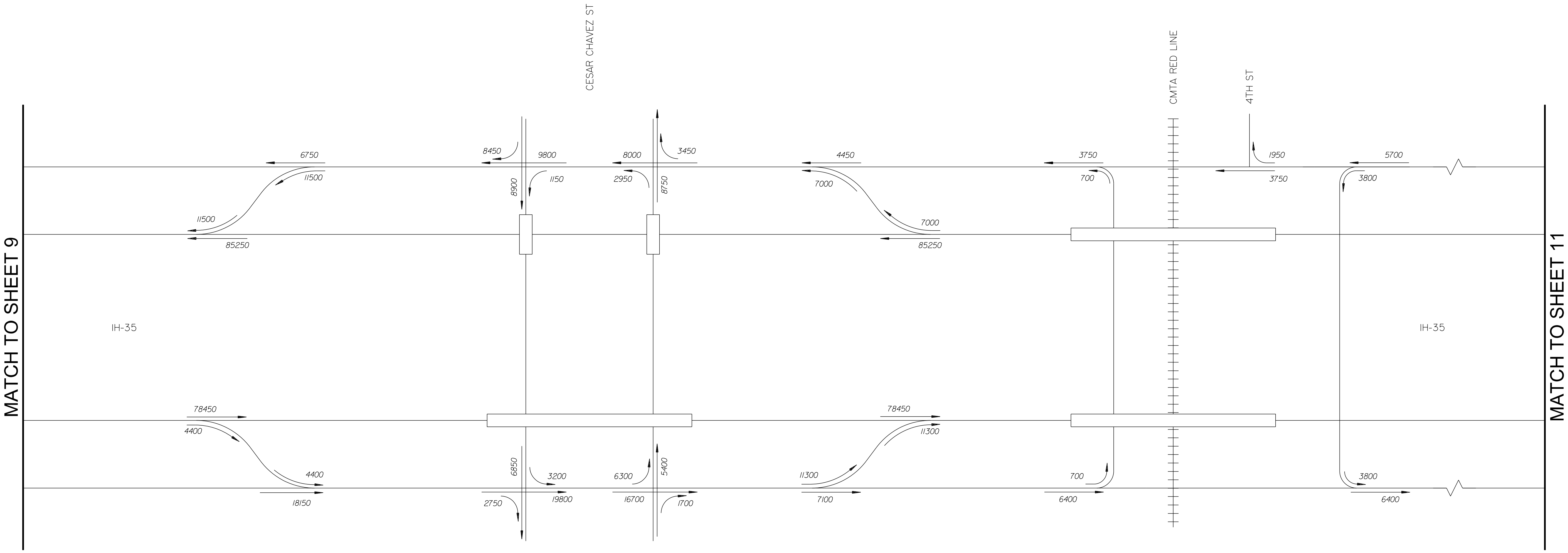
Texas Department of Transportation

CAPITAL EXPRESS
2018 EXISTING CONFIGURATION
24 HOUR VOLUMES
(SHEET 9 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	9

...\2018.0011*LineDiagrams*TPP*Existing*2018.dgn
THouston
10:28:34 AM
1/25/2019

2018 EXISTING CONFIGURATION



2018 FORECASTED AVERAGE DAILY TRAFFIC VOLUMES
AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
IH-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2018 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

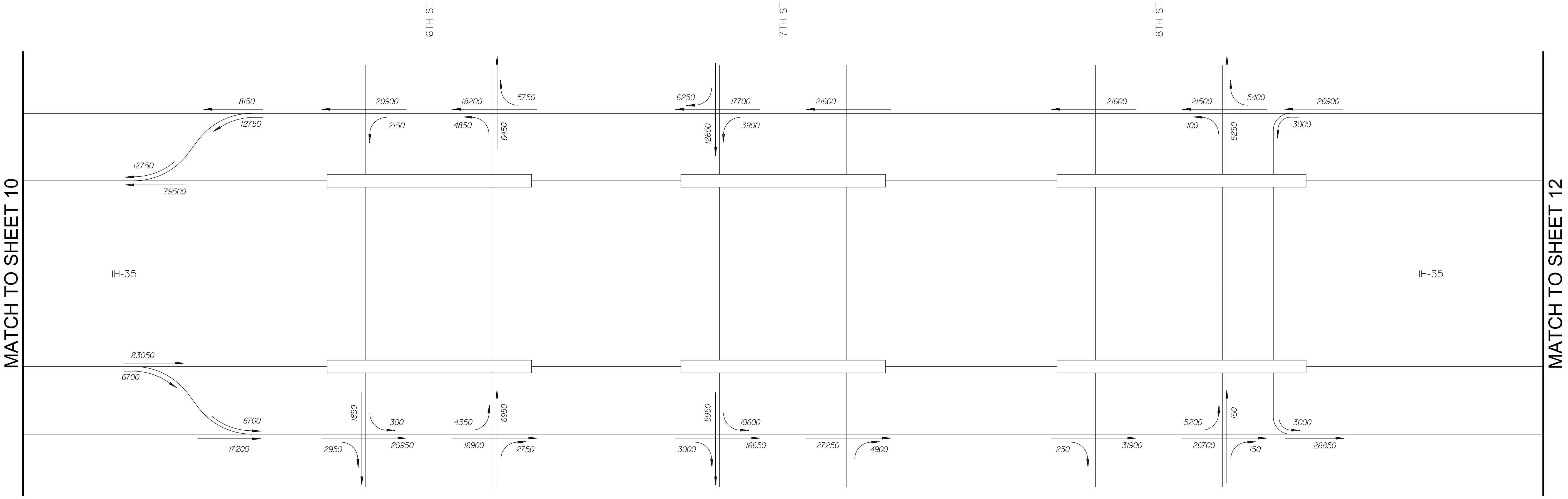
Texas Department of Transportation

CAPITAL EXPRESS
2018 EXISTING CONFIGURATION
24 HOUR VOLUMES
(SHEET 10 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	10

...\2018.0011*LineDiagrams*TPP*Existing*2018.dgn THouston 10:28:34 AM 1/25/2019

2018 EXISTING CONFIGURATION



2018 FORECASTED AVERAGE DAILY TRAFFIC VOLUMES
AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
IH-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2018 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F - 812

Texas Department of Transportation

CAPITAL EXPRESS
2018 EXISTING CONFIGURATION
24 HOUR VOLUMES
(SHEET 11 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	11

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THouston
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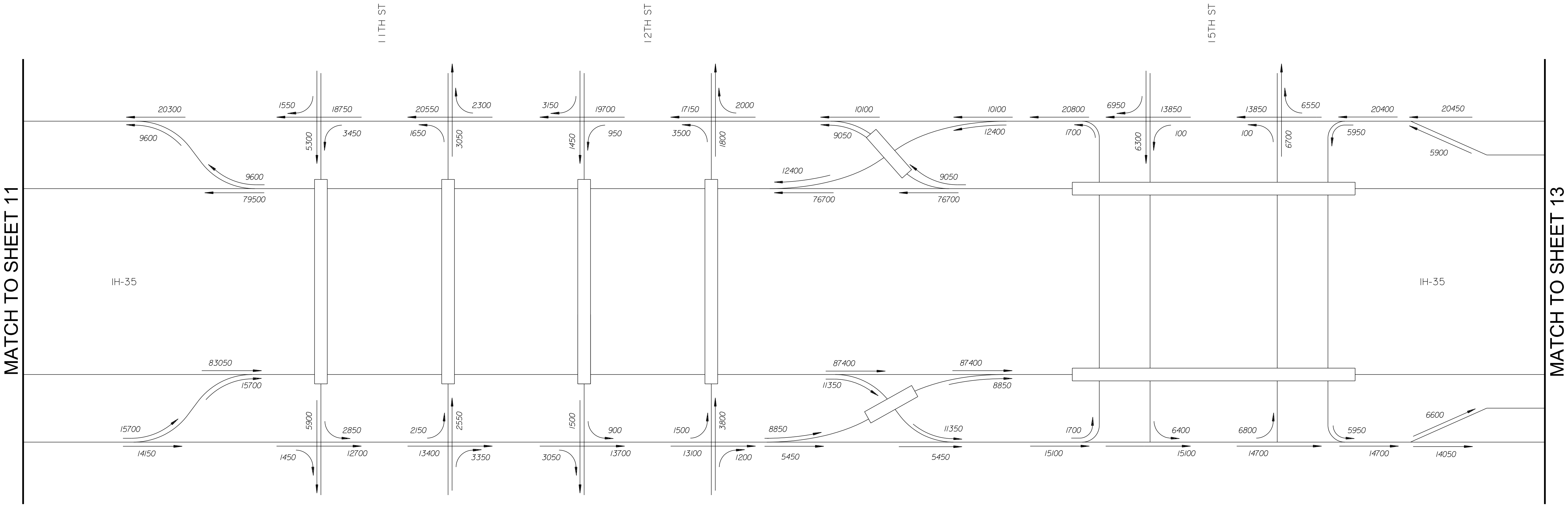
1/25/2019

2018 EXISTING CONFIGURATION



NOT TO SCALE

2018 FORECASTED AVERAGE DAILY TRAFFIC VOLUMES
AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
IH-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2018 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

ATG ALLIANCE TRANSPORTATION GROUP

Texas Department of Transportation

CAPITAL EXPRESS
2018 EXISTING CONFIGURATION
24 HOUR VOLUMES
(SHEET 12 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	12

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THouston
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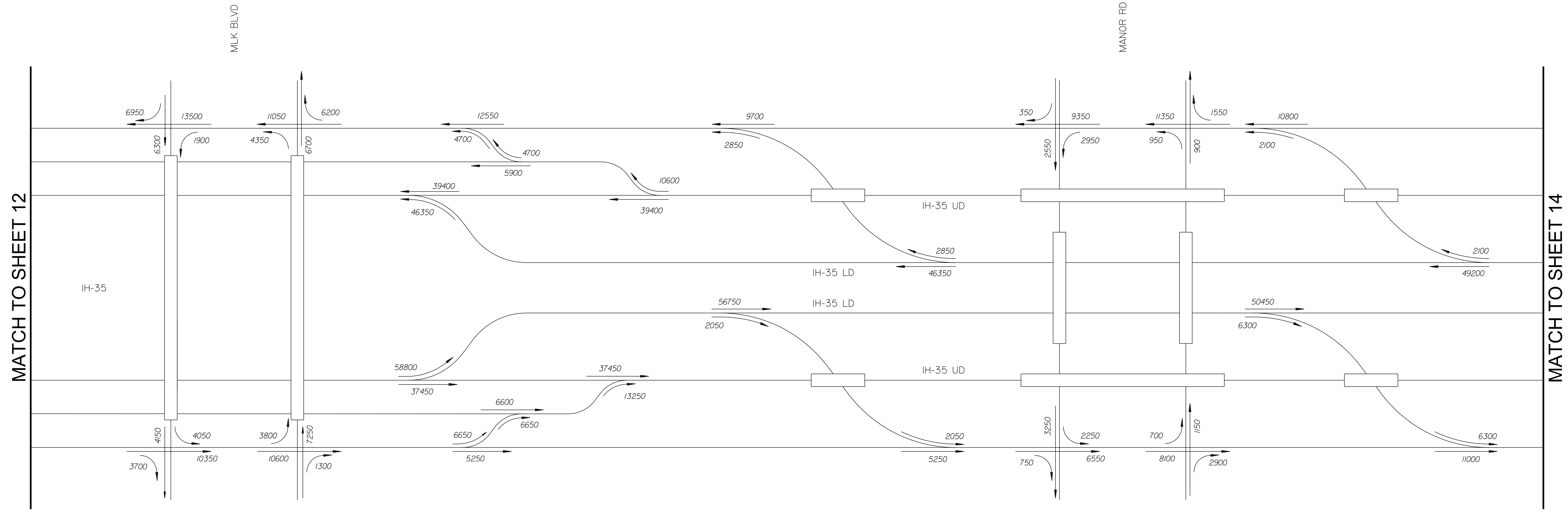
1/25/2019

2018 EXISTING CONFIGURATION



NOT TO SCALE

2018 FORECASTED AVERAGE DAILY TRAFFIC VOLUMES
AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
IH-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2018 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F - 812

Texas Department of Transportation

CAPITAL EXPRESS
2018 EXISTING CONFIGURATION
24 HOUR VOLUMES
(SHEET 13 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	13

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THouston
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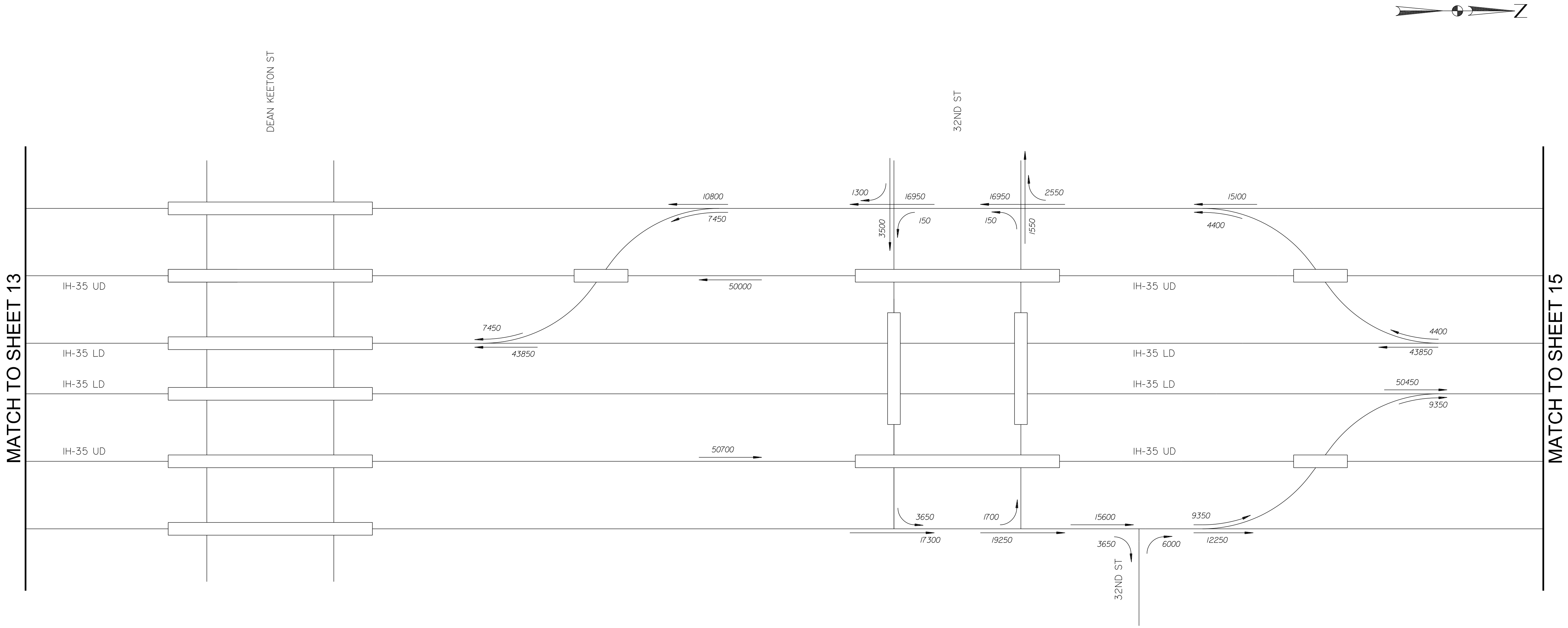
1/25/2019

2018 EXISTING CONFIGURATION



2018 FORECASTED AVERAGE DAILY TRAFFIC VOLUMES
AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
IH-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2018 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
2018 EXISTING CONFIGURATION
24 HOUR VOLUMES
(SHEET 14 OF 28)

SCALE : N.T.S.		PROJECT NO.	
DWN: TH	CKD: HH		
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY
TEXAS	14	6	TRAVIS

CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	14

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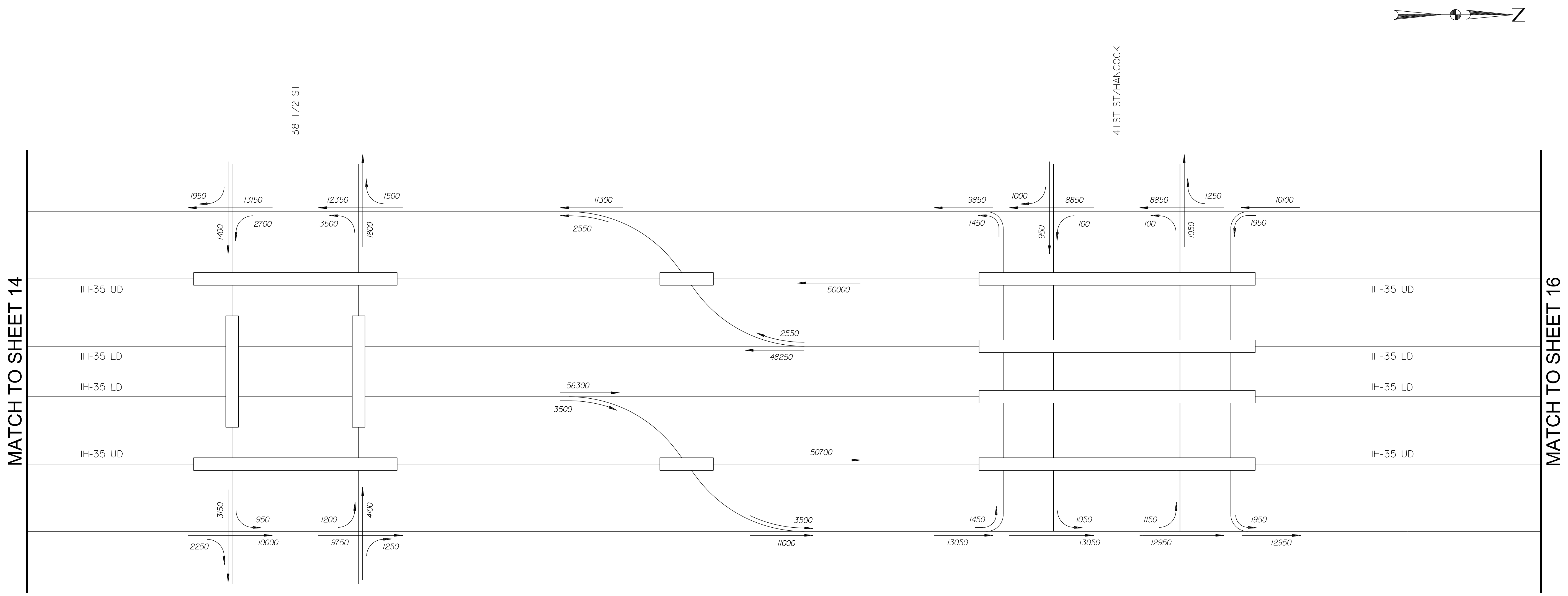
THouston
10:28:35 AM
1/25/2019

2018 EXISTING CONFIGURATION



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THouston

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1/25/2019

2018 FORECASTED AVERAGE DAILY TRAFFIC VOLUMES
AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
IH-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2018 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

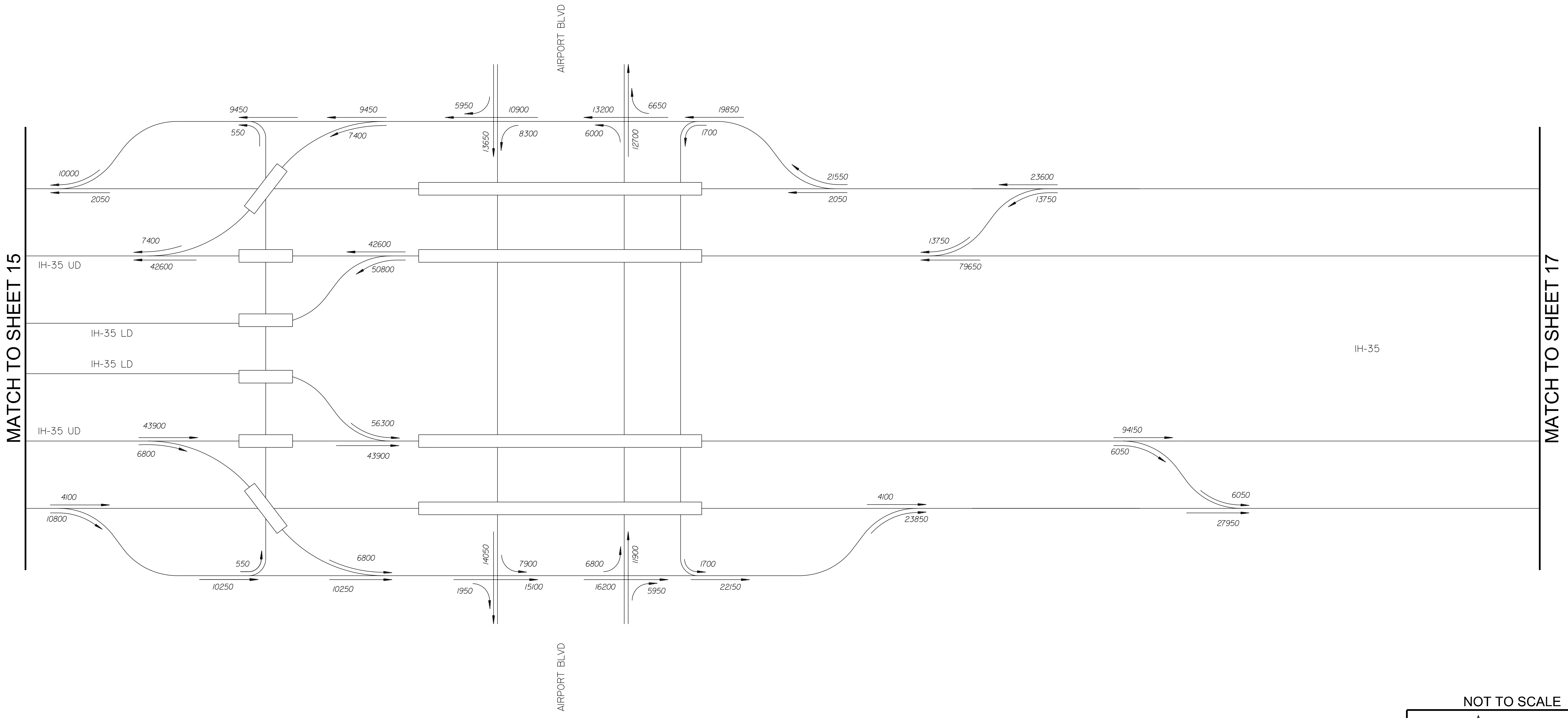
ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
2018 EXISTING CONFIGURATION
24 HOUR VOLUMES
(SHEET 15 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	15

2018 EXISTING CONFIGURATION



2018 FORECASTED AVERAGE DAILY TRAFFIC VOLUMES
AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
IH-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2018 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
2018 EXISTING CONFIGURATION
24 HOUR VOLUMES
(SHEET 16 OF 28)

SCALE : N.T.S.		PROJECT NO.		
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	16

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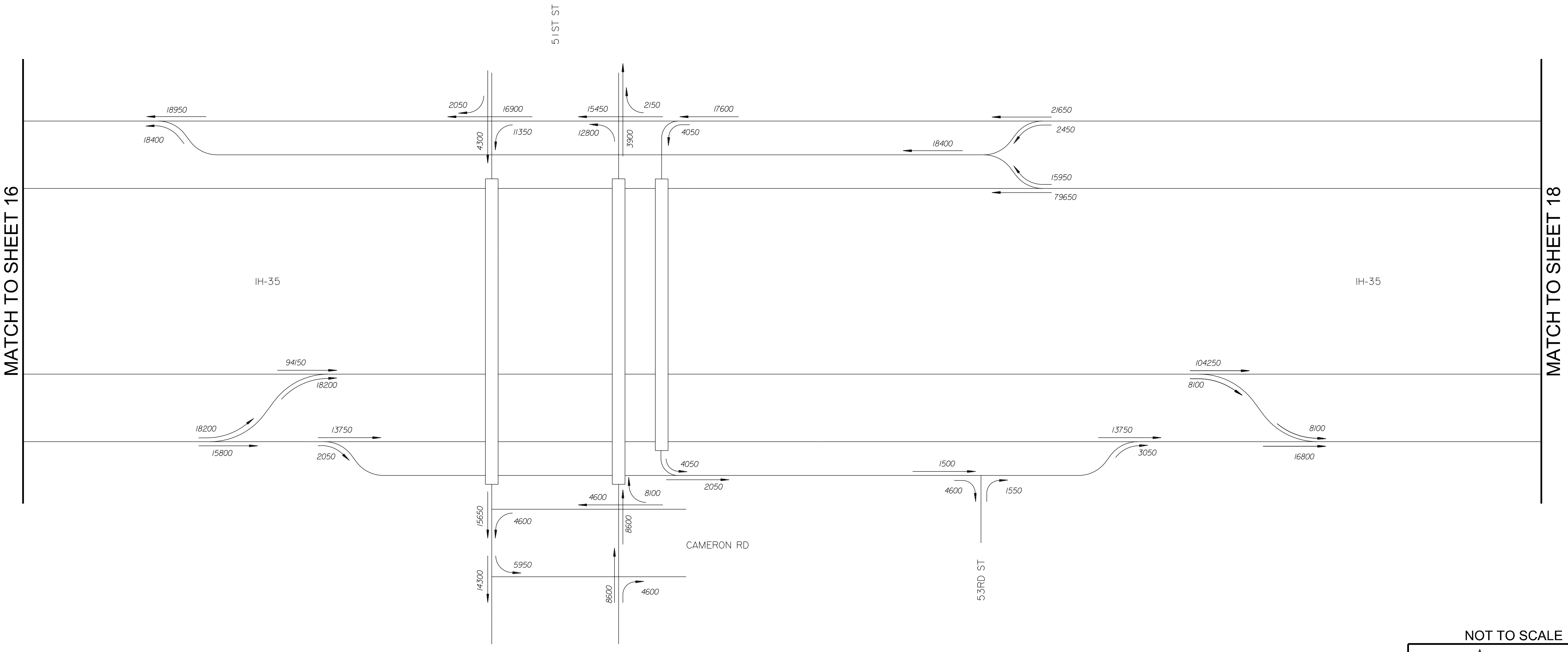
1/25/2019

2018 EXISTING CONFIGURATION



2018 FORECASTED AVERAGE DAILY TRAFFIC VOLUMES
AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
IH-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2018 ADT
LD - LOWER DECK
UD - UPPER DECK
⟶ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
2018 EXISTING CONFIGURATION
24 HOUR VOLUMES
(SHEET 17 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	17

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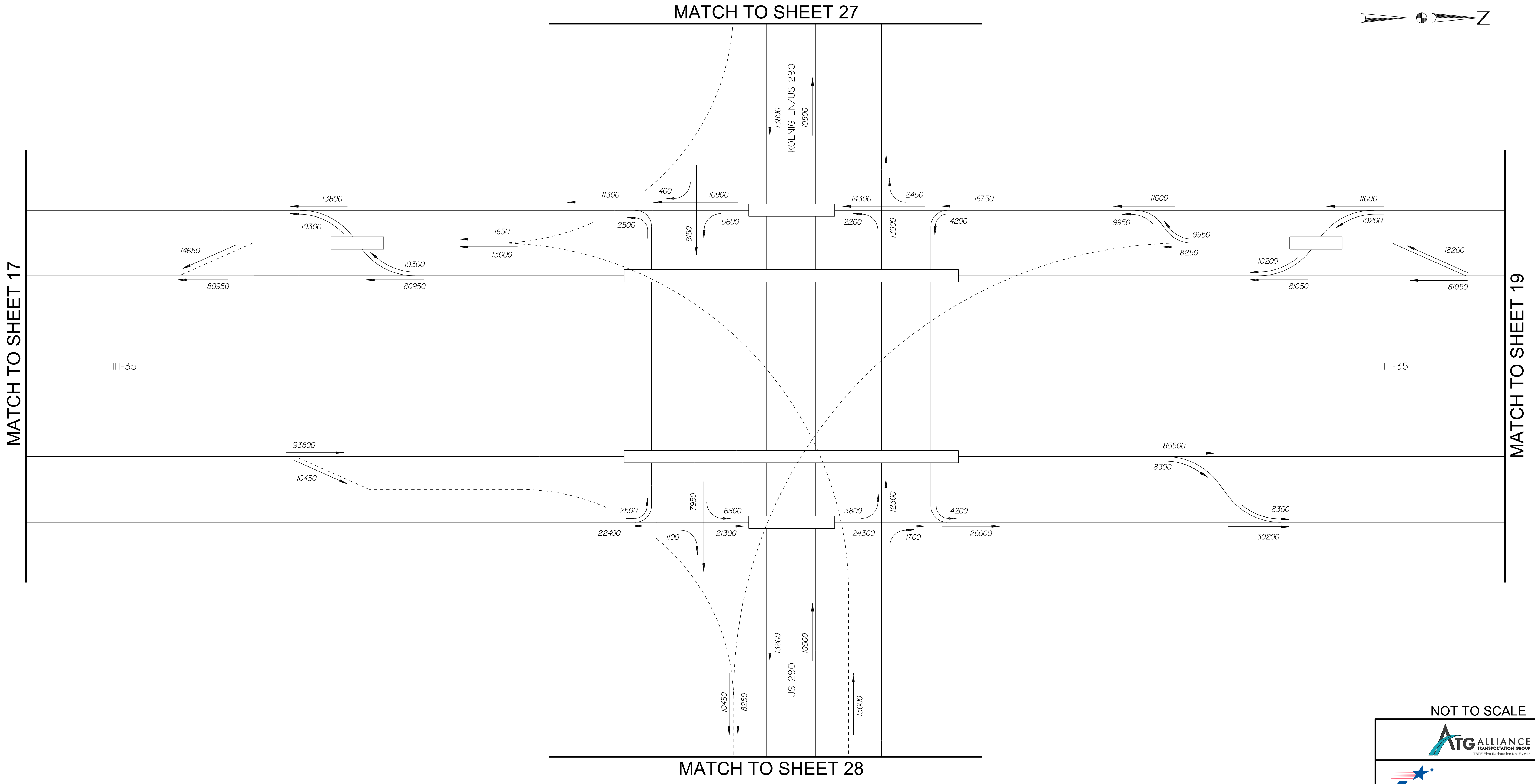
1/25/2019

2018 EXISTING CONFIGURATION



2018 FORECASTED AVERAGE DAILY TRAFFIC VOLUMES
AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
IH-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2018 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
2018 EXISTING CONFIGURATION
24 HOUR VOLUMES
(SHEET 18 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	18

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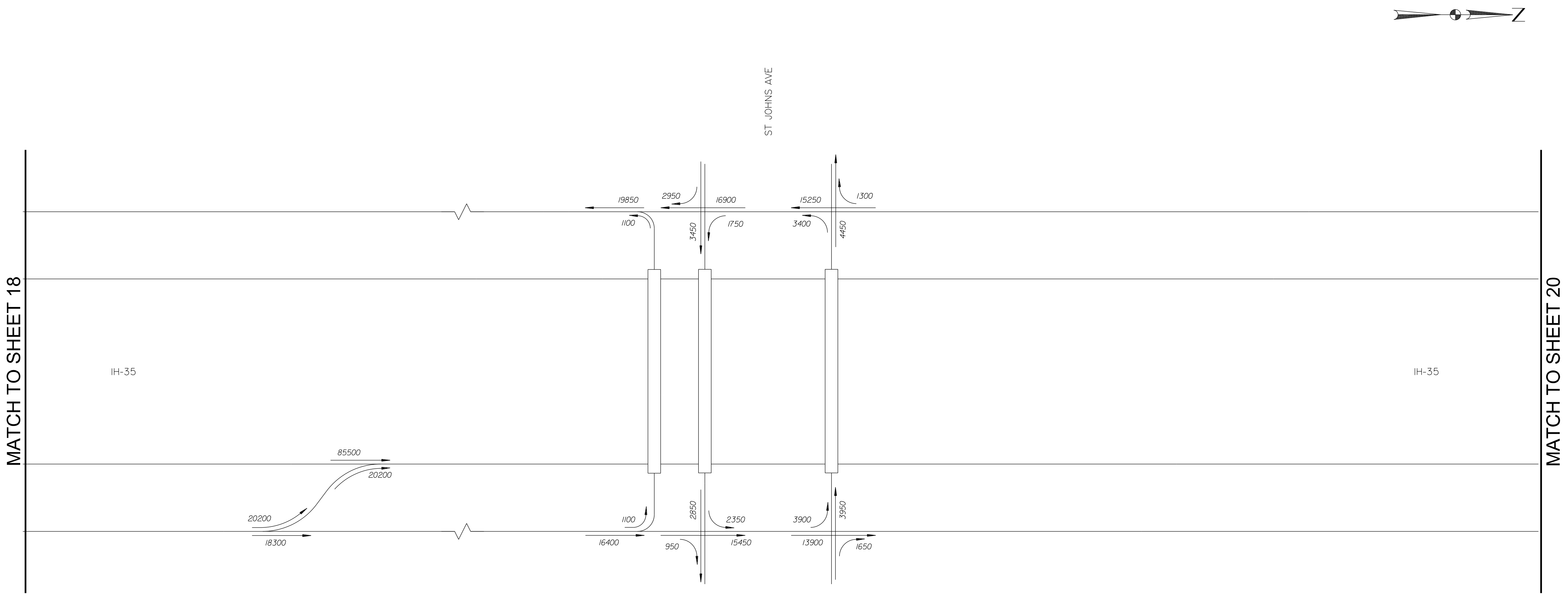
THouston
10:28:37 AM
1/25/2019

2018 EXISTING CONFIGURATION



2018 FORECASTED AVERAGE DAILY TRAFFIC VOLUMES
AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
IH-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2018 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
2018 EXISTING CONFIGURATION
24 HOUR VOLUMES
(SHEET 19 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	19

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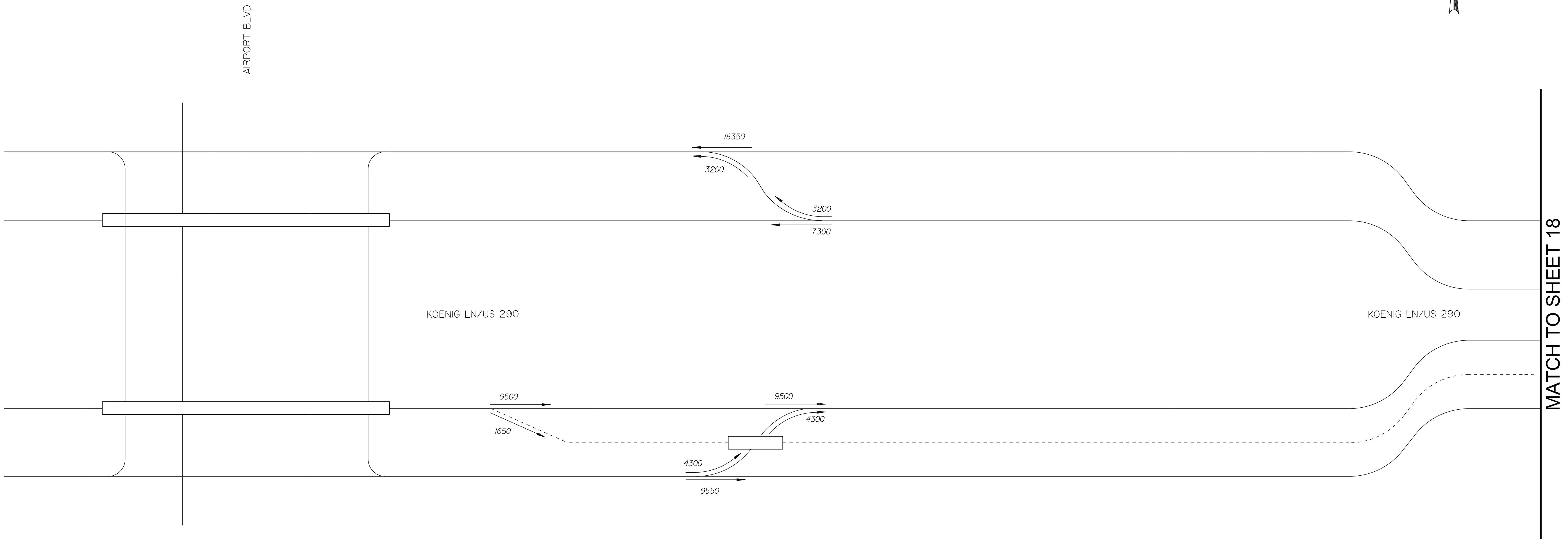
2018 EXISTING CONFIGURATION



2018 FORECASTED AVERAGE DAILY TRAFFIC VOLUMES
AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
IH-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2018 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

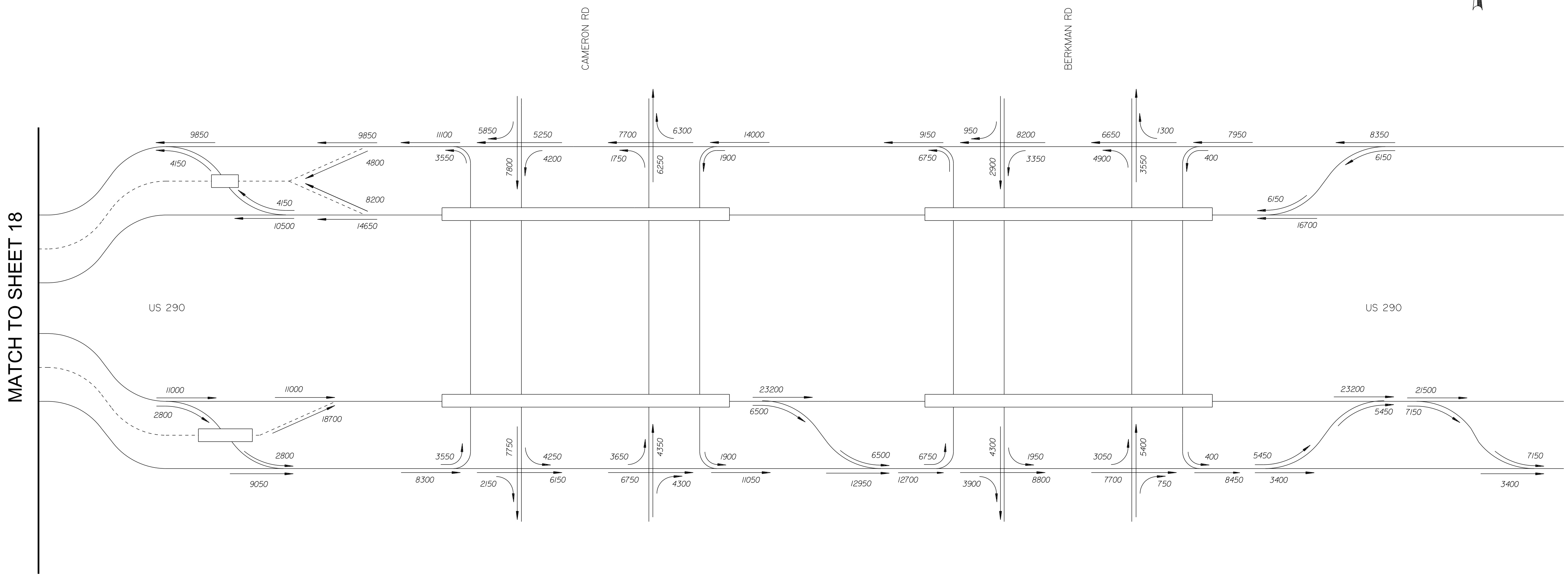
ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
2018 EXISTING CONFIGURATION
24 HOUR VOLUMES
(SHEET 27 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	27

2018 EXISTING CONFIGURATION



2018 FORECASTED AVERAGE DAILY TRAFFIC VOLUMES
AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
IH-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2018 ADT
LD - LOWER DECK
UD - UPPER DECK
⟶ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
2018 EXISTING CONFIGURATION
24 HOUR VOLUMES
(SHEET 28 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	28

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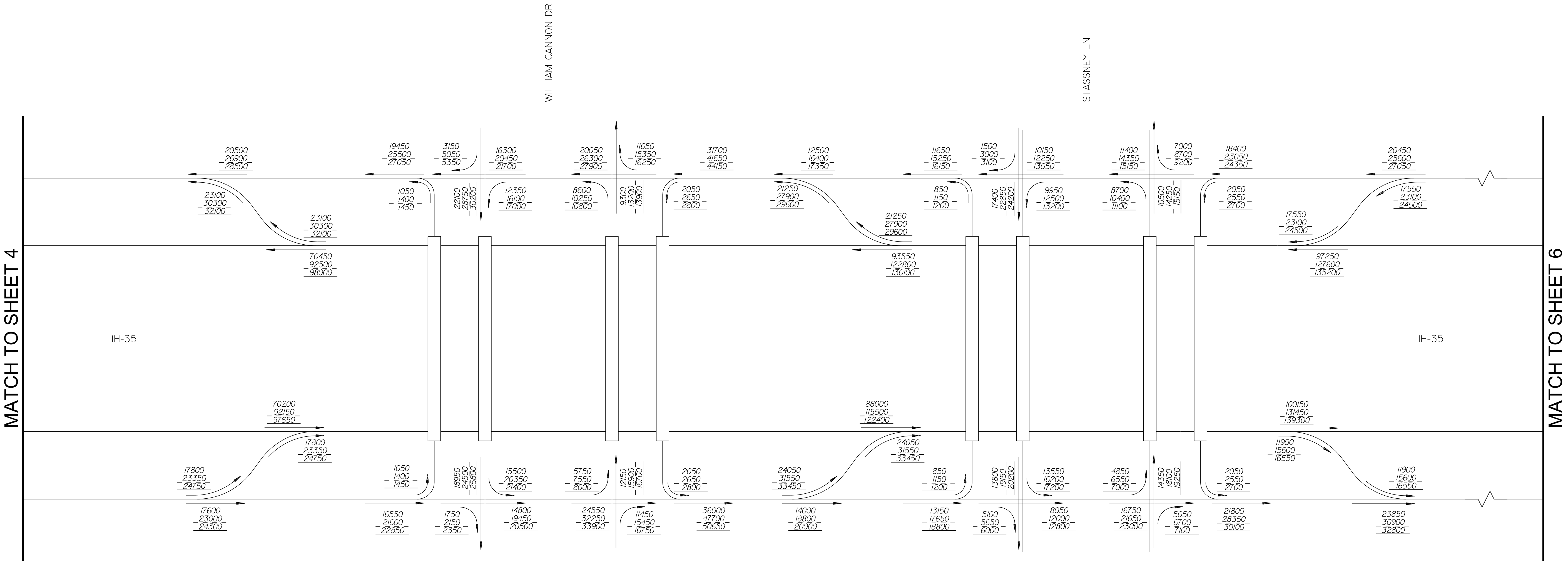
NO-BUILD CONFIGURATION



2030, 2050, 2060 FORECASTED NO-BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
NO-BUILD CONFIGURATION
24 HOUR VOLUMES
(SHEET 5 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	5

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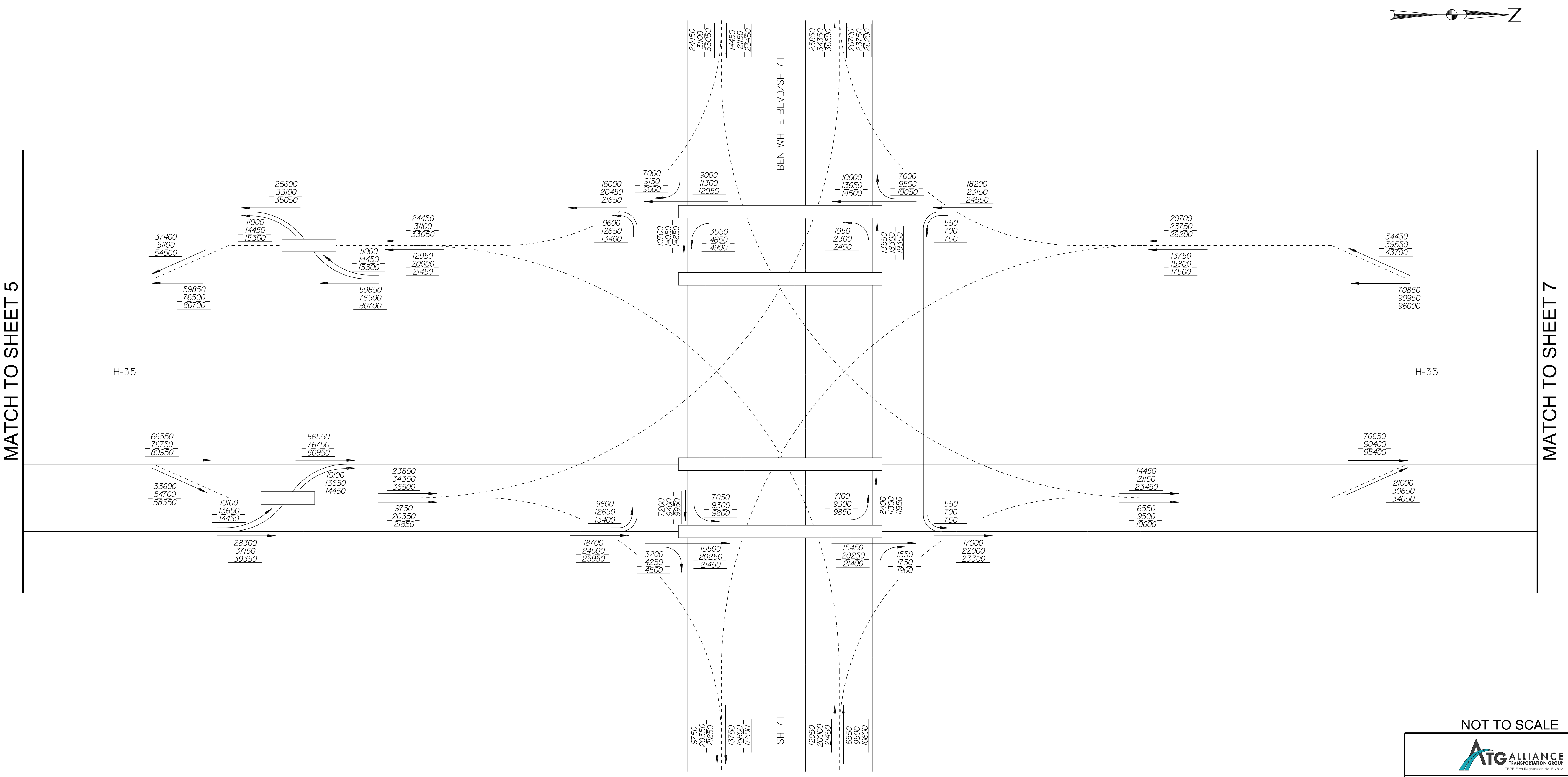
NO-BUILD CONFIGURATION



2030, 2050, 2060 FORECASTED NO-BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP

Texas Department of Transportation

CAPITAL EXPRESS
NO-BUILD CONFIGURATION
24 HOUR VOLUMES
(SHEET 6 OF 28)

SCALE : N.T.S.		PROJECT NO.	
DWN: TH	CKD: HH		
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY
TEXAS	14	6	TRAVIS

CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	6

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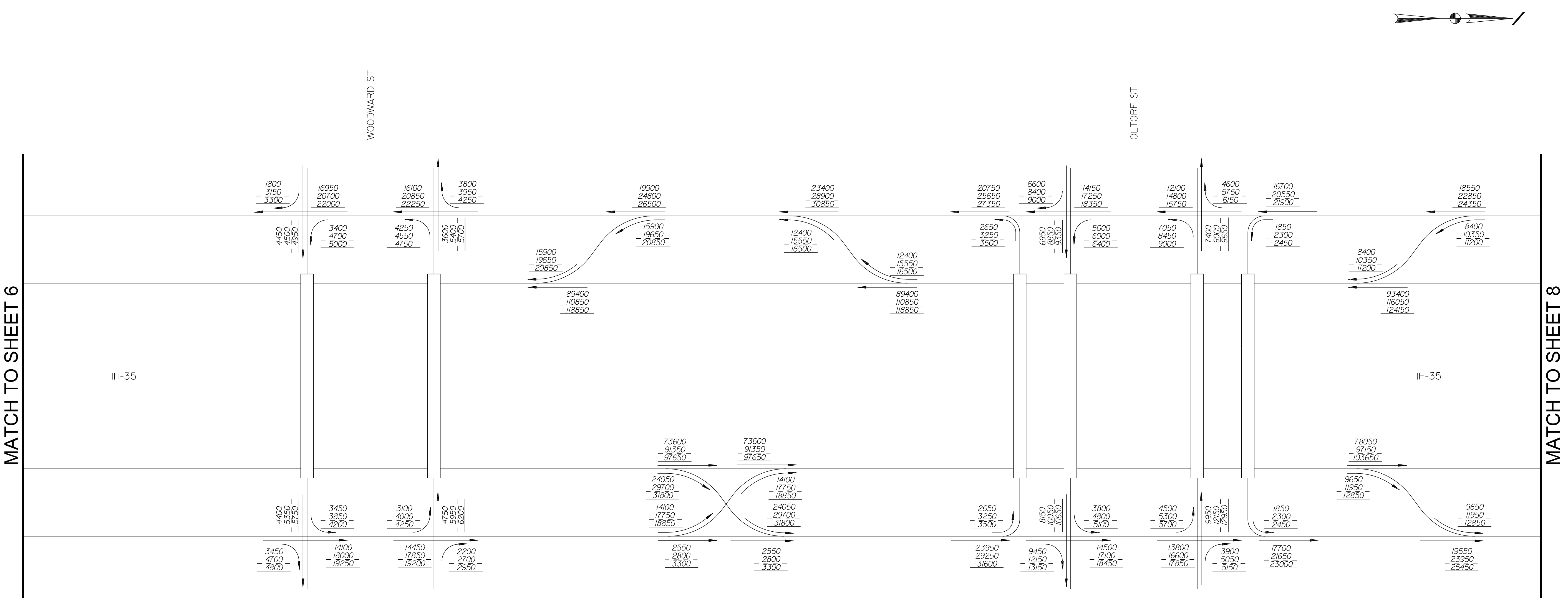
NO-BUILD CONFIGURATION



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2030, 2050, 2060 FORECASTED NO-BUILD AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

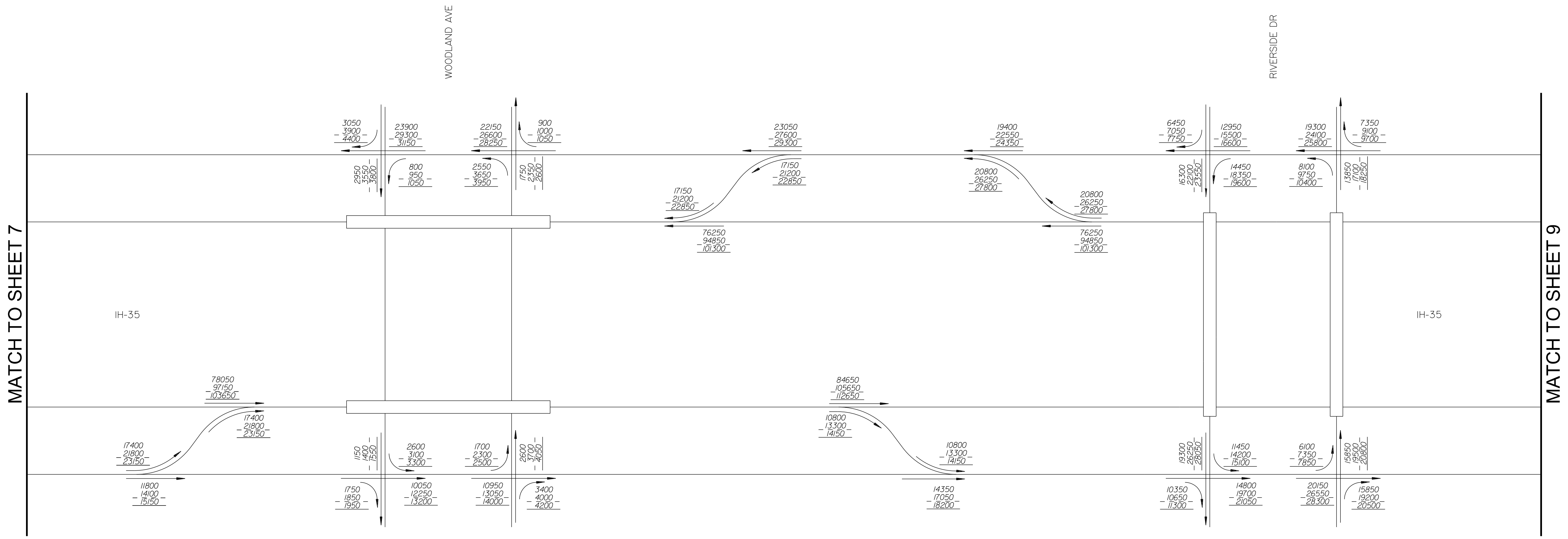
Texas Department of Transportation

CAPITAL EXPRESS
NO-BUILD CONFIGURATION
24 HOUR VOLUMES
(SHEET 7 OF 28)

SCALE : N.T.S.		PROJECT NO.	
DWN: TH	CKD: HH		
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY
TEXAS	14	6	TRAVIS

CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	7

NO-BUILD CONFIGURATION



2030, 2050, 2060 FORECASTED NO-BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
NO-BUILD CONFIGURATION
24 HOUR VOLUMES
(SHEET 8 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	8

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THouston
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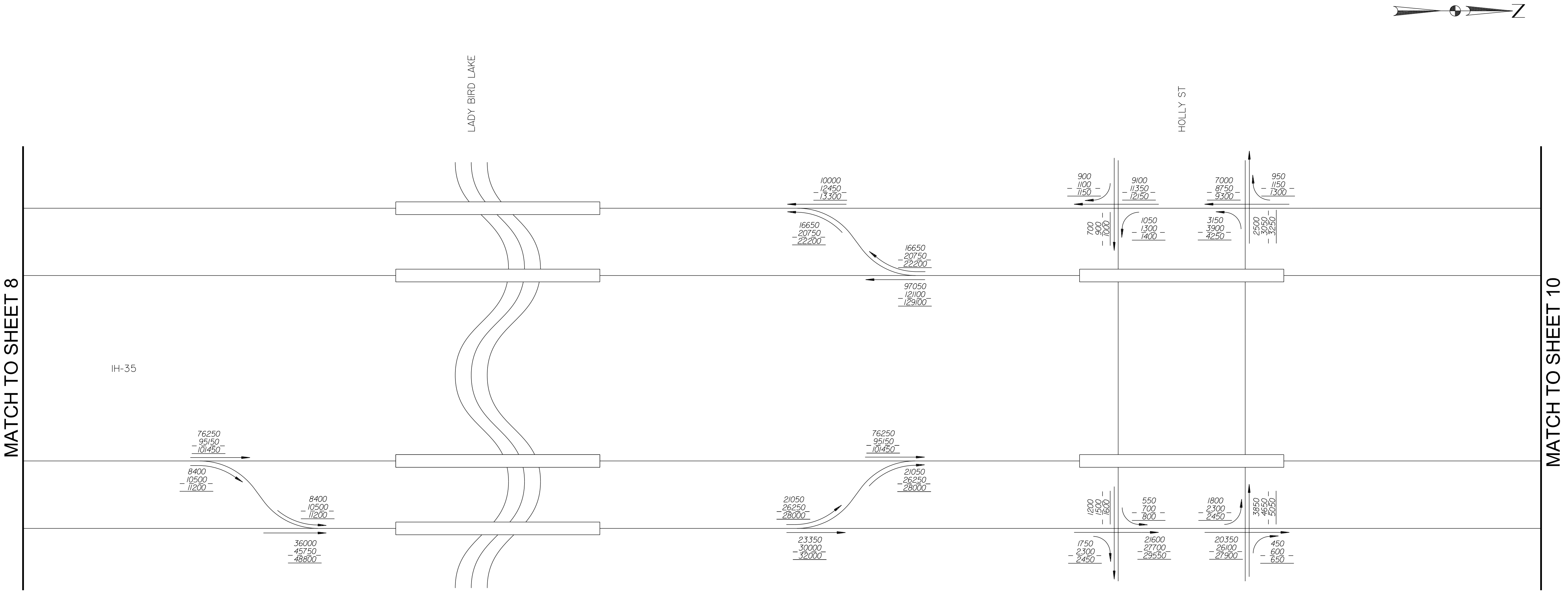
1/25/2019

NO-BUILD CONFIGURATION



2030, 2050, 2060 FORECASTED NO-BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

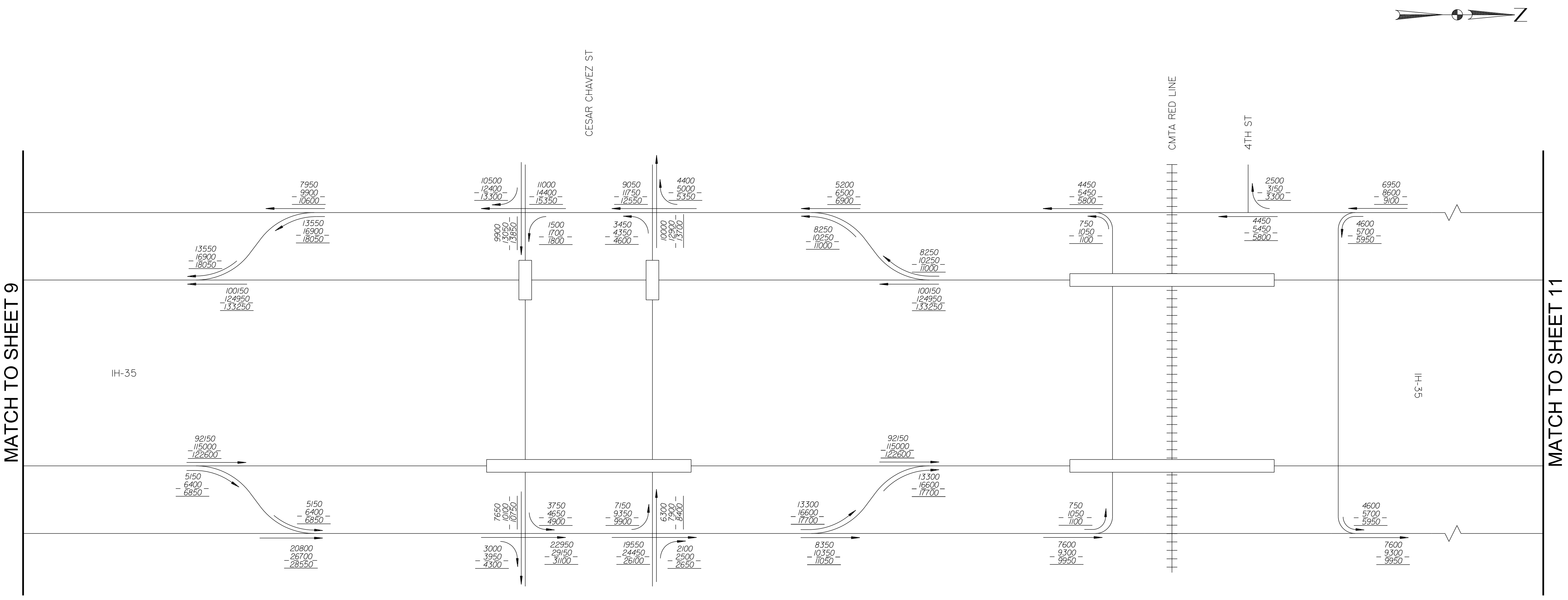
Texas Department of Transportation

CAPITAL EXPRESS
NO-BUILD CONFIGURATION
24 HOUR VOLUMES
(SHEET 9 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	9

...\2018.0011*LineDiagrams*TPP*NB.dgn
THouston
11:12:02 AM
1/25/2019

NO-BUILD CONFIGURATION



2030, 2050, 2060 FORECASTED NO-BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
NO-BUILD CONFIGURATION
24 HOUR VOLUMES
(SHEET 10 OF 28)

SCALE : N.T.S.				PROJECT NO.
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	10

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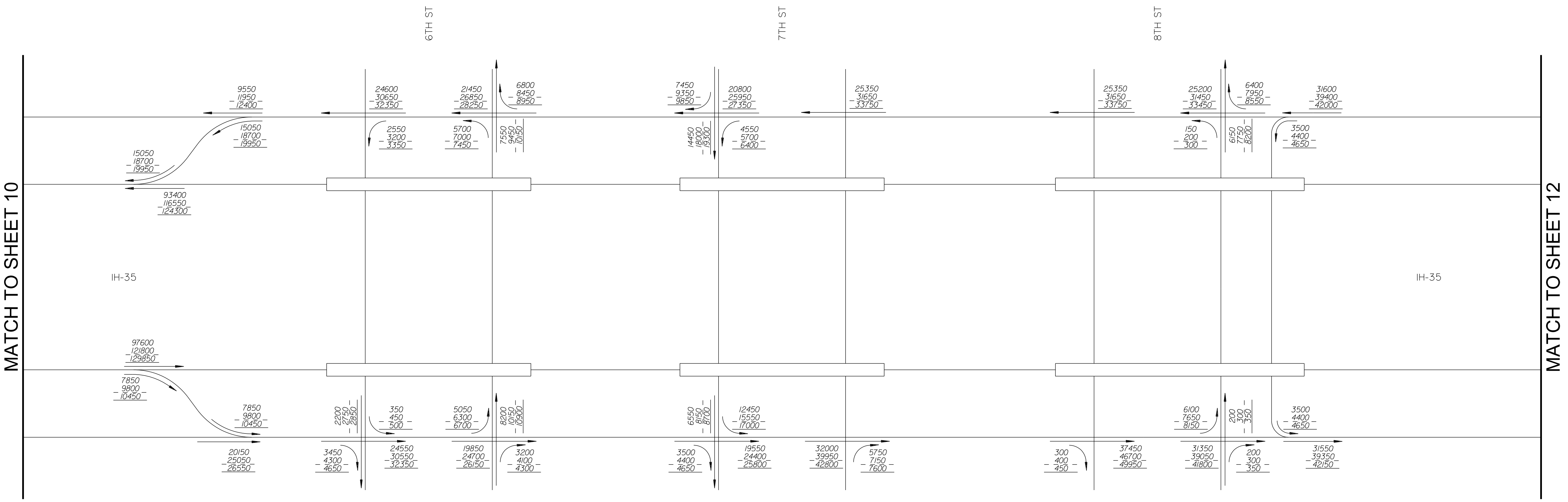
THouston
11:12:03 AM
1/25/2019

NO-BUILD CONFIGURATION



2030, 2050, 2060 FORECASTED NO-BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
NO-BUILD CONFIGURATION
24 HOUR VOLUMES
(SHEET 11 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	11

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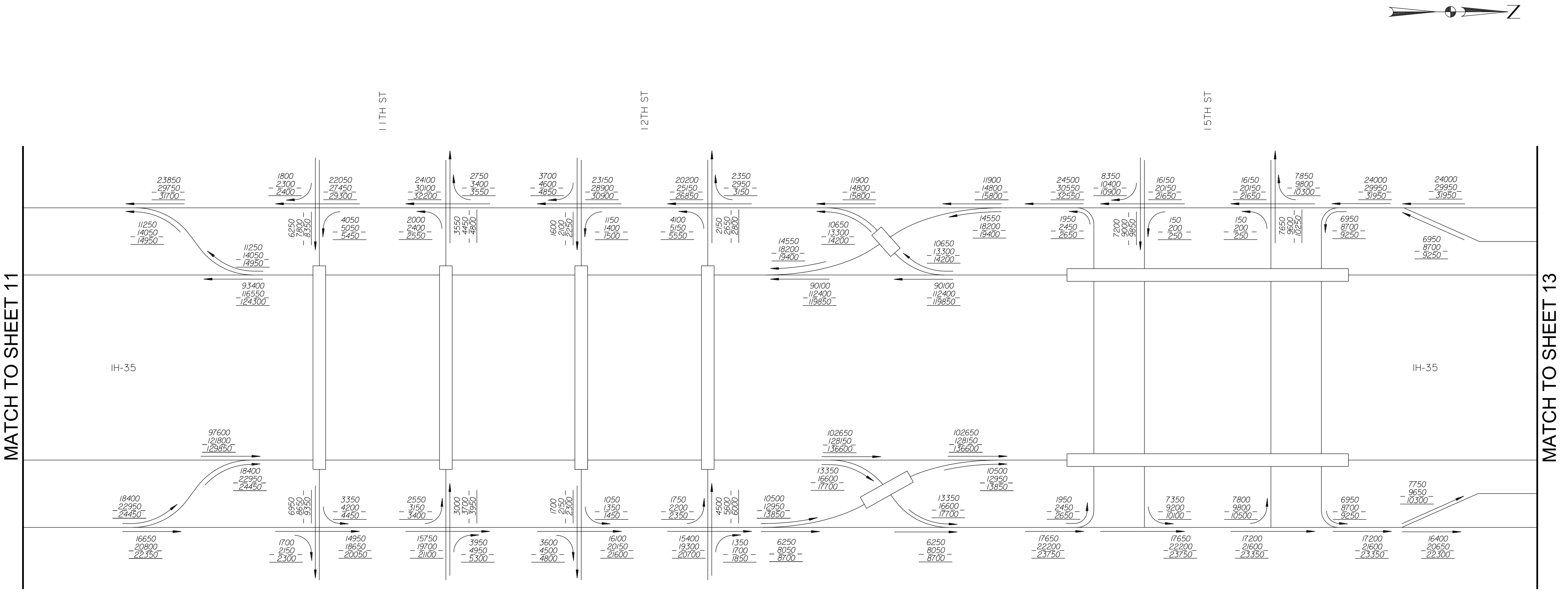
THouston

11:12:03 AM

1/25/2019

NO-BUILD CONFIGURATION



2030, 2050, 2060 FORECASTED NO-BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
NO-BUILD CONFIGURATION
24 HOUR VOLUMES
(SHEET 12 OF 28)

SCALE : N.T.S.		PROJECT NO.	
DWN: TH	CKD: HH		
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY
TEXAS	14	6	TRAVIS

CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	12

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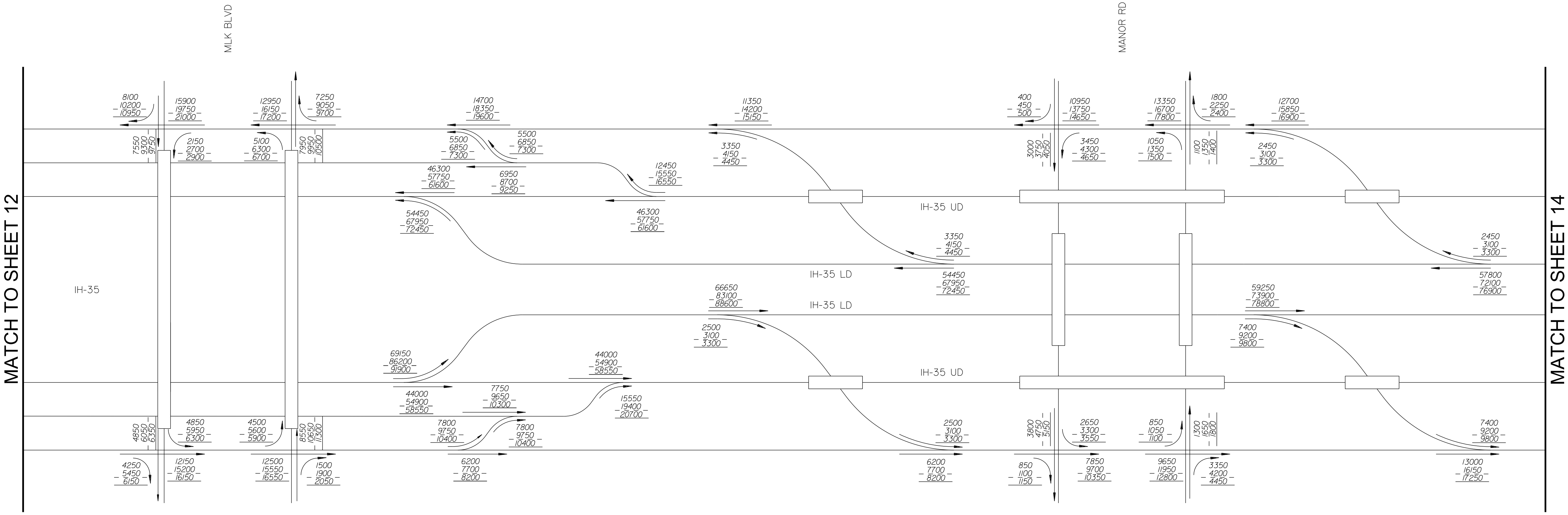
NO-BUILD CONFIGURATION



2030, 2050, 2060 FORECASTED NO-BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
NO-BUILD CONFIGURATION
24 HOUR VOLUMES
(SHEET 13 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	13

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THouston

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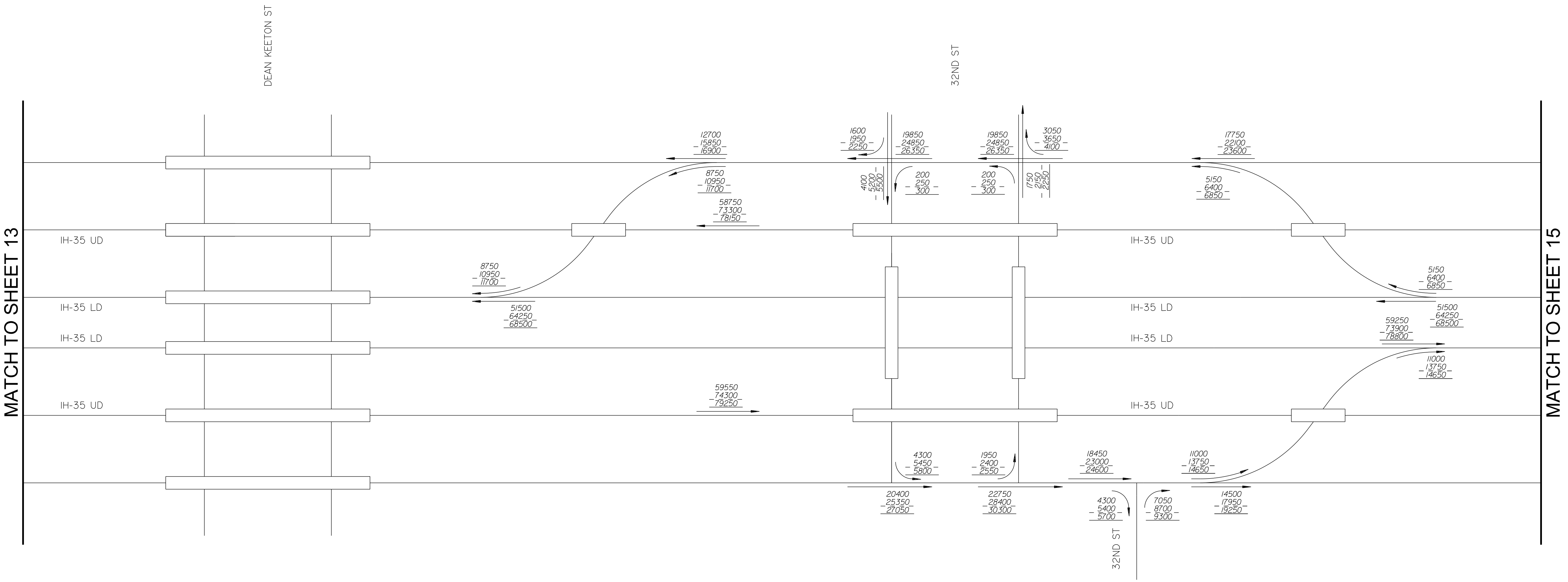


NOT TO SCALE

2030, 2050, 2060 FORECASTED NO-BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

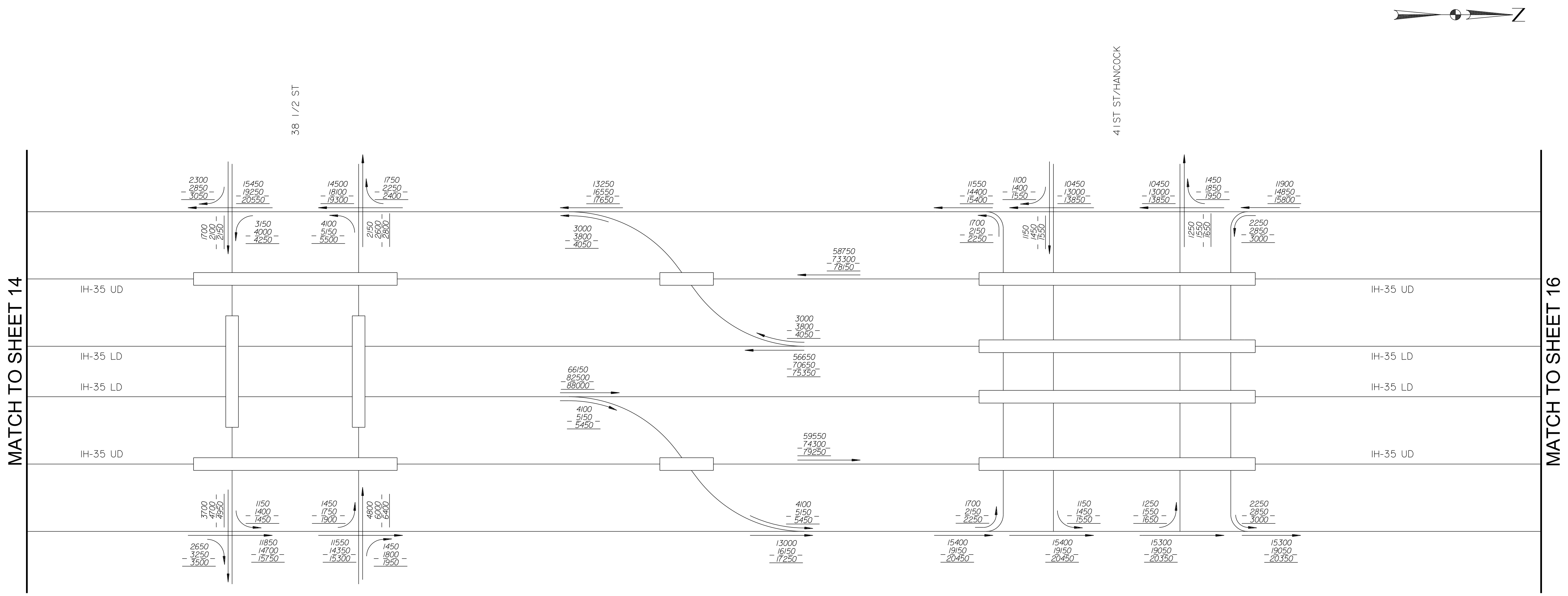
Texas Department of Transportation

CAPITAL EXPRESS
NO-BUILD CONFIGURATION
24 HOUR VOLUMES
(SHEET 14 OF 28)

SCALE : N.T.S.	PROJECT NO.
DWN: TH CKD: HH	

STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	14

NO-BUILD CONFIGURATION



2030, 2050, 2060 FORECASTED NO-BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
NO-BUILD CONFIGURATION
24 HOUR VOLUMES
(SHEET 15 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	15

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THouston
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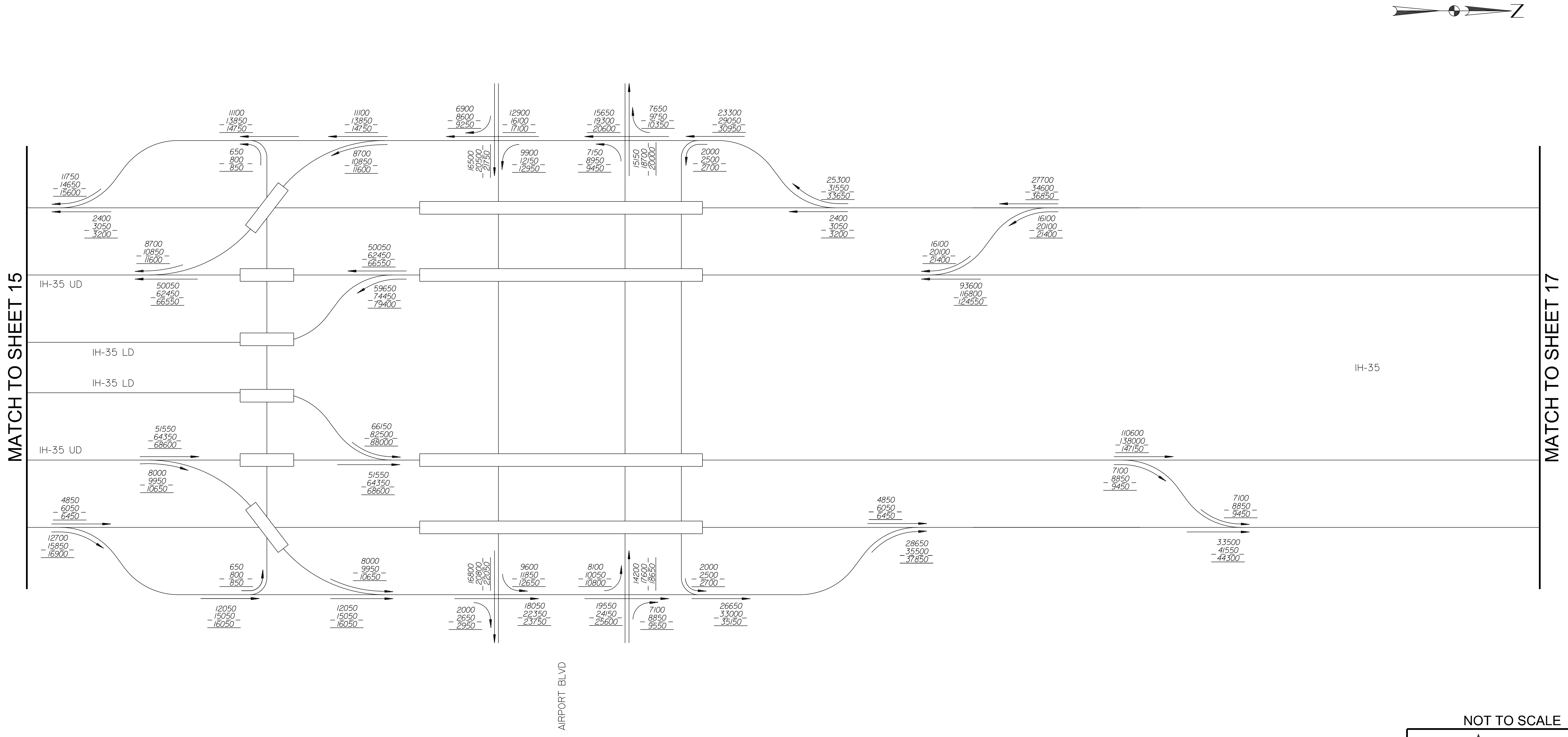
1/25/2019

NO-BUILD CONFIGURATION



2030, 2050, 2060 FORECASTED NO-BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
NO-BUILD CONFIGURATION
24 HOUR VOLUMES
(SHEET 16 OF 28)

SCALE : N. T. S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	16

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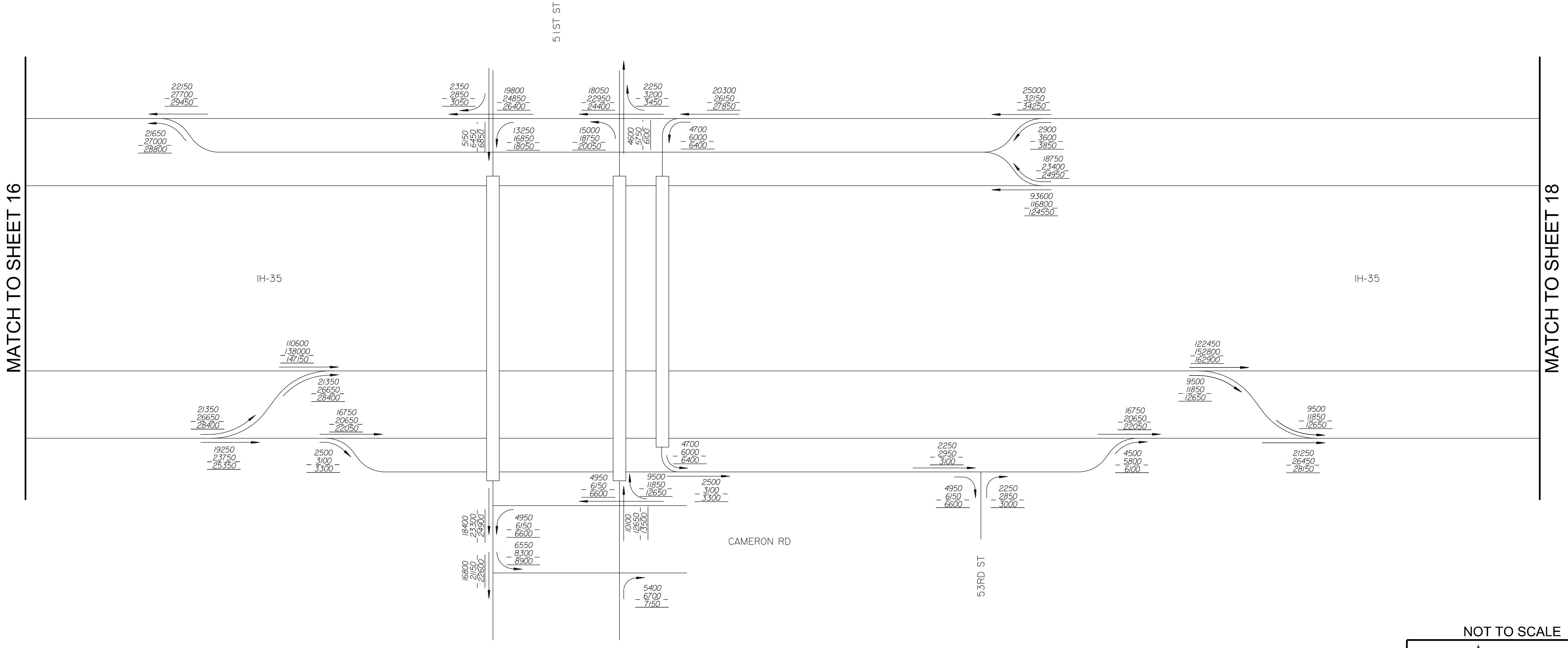
NO-BUILD CONFIGURATION



2030, 2050, 2060 FORECASTED NO-BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
NO-BUILD CONFIGURATION
24 HOUR VOLUMES
(SHEET 17 OF 28)

SCALE : N.T.S.		PROJECT NO.		
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	17

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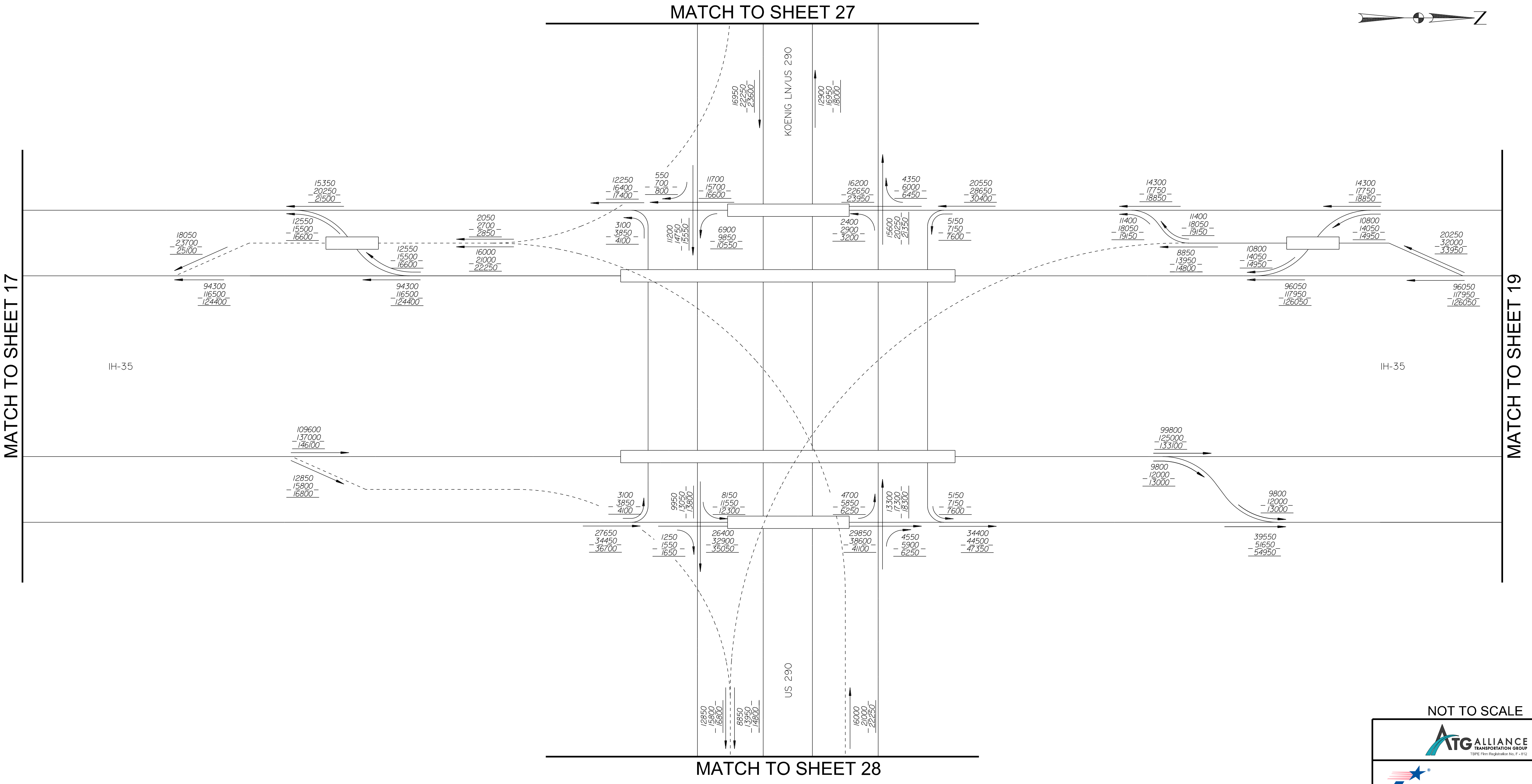
NO-BUILD CONFIGURATION



2030, 2050, 2060 FORECASTED NO-BUILD AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
NO-BUILD CONFIGURATION
24 HOUR VOLUMES
(SHEET 18 OF 28)

SCALE : N.T.S.				PROJECT NO.	
DWN: TH	CKD: HH				
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY		
TEXAS	14	6	TRAVIS		
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.	
5000	00	106	IH-35	18	

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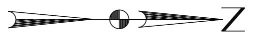
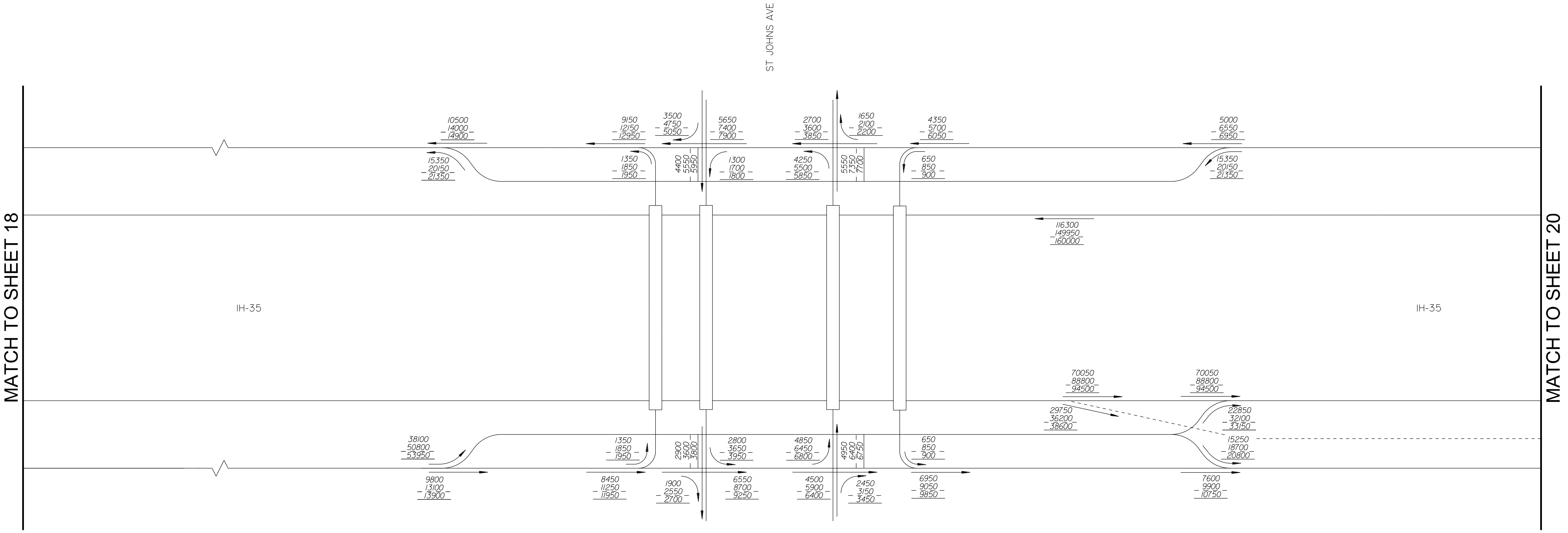
NO-BUILD CONFIGURATION





2030, 2050, 2060 FORECASTED NO-BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND
1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
NO-BUILD CONFIGURATION
24 HOUR VOLUMES
(SHEET 19 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	19

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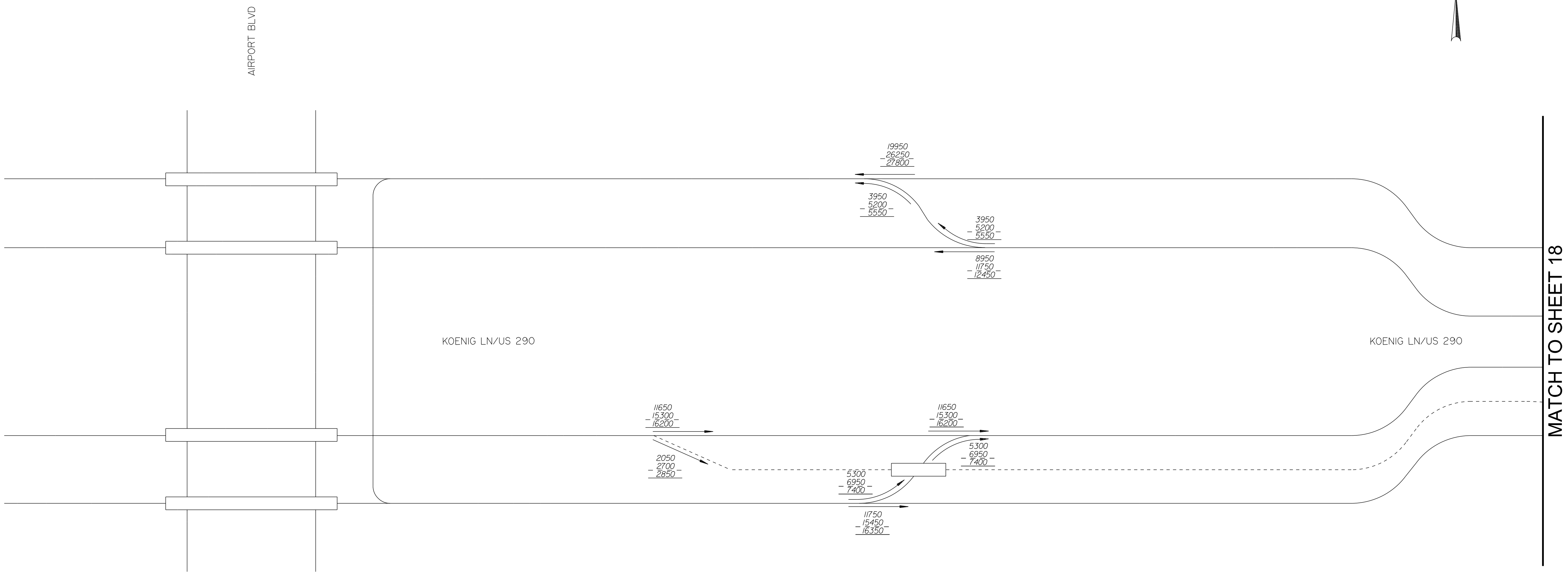
THouston
11:12:06 AM
1/25/2019

NO-BUILD CONFIGURATION



2030, 2050, 2060 FORECASTED NO-BUILD AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
NO-BUILD CONFIGURATION
24 HOUR VOLUMES
(SHEET 27 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	27

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THouston

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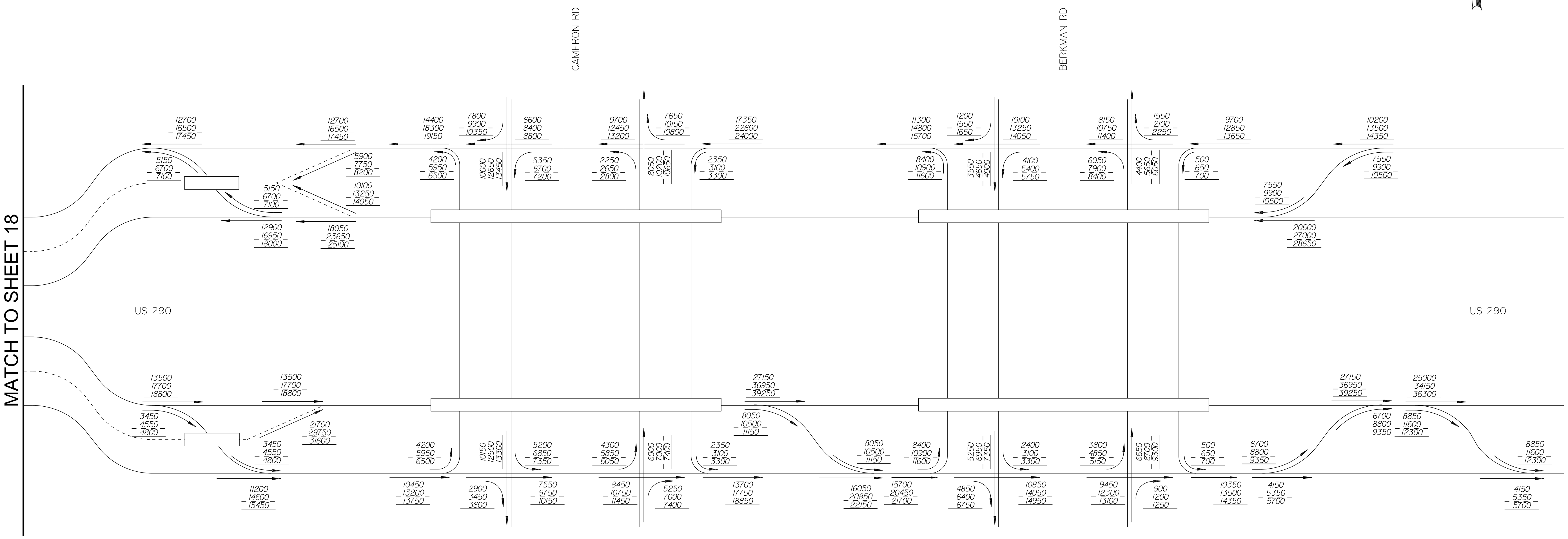
1/25/2019

NO-BUILD CONFIGURATION

N



2030, 2050, 2060 FORECASTED NO-BUILD AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
LD - LOWER DECK
UD - UPPER DECK
→ TRAVEL DIRECTION

NOT TO SCALE

ATG ALLIANCE TRANSPORTATION GROUP
TBPE Firm Registration No. F-812

Texas Department of Transportation

CAPITAL EXPRESS
NO-BUILD CONFIGURATION
24 HOUR VOLUMES
(SHEET 28 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	28

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THouston

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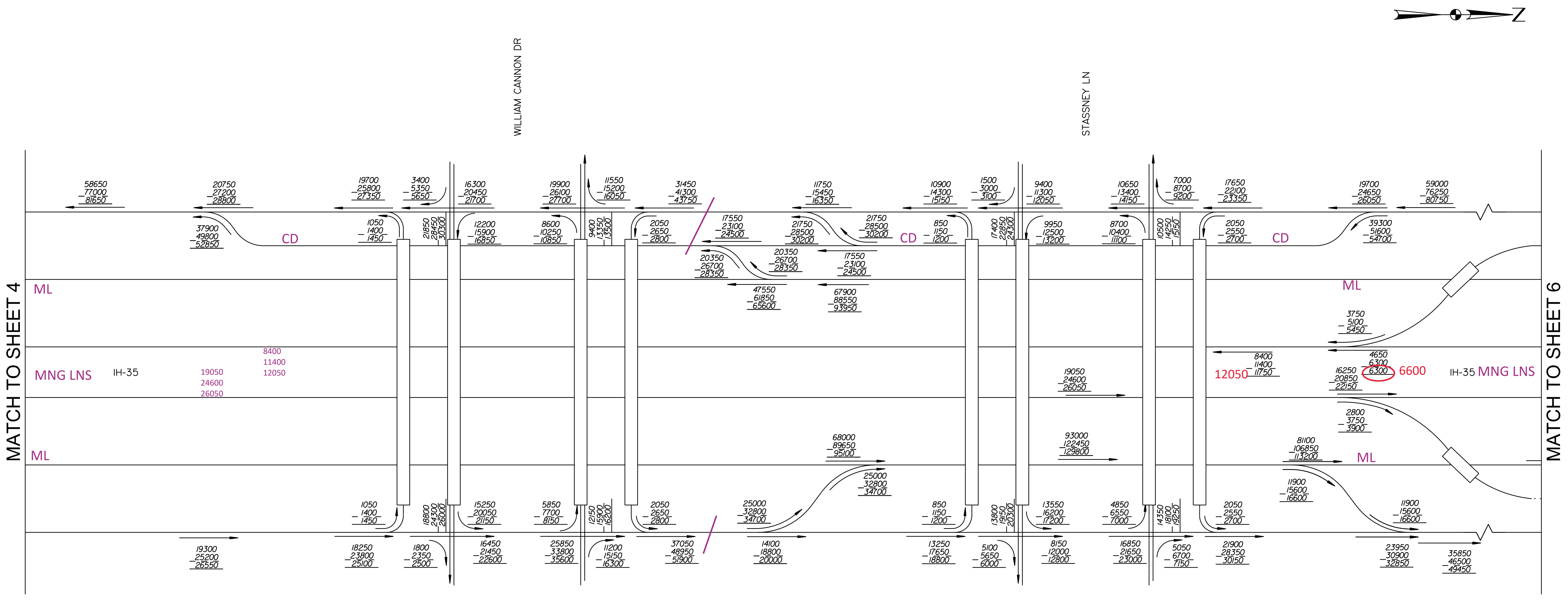
1/25/2019

BUILD CONFIGURATION



BUILD
SECTION 1:
From William Cannon Dr
To Ben White Blvd/SH 71

Frontage Roads (Collector Distributor Lanes included)
110500
145350
154100

2030, 2050, 2060 FORECASTED ULTIMATE BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND
1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
→ TRAVEL DIRECTION

NOT TO SCALE

HDR

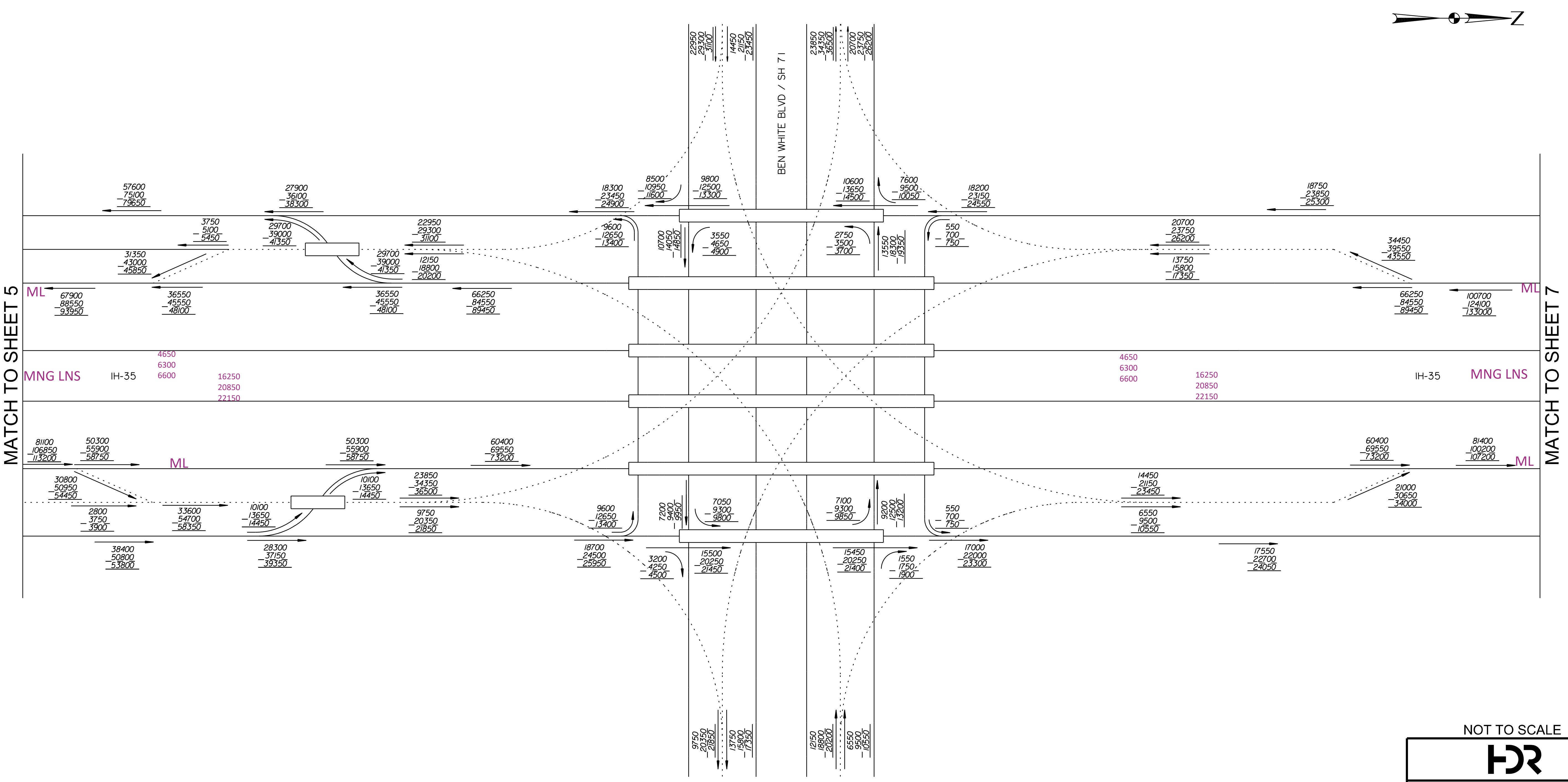
Texas Department of Transportation

CAPITAL EXPRESS
BUILD CONFIGURATION

24 HOUR VOLUMES
(SHEET 5 OF 28)

SCALE : N.T.S.		PROJECT NO.		
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	5

BUILD CONFIGURATION



2030, 2050, 2060 FORECASTED ULTIMATE BUILD AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
→ TRAVEL DIRECTION

NOT TO SCALE

HDR

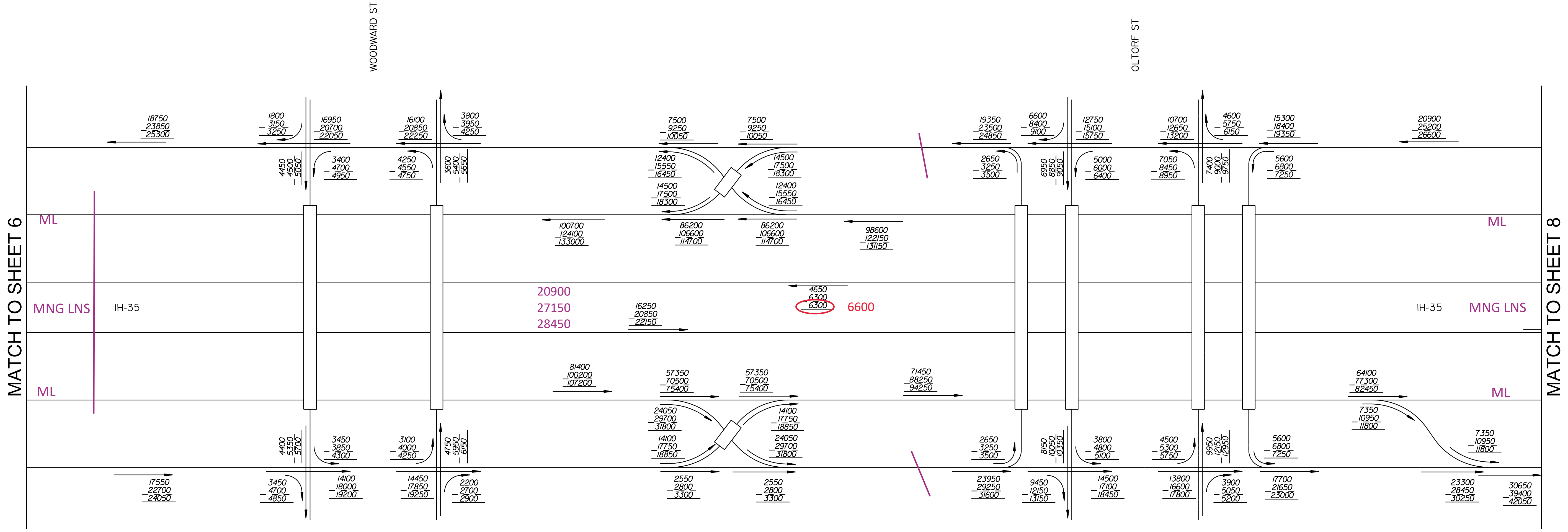
Texas Department of Transportation

CAPITAL EXPRESS
BUILD CONFIGURATION

24 HOUR VOLUMES
(SHEET 6 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	6

BUILD CONFIGURATION



BUILD
SECTION 1:
From William Cannon Dr
To MLK Blvd

ML+Managed Lanes
203000
251450
268950

BUILD
SECTION 2:
From Ben White Blvd/SH 71
To Oltorf Street

Frontage Roads
48600
59250
63450

2030, 2050, 2060 FORECASTED ULTIMATE BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND
1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
→ TRAVEL DIRECTION

NOT TO SCALE

HDR

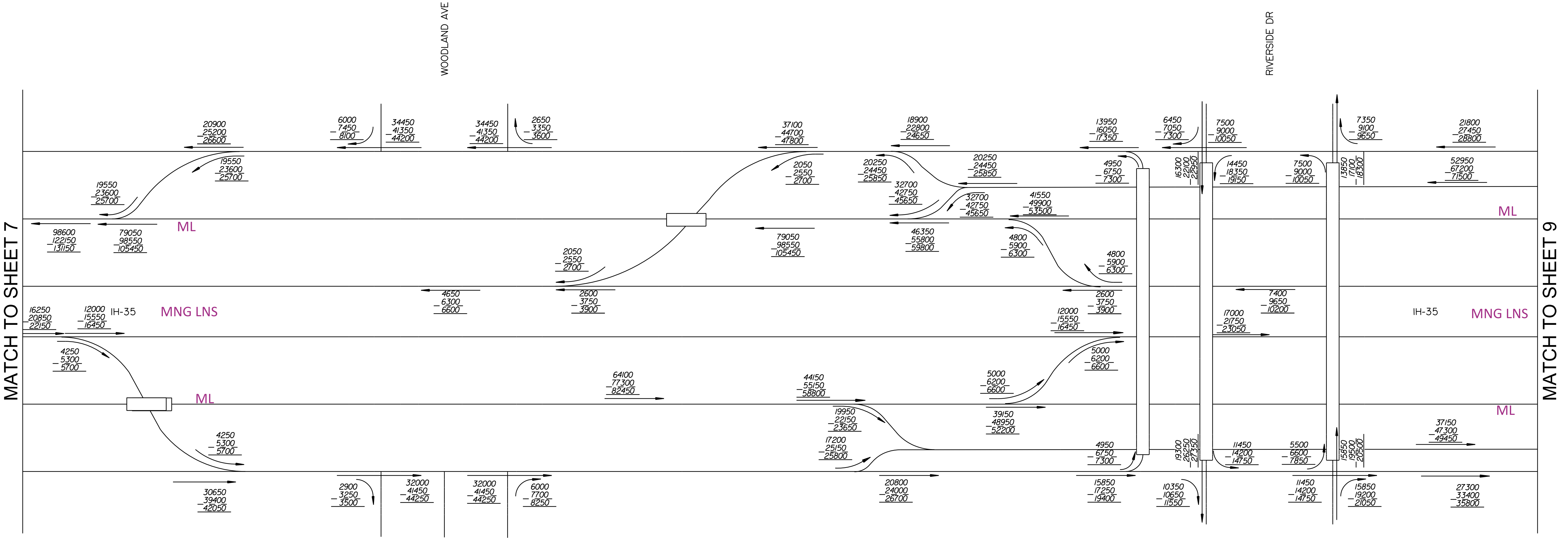
Texas Department of Transportation

CAPITAL EXPRESS
BUILD CONFIGURATION

24 HOUR VOLUMES
(SHEET 7 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	7

BUILD CONFIGURATION



2030, 2050, 2060 FORECASTED ULTIMATE BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
→ TRAVEL DIRECTION

NOT TO SCALE

HDR

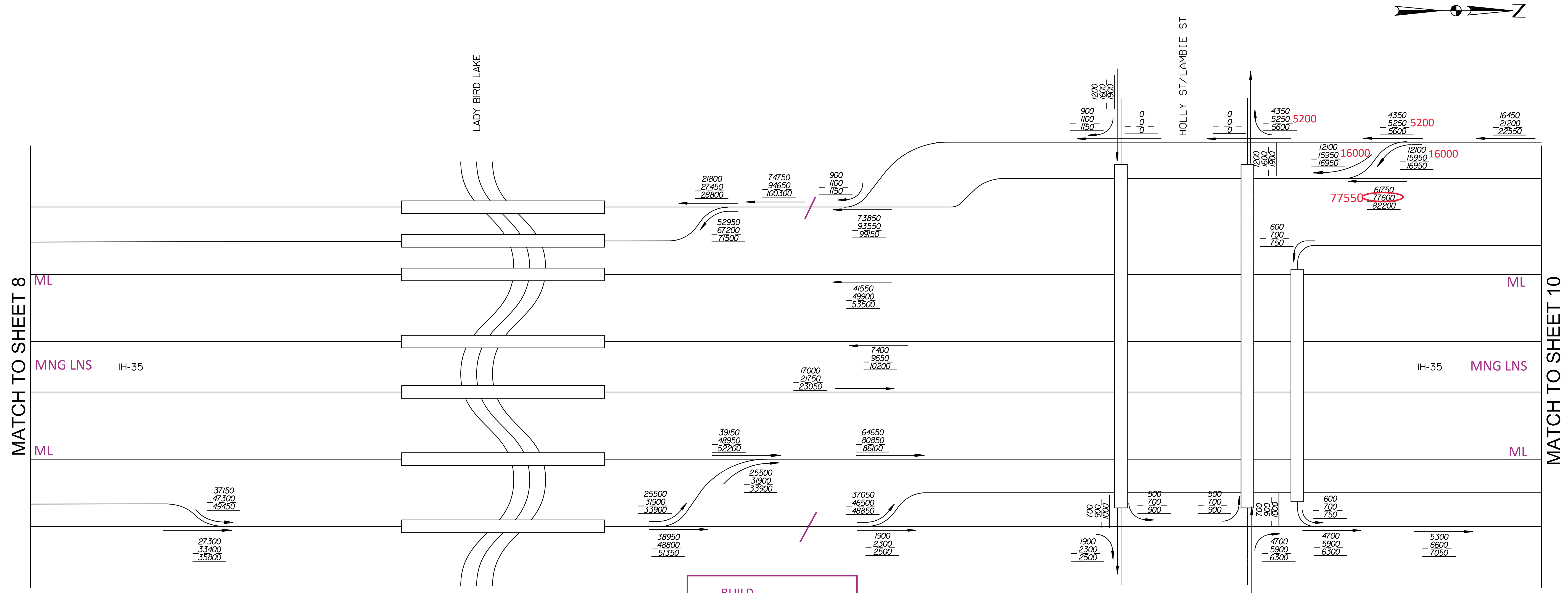
Texas Department of Transportation

CAPITAL EXPRESS
BUILD CONFIGURATION

24 HOUR VOLUMES
(SHEET 8 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	8

BUILD CONFIGURATION



BUILD
SECTION 3:
From Oltorf Street
To MLK Blvd

Frontage Roads
113700
143450
151650

2030, 2050, 2060 FORECASTED ULTIMATE BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
⟶ TRAVEL DIRECTION

NOT TO SCALE

HDR

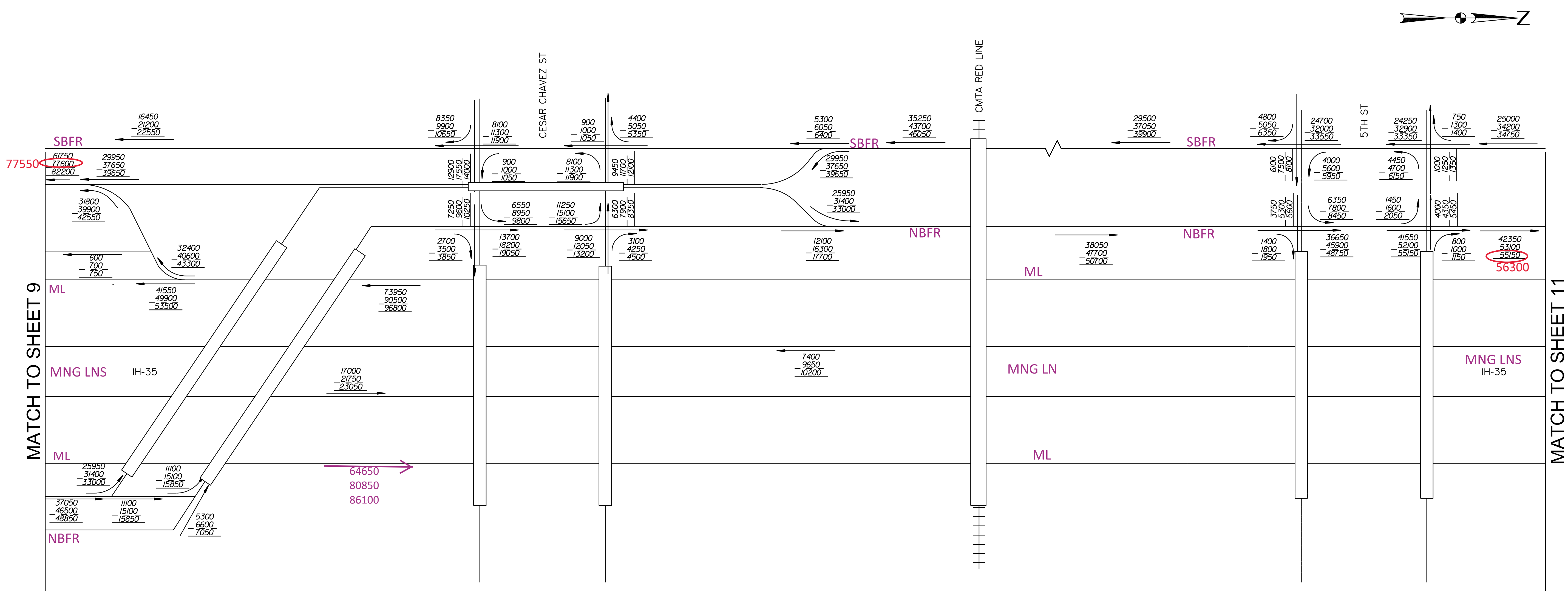
Texas Department of Transportation

CAPITAL EXPRESS
BUILD CONFIGURATION

24 HOUR VOLUMES
(SHEET 9 OF 28)

SCALE : N.T.S.		PROJECT NO.		
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	9

BUILD CONFIGURATION



NOT TO SCALE

2030, 2050, 2060 FORECASTED ULTIMATE BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
→ TRAVEL DIRECTION

HDR

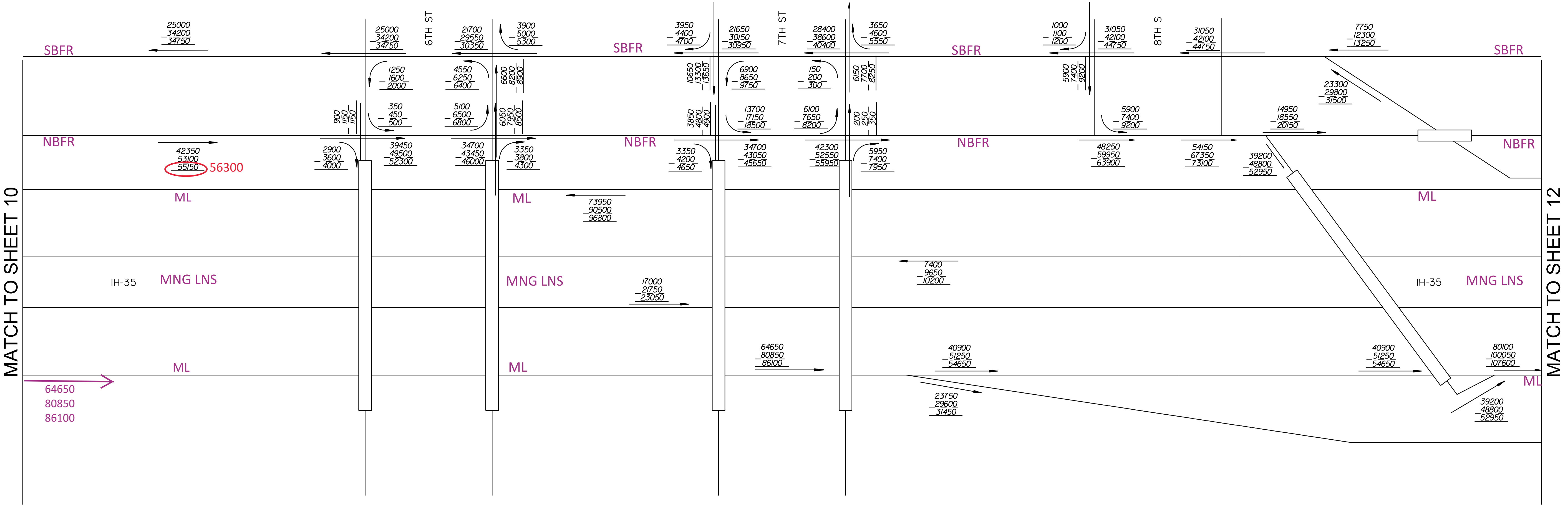
Texas Department of Transportation

CAPITAL EXPRESS
BUILD CONFIGURATION

24 HOUR VOLUMES
(SHEET 10 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	10

BUILD CONFIGURATION



NOT TO SCALE

2030, 2050, 2060 FORECASTED ULTIMATE BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
→ TRAVEL DIRECTION

HDR

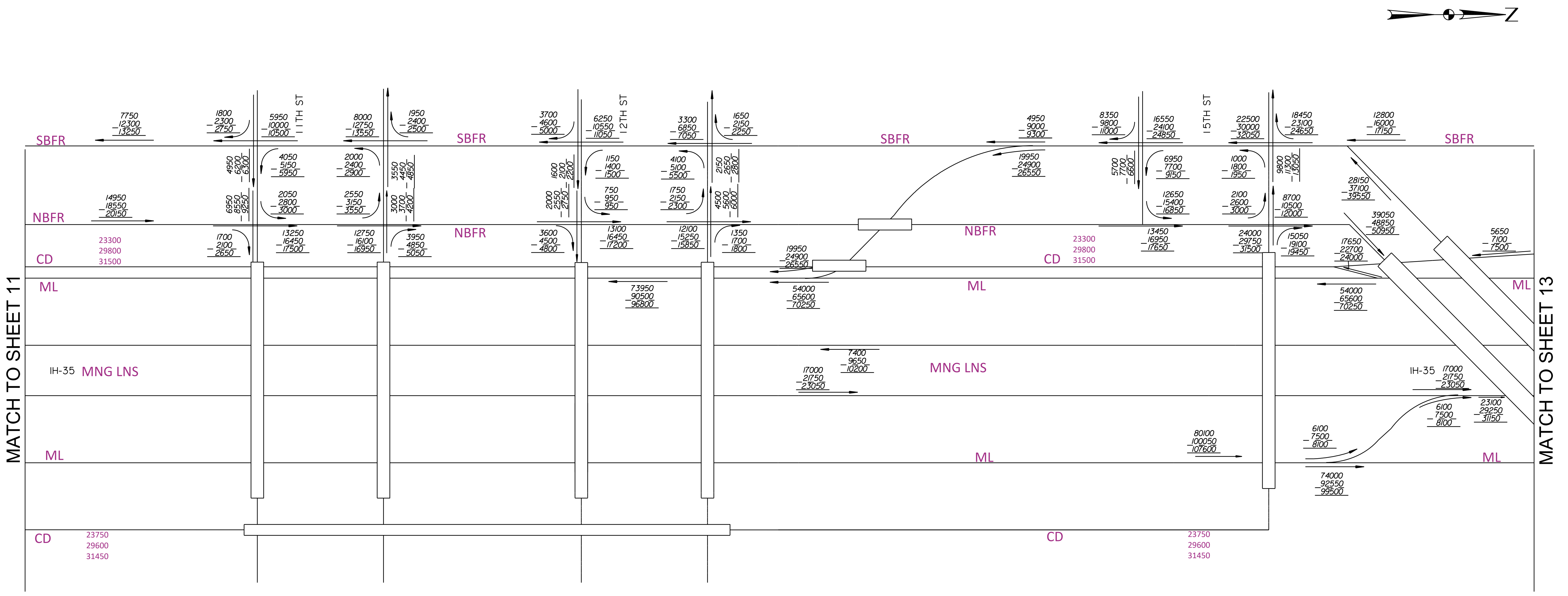
Texas Department of Transportation

CAPITAL EXPRESS
BUILD CONFIGURATION

24 HOUR VOLUMES
(SHEET 11 OF 28)

SCALE : N.T.S.		PROJECT NO.		
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	11

BUILD CONFIGURATION



NOT TO SCALE

2030, 2050, 2060 FORECASTED ULTIMATE BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
→ TRAVEL DIRECTION

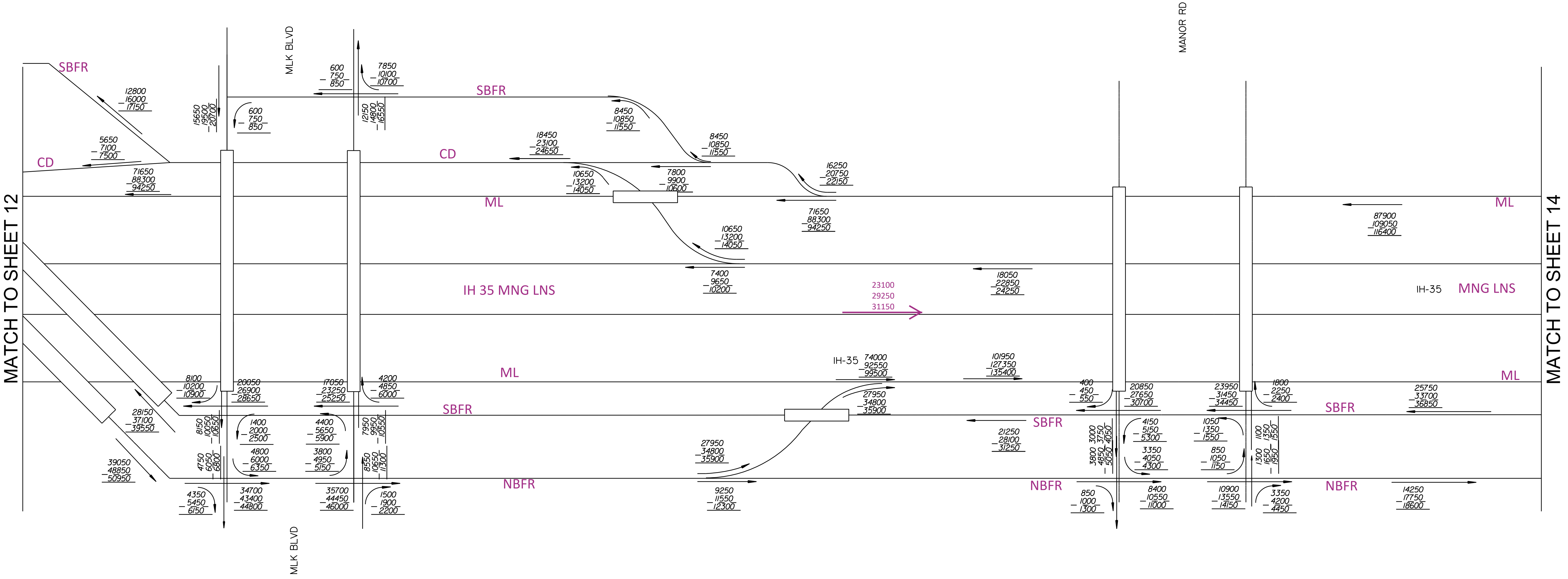
Texas Department of Transportation

CAPITAL EXPRESS
BUILD CONFIGURATION

24 HOUR VOLUMES
(SHEET 12 OF 28)

SCALE : N.T.S.		PROJECT NO.		
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	12

BUILD CONFIGURATION



Z

2030, 2050, 2060 FORECASTED ULTIMATE BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
→ TRAVEL DIRECTION

NOT TO SCALE

HDR

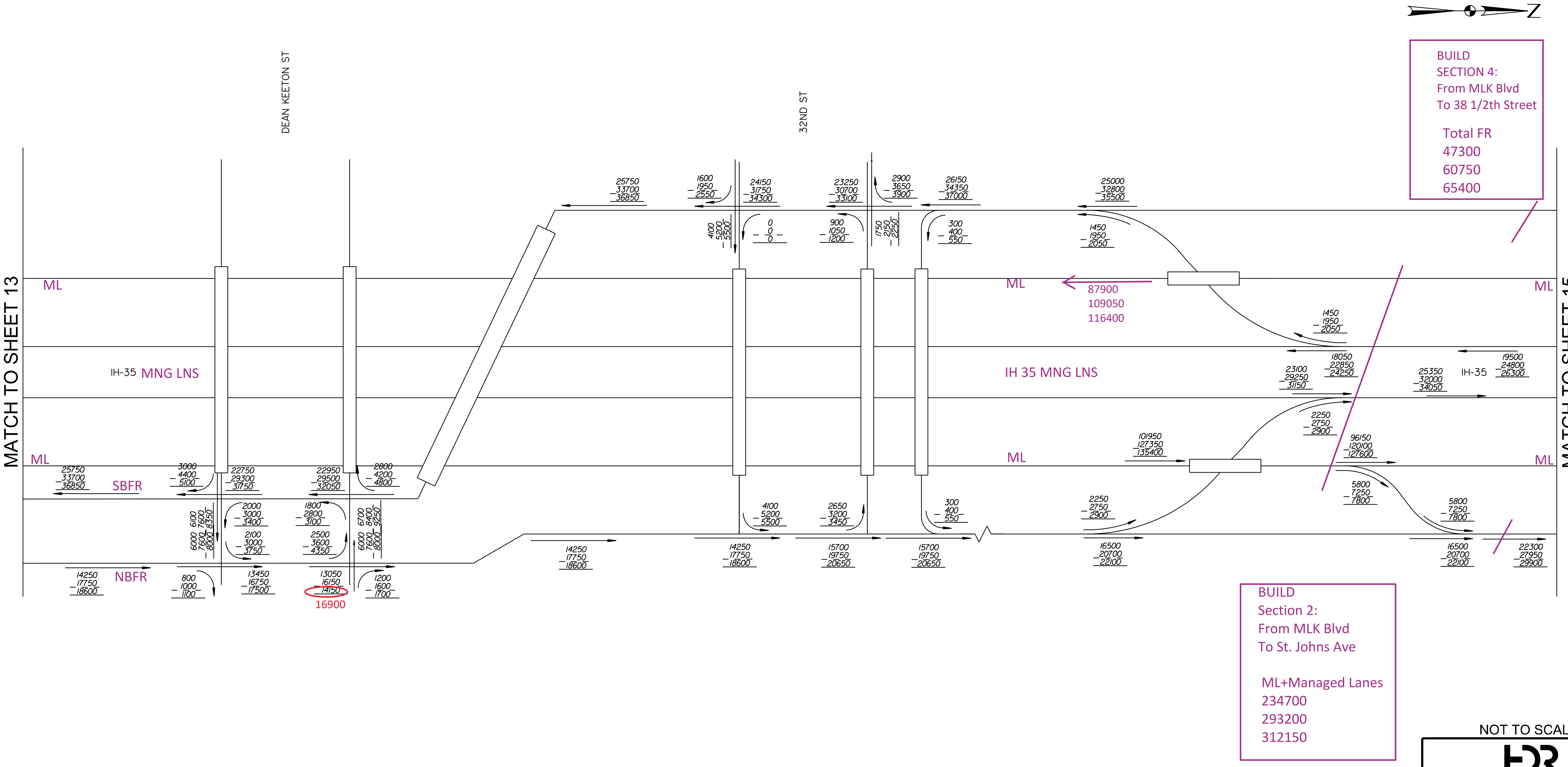
Texas Department of Transportation

CAPITAL EXPRESS
BUILD CONFIGURATION

24 HOUR VOLUMES
(SHEET 13 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	13

BUILD CONFIGURATION



NOT TO SCALE

2030, 2050, 2060 FORECASTED ULTIMATE BUILD AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
→ TRAVEL DIRECTION

HDR

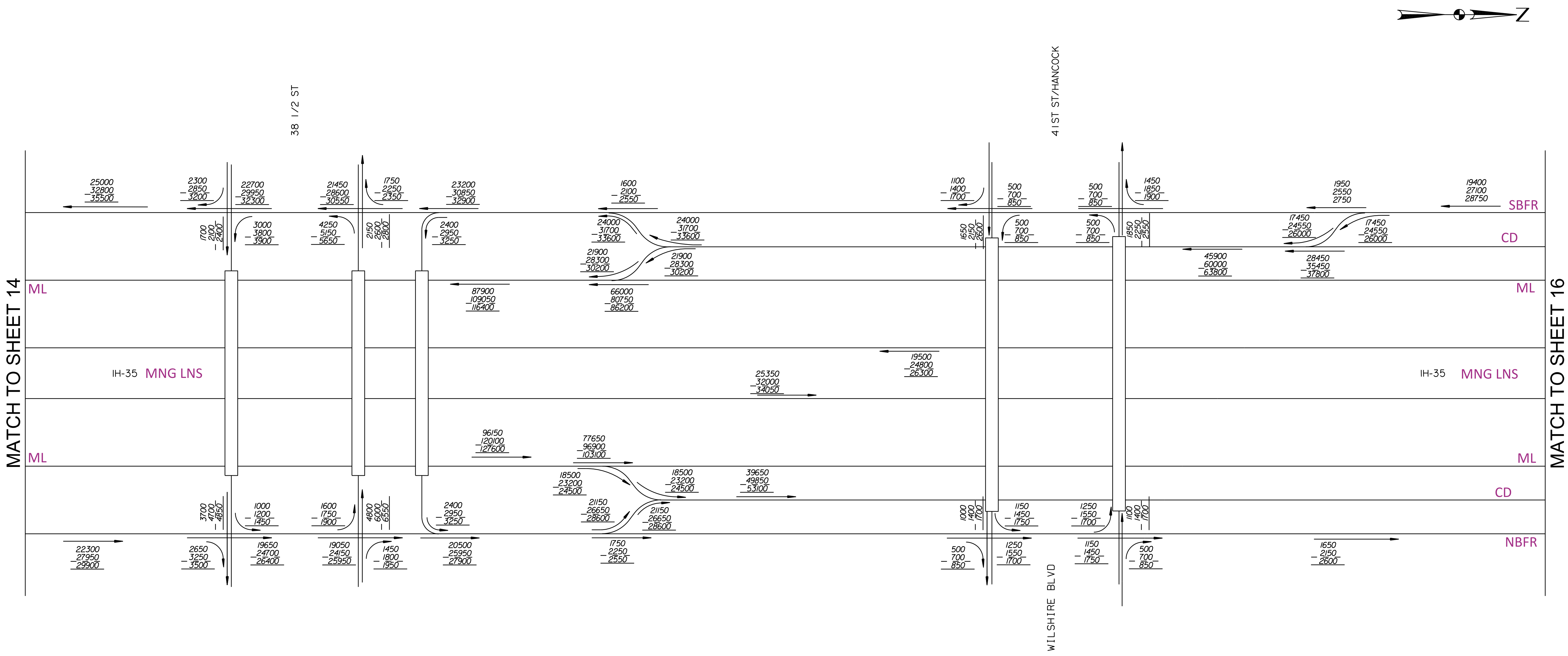
Texas Department of Transportation

CAPITAL EXPRESS
BUILD CONFIGURATION

24 HOUR VOLUMES
(SHEET 14 OF 28)

SCALE : N.T.S.		PROJECT NO.		
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	14

BUILD CONFIGURATION



2030, 2050, 2060 FORECASTED ULTIMATE BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
→ TRAVEL DIRECTION

NOT TO SCALE

HDR

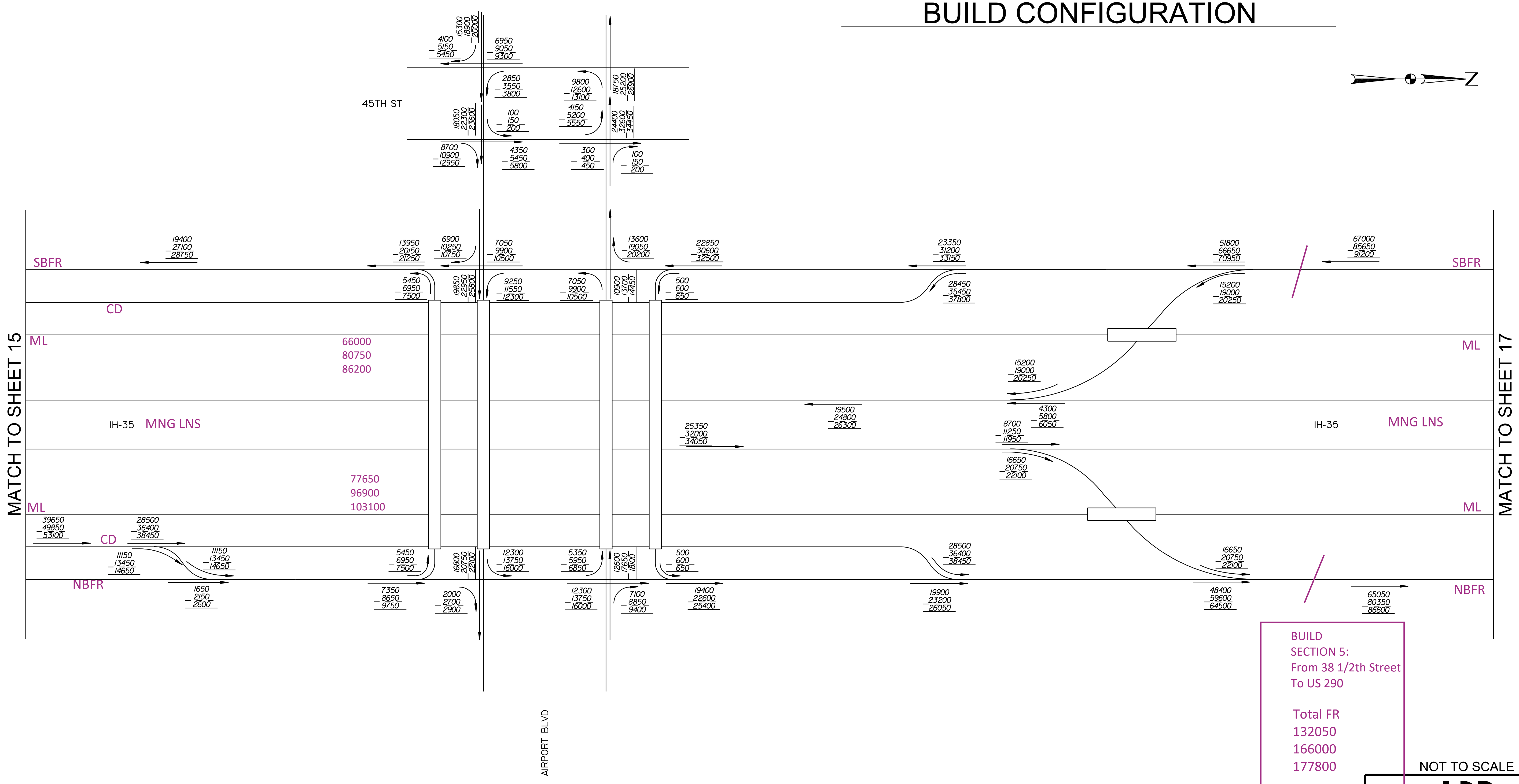
Texas Department of Transportation

CAPITAL EXPRESS
BUILD CONFIGURATION

24 HOUR VOLUMES
(SHEET 15 OF 28)

SCALE : N.T.S.		PROJECT NO.		
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	15

BUILD CONFIGURATION



BUILD
SECTION 5:
From 38 1/2th Street
To US 290

Total FR
132050
166000
177800

NOT TO SCALE

2030, 2050, 2060 FORECASTED ULTIMATE BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND
1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
→ TRAVEL DIRECTION

HDR

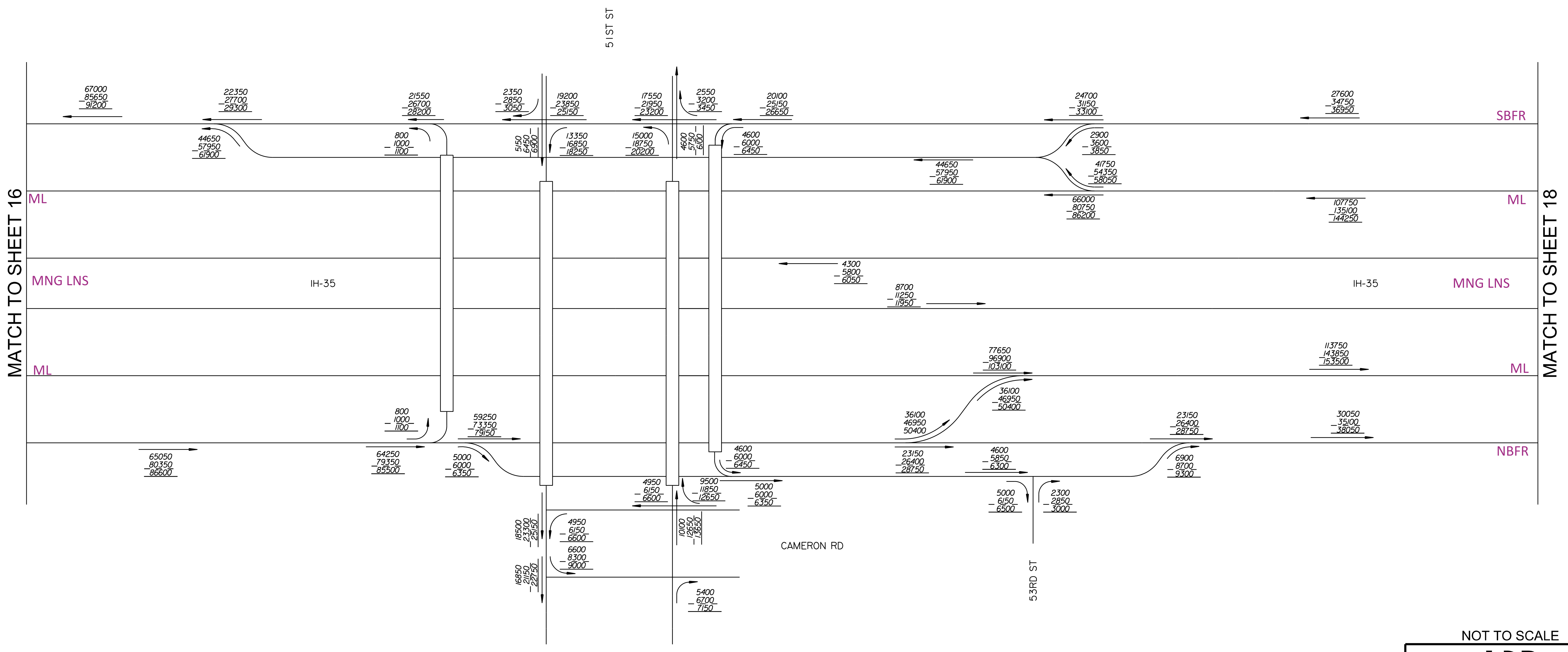
Texas Department of Transportation

CAPITAL EXPRESS
BUILD CONFIGURATION

24 HOUR VOLUMES
(SHEET 16 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	16

BUILD CONFIGURATION



N

NOT TO SCALE

2030, 2050, 2060 FORECASTED ULTIMATE BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
TRAVEL DIRECTION

HDR

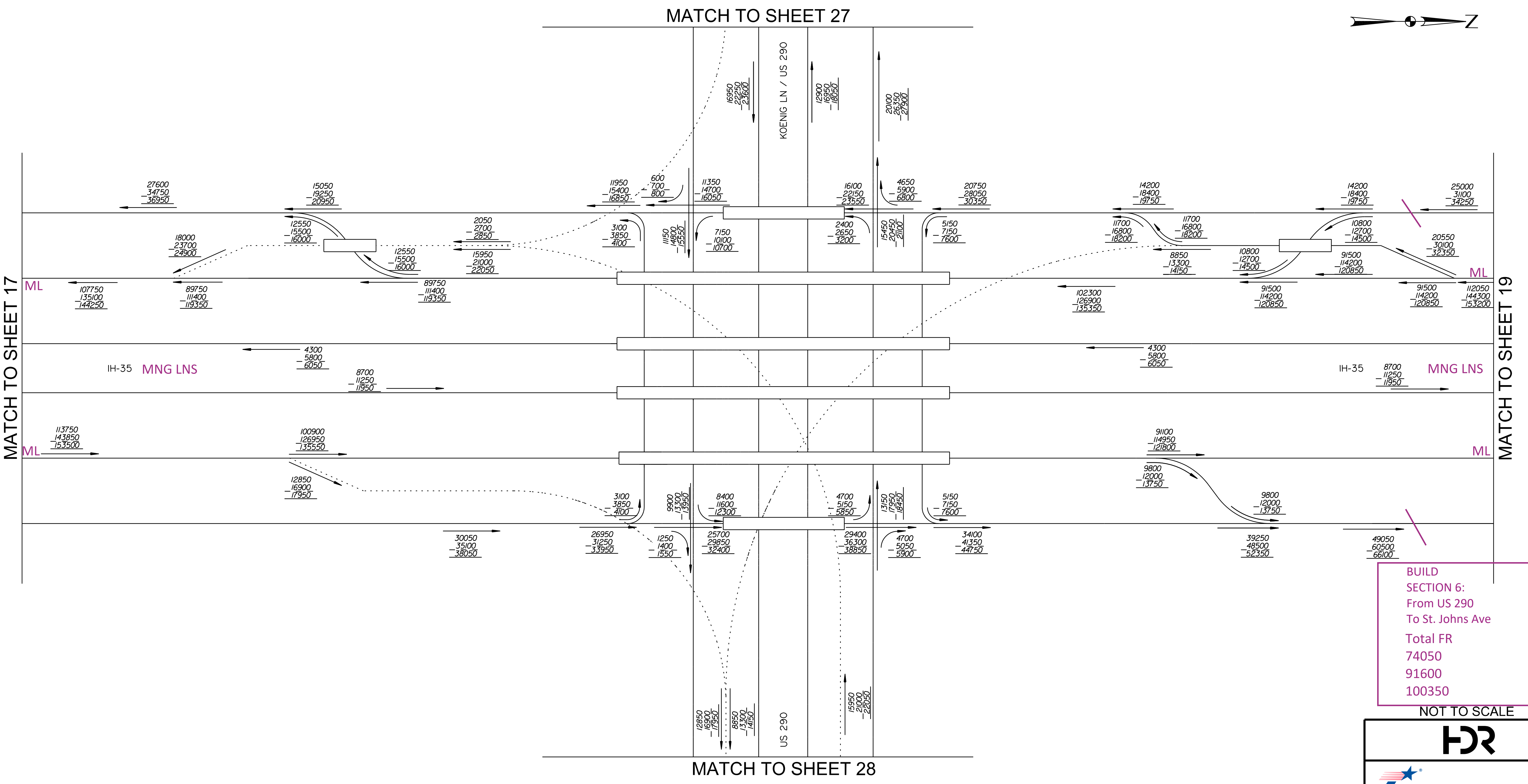
Texas Department of Transportation

CAPITAL EXPRESS
BUILD CONFIGURATION

24 HOUR VOLUMES
(SHEET 17 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	17

BUILD CONFIGURATION



BUILD
SECTION 6:
From US 290
To St. Johns Ave
Total FR
74050
91600
100350

NOT TO SCALE

2030, 2050, 2060 FORECASTED ULTIMATE BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000	2030 ADT
1000 (underlined)	2050 ADT
1000 (double underlined)	2060 ADT
→	TRAVEL DIRECTION

HDR

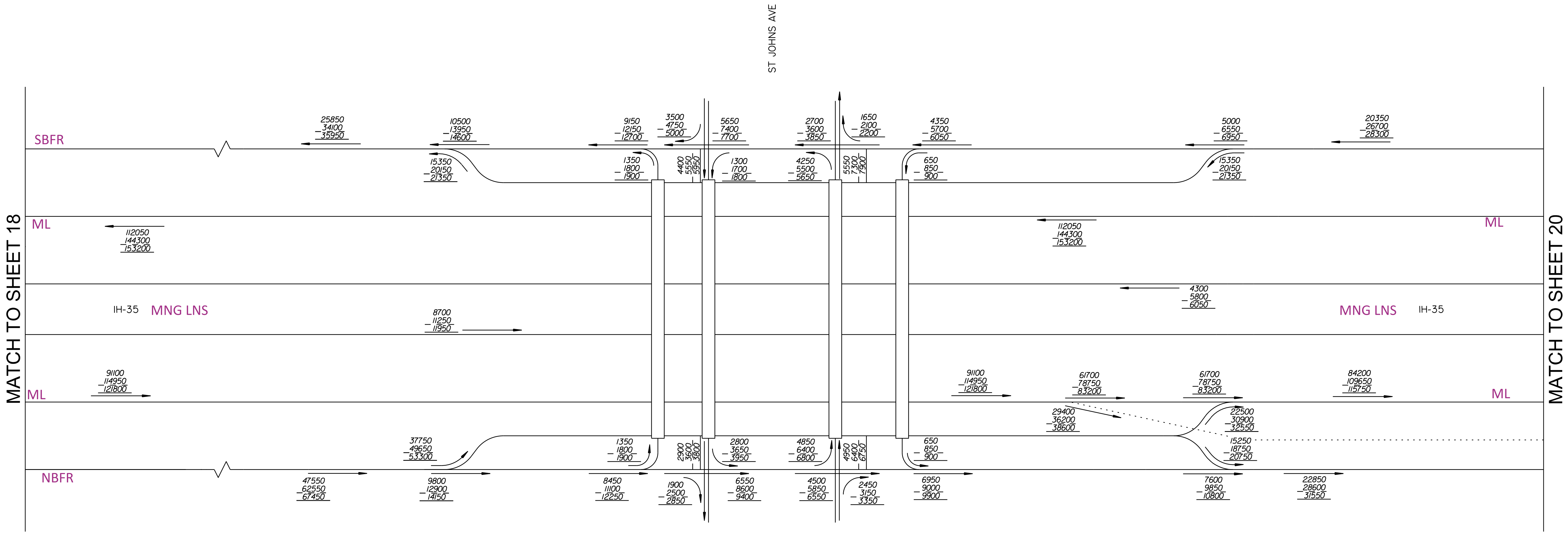
Texas Department of Transportation

CAPITAL EXPRESS
BUILD CONFIGURATION

24 HOUR VOLUMES
(SHEET 18 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	18

BUILD CONFIGURATION



2030, 2050, 2060 FORECASTED ULTIMATE BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
→ TRAVEL DIRECTION

NOT TO SCALE

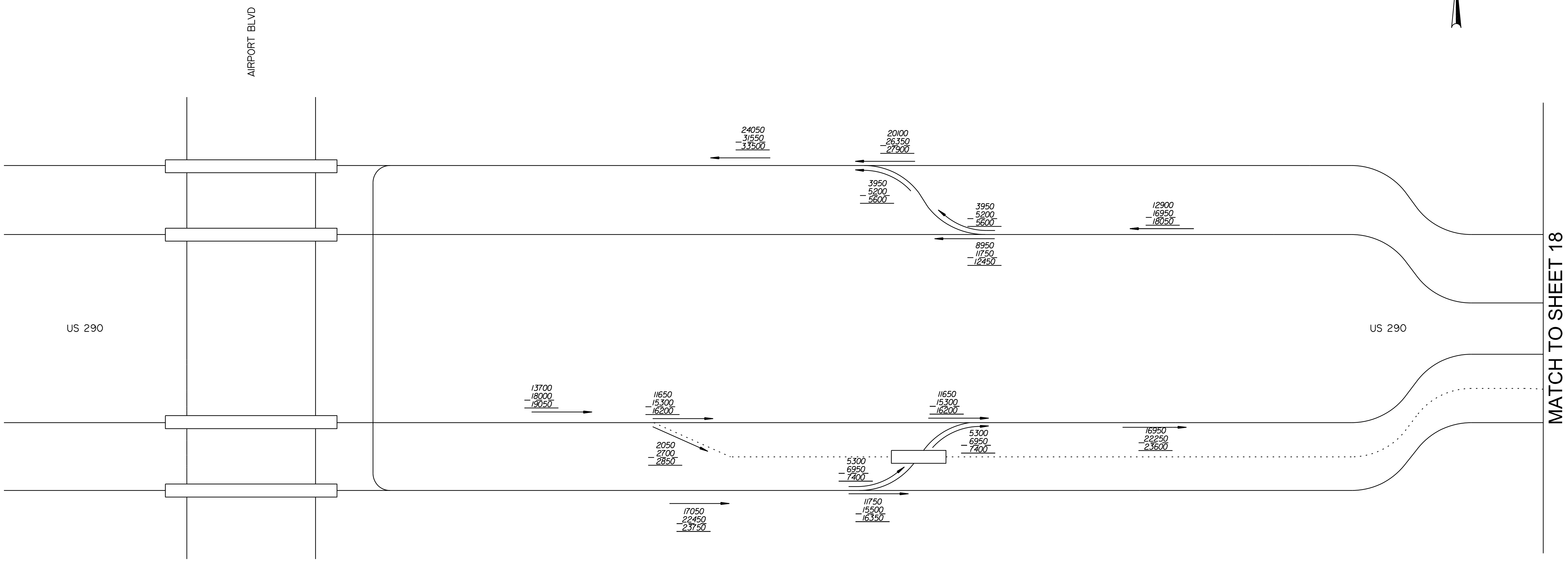
Texas Department of Transportation

CAPITAL EXPRESS
BUILD CONFIGURATION

24 HOUR VOLUMES
(SHEET 19 OF 28)

SCALE : N.T.S.		PROJECT NO.		
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	19

BUILD CONFIGURATION



2030, 2050, 2060 FORECASTED ULTIMATE BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
TRAVEL DIRECTION

NOT TO SCALE

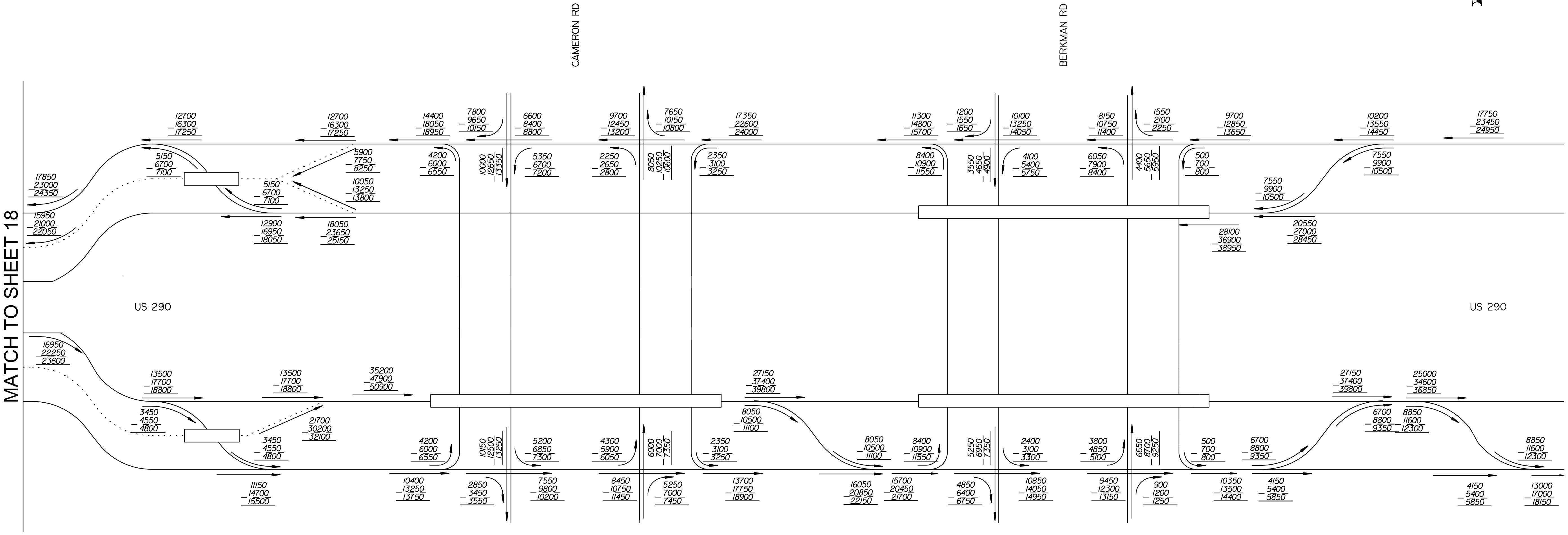
Texas Department of Transportation

CAPITAL EXPRESS
BUILD CONFIGURATION

24 HOUR VOLUMES
(SHEET 27 OF 28)

SCALE : N.T.S.			PROJECT NO.	
DWN: TH	CKD: HH			
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY	
TEXAS	14	6	TRAVIS	
CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	27

BUILD CONFIGURATION



2030, 2050, 2060 FORECASTED ULTIMATE BUILD AVERAGE DAILY TRAFFIC
VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
CORRIDOR I-35 FROM MAIN ST TO HESTER'S CROSSING ROAD
AND US 290 FROM AIRPORT BLVD TO US 183

LEGEND

1000 - 2030 ADT
1000 - 2050 ADT
1000 - 2060 ADT
→ TRAVEL DIRECTION

NOT TO SCALE

HDR

Texas Department of Transportation

CAPITAL EXPRESS
BUILD CONFIGURATION

24 HOUR VOLUMES
(SHEET 28 OF 28)

SCALE : N.T.S.		PROJECT NO.	
DWN: TH	CKD: HH		
STATE	STATE DISTRICT	FED. RD. DIV. NO.	COUNTY
TEXAS	14	6	TRAVIS

CONTROL	SECTION	JOB	HWY. NO.	SHEET NO.
5000	00	106	IH-35	28

ALLIANCE@20
TWO DECADES OF MAKING LIVES BETTER

MEMORANDUM

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Austin, TX 78758
Phone: 512.821.2081
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Toll Free: 866.576.0597
TBPE Firm Registration No. 812

DATE: September 19, 2018
TO: Gabriel Contreras, TxDOT-TPP
CC: Janie Temple, TxDOT-TPP; Brandon Marshall, TxDOT- Austin District
FROM: Mike Chaney, Alliance Transportation Group, Inc.
RE: Traffic Forecasting Methodology for IH 35 Capital Express

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This memorandum describes procedures used to forecast traffic volumes that will be incorporated into the design and development of Interstate 35 (IH 35) Capital Express project in Travis County. These traffic volumes are forecasted to support the independent segment teams designing the proposed roadway improvements. The traffic forecasts will be used for pavement design, operational analysis, as well as air and noise analysis.

TxDOT's Austin District requested forecasted traffic volumes for pavement design and air and noise analysis along IH 35. Districts have three options when requesting traffic data: (A) a request is made to TxDOT's Transportation Planning & Programming Division (TPP) to generate traffic data and TPP will then sign and seal the project, (B) a request is made to TPP to assist in the development of future traffic volumes and TPP will then sign and seal the project, or (C) the respective TxDOT district is responsible for the development of the future volumes and the District will then sign and seal the project. As the IH 35 project includes both High Occupancy Vehicles (HOV) and transit components, TPP's guidance is the project utilize Option C to develop the required future year volumes.

The following sections describe the process and merits of the analysis that will be employed by Alliance Transportation Group, Inc. (ATG).

Corridor Analysis Process

Once the Consultant Corridor Packet (CCP) is received, the provided data, available regional travel demand model (TDM), and additional count data from TxDOT databases will be inventoried and processed to begin the corridor analysis procedure. After the data has been aggregated, the subsequent step, described below, will follow the Corridor Analysis Standard Operating Procedures (SOP) created by TPP in February 2017.

These count data will be used to develop the base year working map volumes. The next step will use these base year volumes to calculate the Straight Line Analysis volumes, and subsequent amendments and diversions will be made by following methodologies described in the SOP, using engineering judgement, and accounting for effects on traffic patterns observed with the TDM. Once balanced, these base year volumes will be used as a basis for the requested future year forecasts. Subsequently, the base year volumes will also serve to calculate Complete Corridor Analysis volumes with a similar amendment and diversion process following. Once balanced, these base year volumes will inform the requested future year forecasts and deliverables unique to the Complete Corridor Analysis.

Project Details

The project area consists of IH 35 from SH 45SE near Buda, Texas, to SH 45N in Round Rock, Texas, a distance of approximately 27 miles. The project was divided into three segments that are being developed by three project teams:

- South: From SH 45SE to SH 71
- Central: From SH 71 to US 290
- North: From US 290 to SH 45N

New Managed Lanes, in the form of barrier separated HOV lanes, and geometric improvements will be proposed for the corridor as a part of the Capital Express project. The project also includes forecasted volumes for 2030 and 2050.

The location and project team segmentation of the IH 35 project is depicted in the **Figure 1** on the following page.

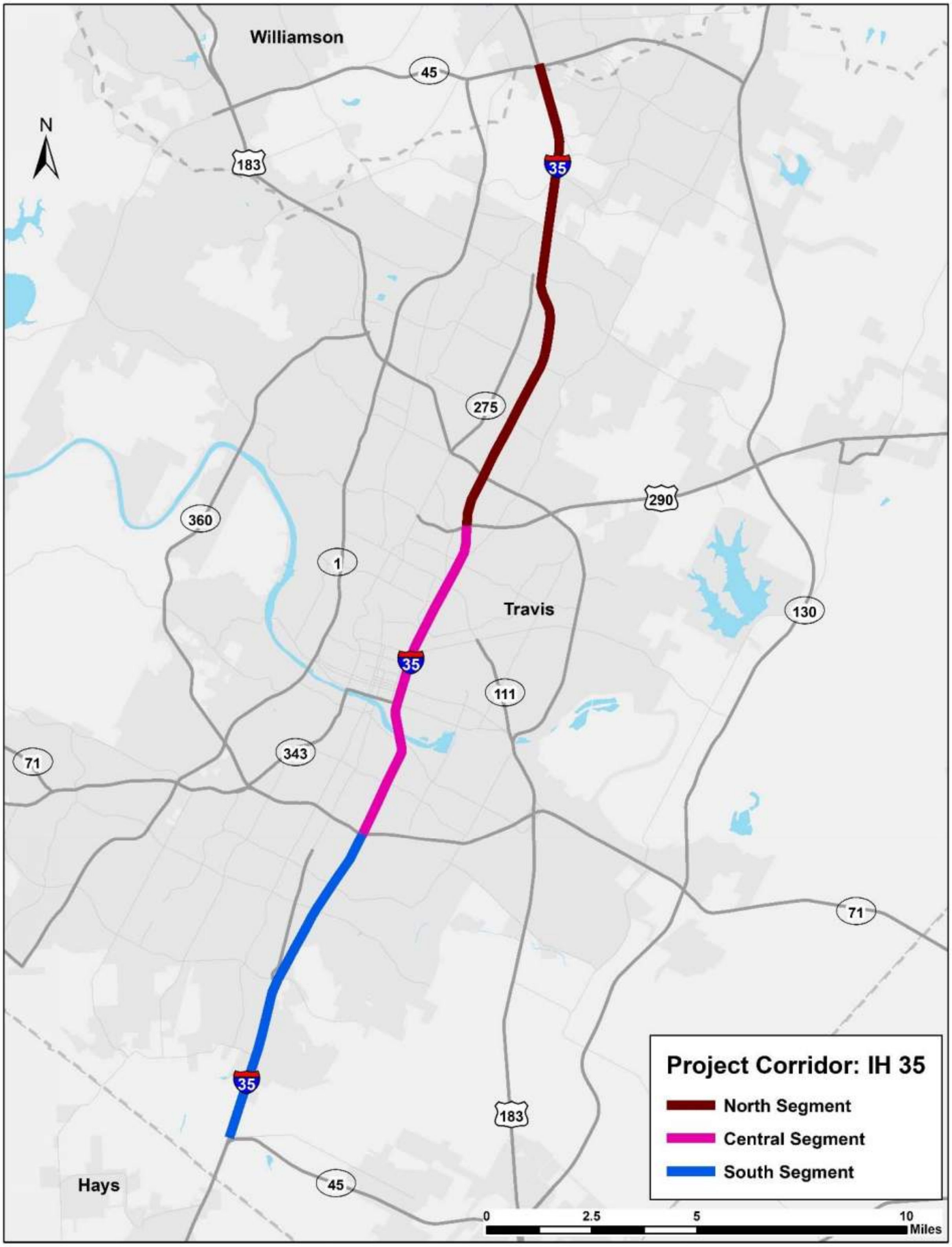


Figure 1: IH 35 Project Limits

Forecasting Future Year Volumes

The following sections detail the available data, describe the review of the TDM, and discuss future steps, which will employ SOP methodologies, and the TDM to forecast future year volumes.

Available Data Sources

Several data sources will be used to determine growth in the project area and develop forecast year traffic volumes. The following sections describe the data available for use and consideration in forecasting future year volumes.

Traffic Counts

Two different traffic count sources will be used to develop a balanced 2016 volume to be used in representing the base year traffic conditions. This data was provided by TxDOT in the CCP and collected in 2016. Count locations include the following types of counts:

- 2016 TxDOT Annual Counts (obtained from the STARS II website and the CCP)
  - 2015 TxDOT Annual Counts (obtained from the STARS II website) will be utilized where 2016 data does not exist
- 2016, 2017, and 2018 Collected Traffic Movement Counts and Tube Counts
  - 2016 Locations and Types
    - Ramps, Mainlanes, and TMCs
    - Spots locations north of Riverside to University Boulevard
  - 2017 Locations and Types
    - Ramps, Mainlanes, and TMCs
    - Spot locations from SH 45 SE to Westinghouse while school is in session, spot locations from SH 45 SE to University Boulevard during the summer
  - 2018 Locations and Types
    - Ramps, Mainlanes, and TMCs
    - Spot locations between 4th Street and Westinghouse

Permanent and Classification Count Locations

The analysis will use the TxDOT Permanent Count Stations on or near the corridor to determine the directional distribution and peak hour factor. Similarly, nearby TxDOT Vehicle Classification Count Stations will determine the heavy vehicle percentages along the corridor. The Traffic Analysis for Highway Design (TAHD) worksheet included with the final traffic forecast will identify these stations.

Historical Counts

Historical traffic count information (1996 to 2016) provided by TXDOT-TPP were used in a linear regression analysis of traffic growth. **Table 1** depicts the resulting historical annual average traffic growth rates (AAGR) calculated by TXDOT and provided in the corridor analysis information packet for this project. The annual stations used in TXDOT's historical linear growth rate analysis are presented in **Figure 2**. The resulting historical average growth rates will inform the selection of growth rates for use in forecasting traffic on the IH 35 facility. These figures will be recalculated to include the 2017 count data recently made available by TPP.

Note that the SH-130 segments 1 to 4 opened between 2006 and 2008, segments 5 & 6 opened in 2012, and the Mopac express lanes opened in 2018.

Table 1: Historical Average Annual Growth Rate along IH 35

Count Station ID	Growth Rate (AAGR)			Total Change in Traffic Count	Data Years
	Low	Forecast	High		
246H51	0.8%	1.6%	2.3%	44,654	1996-2016
246H27	1.2%	2.1%	3.1%	67,310	1996-2016
246H28	0.9%	2.0%	3.0%	40,767	1996-2016
246H29	0.7%	1.7%	2.7%	73,920	1996-2016
246T62	0.9%	1.7%	2.4%	73,038	1996-2016
246SP246	0.7%	1.6%	2.6%	106,336	1996-2016
246H33	0.8%	1.5%	2.2%	67,238	1996-2016
227H5	0.7%	1.3%	1.9%	65,811	1996-2016
227H120	0.5%	0.8%	1.5%	21,946	2001-2016
227H4	0.6%	1.3%	1.9%	68,445	1996-2016
227SP190	0.5%	1.1%	1.6%	63,306	1996-2016
227H12	0.5%	1.0%	1.5%	53,950	1996-2016
227H13	0.3%	0.7%	1.1%	43,369	1996-2016
227H14	-0.2%	0.4%	0.9%	38,949	1996-2016
227H17	0.2%	0.7%	1.1%	68,500	1996-2016
227H119	-0.3%	0.2%	0.7%	24,803	2001-2016
227H118	-1.5%	-0.9%	-0.3%	(7,063)	2001-2016
227H117	-1.2%	0.8%	2.7%	(5,058)	2001-2016
227H116	-0.7%	-0.1%	0.6%	(1,079)	2002-2016
227H115A	-1.9%	-1.2%	-0.4%	(18,784)	2001-2016
227SP132	-0.6%	0.1%	0.7%	3,378	1996-2016
227H92A	0.0%	0.4%	0.8%	9,578	2001-2016
227H92	0.2%	0.7%	1.2%	19,775	1996-2016
227H94	0.5%	1.3%	2.1%	65,550	1996-2016
227H94A	0.9%	1.5%	2.1%	57,177	1996-2016
227H95	1.3%	2.2%	3.1%	76,597	1996-2016
227D8	-3.2%	0.7%	4.6%	13,118	1996-2012
227SP4	1.3%	2.1%	2.9%	63,188	1996-2016
227H82A	1.5%	2.5%	3.5%	82,700	1996-2016

Table 2: Average Change in Traffic Per Year by Segment

Project Segment	Data Years	Average Change in Traffic Count	Minimum Change in Traffic Count	Maximum Change in Traffic Count
North	1996-2016	2,874	1,947	3,425
Central	2001-2016	46	(1,252)	1,654
South	1996-2016	3,281	2,859	3,830

Table 2 presents the average change in traffic counts for each project segment. In this table, 2001 to 2016 count information were used for the central segment because most count locations had data available for these years in the corridor analysis information packet provided by TXDOT-TPP. The central segment has the lowest yearly average change in traffic counts.

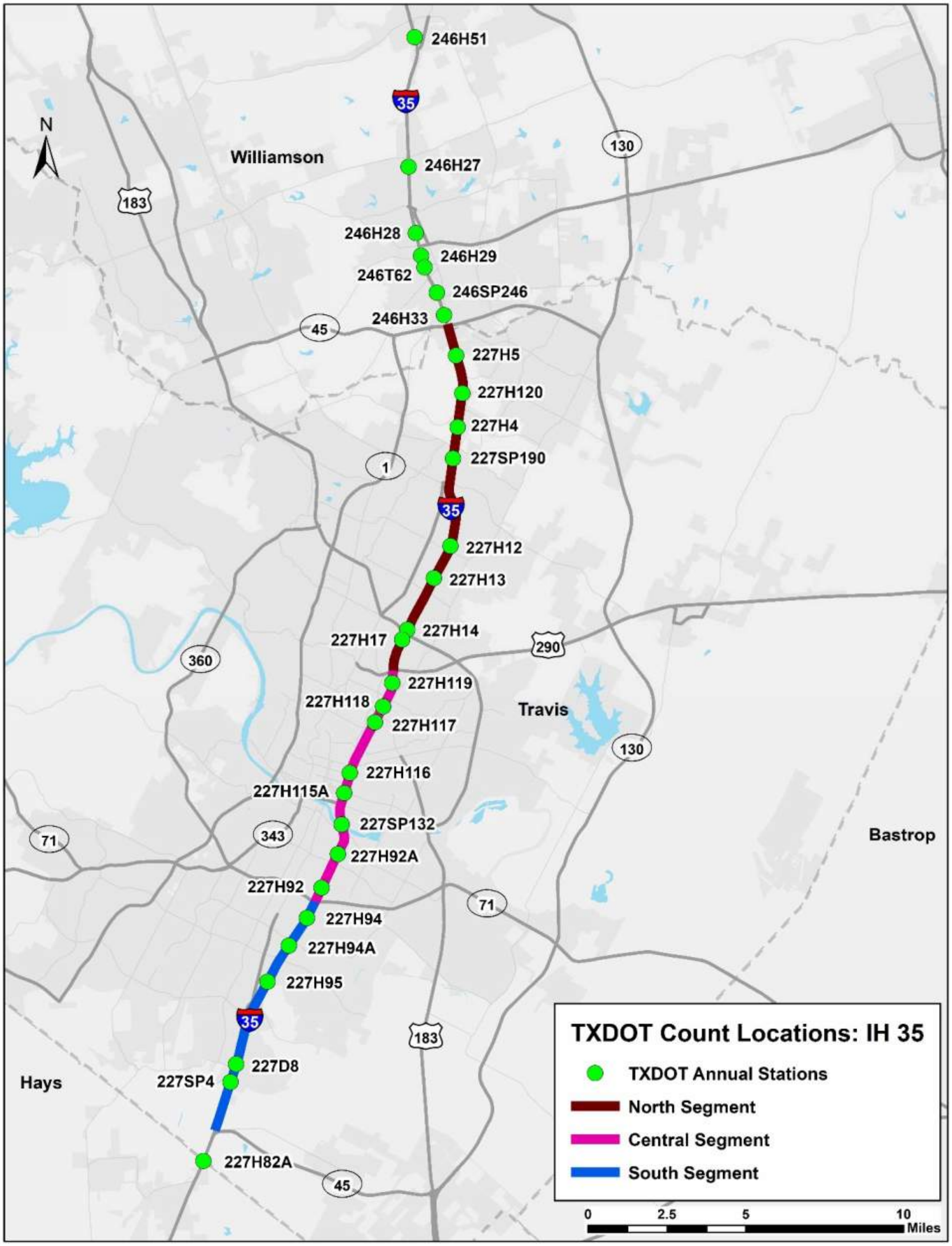


Figure 2: TXDOT Count Locations along IH 35

Figure 3 presents the “forecast” or mid-level growth rates produced with TPP’s regression analysis and depicted in **Table 1.** The historic growth rate is depicted in several ranges of growth at traffic count locations along IH 35. Higher rates of growth are seen in the north and south segments where traffic volumes are lower than observed in the central segment.

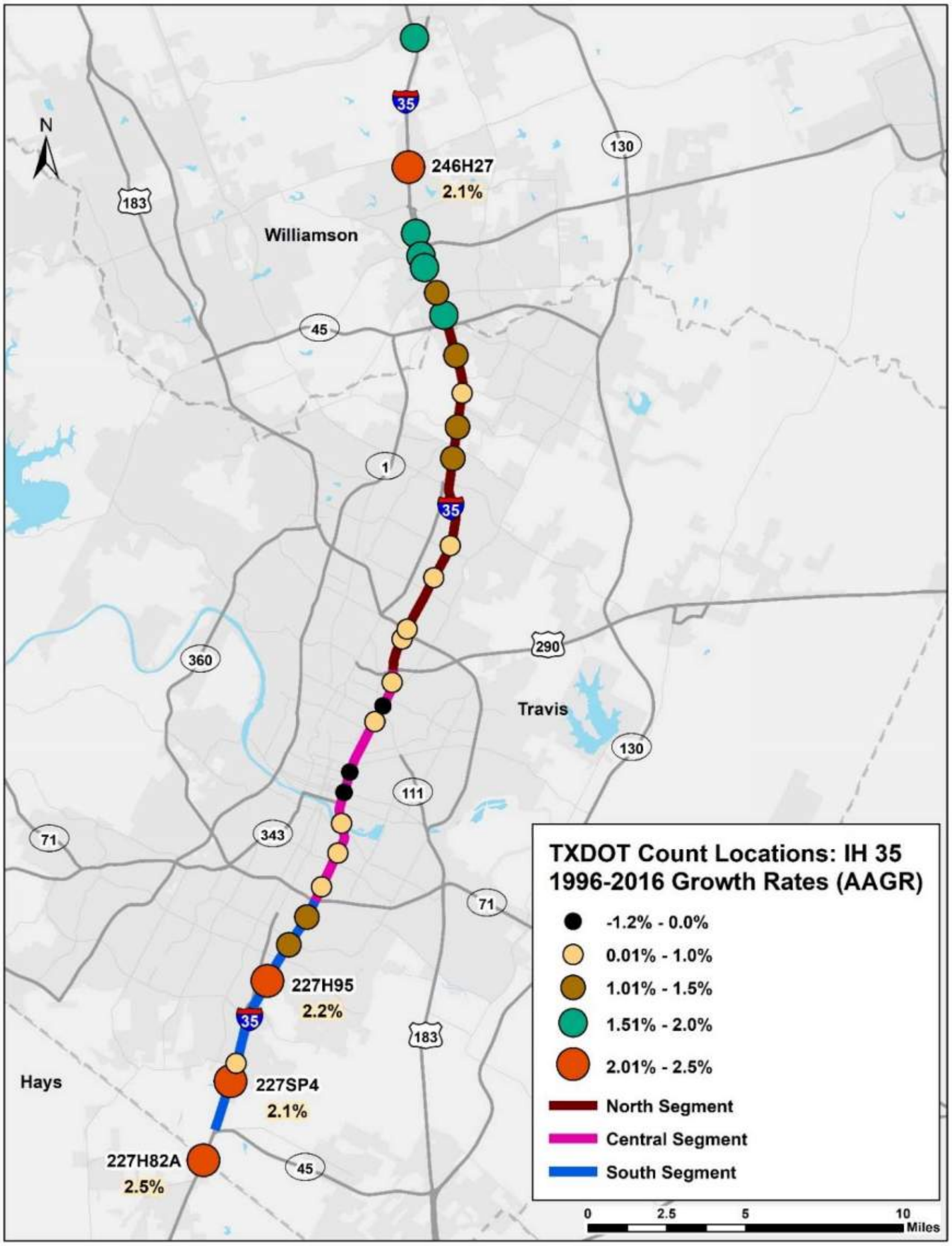


Figure 3: Historical Annual Average Growth Rates

Traffic Demand Model Review

The 2010 and 2040 CAMPO Travel Demand Model (TDM) scenarios used in this analysis were produced with the latest adopted regional TDM, which includes both roadway and transit networks that reflect the adopted 2040 MTP. Below, the 2010 scenario volumes are compared against 2010 traffic counts to gauge how valid the CAMPO TDM is along the IH 35 corridor. In addition, the 2010 and 2040 scenarios are compared to gauge relative growth along the corridor.

Count to TDM Comparison

Table 3 below depicts this model volume to count comparison sorted by locations along the study corridor, and **Table 4** shows the same comparison by aggregated links. **Table 3** represents counts and volumes summed by cutline for both main-lane and frontage roadways. While **Table 4** aggregates individual links by facility along the corridor.

Table 3: Count to TDM Volume Comparison Cutline

Roadway	Location	2010 Count	2010 TDM Volume	Count to Volume Difference	% Difference
IH 35	SH 45	132,600	154,505	21,905	17%
IH 35	Onion Creek Pkwy	122,385	145,387	23,002	19%
IH 35	William Cannon	148,909	158,544	9,635	6%
IH 35	Stassney	161,900	173,276	11,376	7%
IH 35	SH 71	181,571	175,294	-6,277	-3%
IH 35	Lady Bird lake	176,187	199,561	23,374	13%
IH 35	Airport	230,065	253,497	23,432	10%
IH 35	Braker	165,458	164,888	-570	0%
IH 35	Grand Ave	161,150	150,908	-10,242	-6%

Table 4: Count to TDM Volume Comparison Aggregated Links

IH 35 Facility	County	2010 Count	2010 TDM Volume	Count to Volume Difference	% Difference
Main	Travis	3,056,159	3,092,170	36,011	1%
Frontage	Travis	666,204	782,448	116,244	17%
Ramp	Travis	753,272	774,405	21,133	3%
	Total Travis	***4,475,635***	***4,649,023***	***173,388***	***4%***

The data comparisons above show the CAMPO TDM to be well validated along the IH 35 corridor. Additional TDM and demographic comparisons are described below to help further evaluate the model.

Base Year to Future Year Model Relative Growth

2010 and 2040 TDM Volumes were compared along the corridor to calculate relative growth between the model scenarios. **Table 5** below depicts selected volumes for each TDM year and the corresponding relative growth at the location. Similar to the count and volume comparison above, **Table 5** shows the summation of available main-lane, and frontage volumes.

Table 5: Relative Model Growth along IH 35 Study Corridor

Roadway	Location	2010 Count	2040 TDM Volume	Count to Volume Difference	Linear Annual Growth Rate
IH 35	SH 45	132,600	250,328	117,728	3%
IH 35	Onion Creek Pkwy	122,385	226,003	103,618	3%
IH 35	William Cannon	148,909	233,003	84,094	2%
IH 35	Stassney	161,900	277,946	116,046	2%
IH 35	SH 71	181,571	246,550	64,979	1%
IH 35	Lady Bird lake	176,187	313,531	137,344	3%
IH 35	Airport	230,065	333,864	103,799	2%
IH 35	Braker	165,458	240,910	75,452	2%
IH 35	Grand Ave	161,150	229,611	68,461	1%

The CAMPO TDM shows reasonable growth (1%-3%) along IH 35 given the already congested conditions along the corridor.

CAMPO Demographics

2010 demographic data were reviewed in comparison with the CAMPO TDM, Census Estimates, Bureau of Labor Statistics (BLS) data, and Texas Demographic Center (TDC) data, to verify accuracy within the TDM. **Table 6** compares the TDM population and employment levels to the several published sources indicated above. The TDM demographics were found to be reasonably accurate for 2010.

Table 6: Travis and Williamson County 2010 Population and Employment Comparison

Reference	CAMPO TDM		Census Estimate	TDC	BLS
Location	Population	Employment	Population	Population	Employment
Travis	1,001,490	564,517	1,024,266	1,024,000	576,500

Table 7 presents the CAGR (Compound Annual Growth Rate) for population and employment in Travis County from 2010 to 2040. Given recent demographic trends of Travis County, the CAMPO TDM socioeconomic forecast represents reasonable growth for the county containing the project area.

Table 7: Demographic County Growth

Location	Item	2010 to 2040
Travis County	Population	1.8%
	Employment	2.5%

Model Validation

The CAMPO TDM is realistically capable of capturing local travel patterns along the study corridor as demonstrated by the count to volume tables above (**Tables 3-7**). Demographics within the counties is reasonable and similar to those found in 3rd party demographic estimates (**Table 6**). Therefore, based on the aforementioned findings and discussions, it can be inferred that the CAMPO TDM is adequately validated and will serve as a useful tool in forecasting traffic volumes and relative growth in traffic along the project corridor. The TDM has the ability to identify high occupancy vehicles and allocates trips to a mode of travel based upon travel time and cost incurred for the trip.

Forecast Year Traffic Volume Development

Future year traffic volumes will be developed by using the methodologies outlined in the SOP in conjunction with TDM input and professional judgement. A growth rate based on historical traffic counts will be derived using a year-over-year methodology and long-term growth rate analysis with outlier data omitted. Forecasted 24-hour baseline segment volume projections will be based on these growth rate(s) derived from historical traffic counts and consideration of TDM volumes, as discussed above. The recommended growth rates from this evaluation and the directional and classification factors from available permanent and classification stations will be conveyed in the TAHD worksheet submitted with the developed volumes.

The SOP will be used to determine 24-hour projected turning movement volumes. Turning movements and through movements at all major intersections along the corridor will be forecasted using the three-legged and four-legged methodologies outlined in the SOP. Amendments to these volumes will be evaluated and implemented based on nearby trip attractors. After the amendment and diversion process, the volumes will then be balanced based on SOP methodologies.

The projected traffic volumes for the corridor will be developed based on TPP's SOP for the proposed geometry of the schematic layout. The analysis will produce 2030 and 2050 forecast volumes, as requested. The magnitude of trips in the HOV lane and ridership on transit in the corridor will rely upon forecasting with the regional TDM. Vehicle classification and percent trucks will be determined based on collected counts and available TxDOT traffic data. Additional DHV factors will be applied to the forecasted volumes to develop forecast volumes for the operational analysis.

Texas
Department
of Transportation

MEMO

June 5, 2018

To: Terry G. McCoy, P.E., District Engineer
Attention: Lorena E. Echeverria De Misi, P.E., Director of TPD

Through: William E. Knowles, P.E.
Traffic Analysis Section Director, TPP

From: James Burnett
Planner, TPP

Subject: Traffic Data
CSJ: 0015-13-388, etc
I-35:
From RM 1431
To SH 45SE
Travis and Williamson Counties

Attached is a corridor analysis information packet for CSJ 0015-13-388, etc. Please refer to your original request dated December 1, 2017. The methodology memorandum dated December 20, 2017, attached with your above mentioned request has been reviewed, resulting in the following comments:

1) TPP typically does not reference travel demand models for developing traffic projections, so all "Travel Demand Model" and/or "TDM" related statements, contexts, and/or tables should be removed from the methodology memorandum.

2) TPP typically does not produce traffic data and projections for express lanes, so all statements and/or contexts related to "express lanes" should be removed from the methodology memorandum.

3) Currently 2016 is the count year from which TPP projects traffic volumes, so any statements and/or contexts with respect to 2017 being the "base" year from which traffic projections will be initiated need to be amended to 2016 being the "count" year from which traffic projections will be initiated.

4) The Historic Counts section of the methodology memorandum mentions referencing historic traffic data from STARS II which does not have 20 years of data. TPP uses 20 year regression analysis for determining growth rates, and this corridor packet includes the growth rates to be used for this project, so the Historic Counts section of the methodology memorandum needs to be amended to state that exclusively the growth rates provided with this corridor packet will be used for developing the traffic projections, and forecast years' traffic volumes for this project.

If you have any questions or need additional information, please contact James Burnett at (512) 486-5165.

Attachments

Submitted in SharePoint 2-5-18

Request for Traffic Data

Date: 12/01/2017

District: Austin **County:** Travis/Williamson **CSJ:** 0015-13-388, etc

Highway: I-35

Limits: RM 1431 to SH 45SE

Texas Reference Marker System

From Marker: 255 From Displacement: .939 From DFO: 255.447

To Marker: 222 To Displacement: .925 To DFO: 222.460

Is it in the UTP: ☒Yes ☐No District Priority: 5 Est. Letting Date: 12/19/2019

Existing Number of Lanes: 6 +/-

Proposed Number of Lanes: 8 +/-

District Contact Person: Carmen Ramos

Phone Number: 512-832-7075

Please attach an 8-1/2" x 11" location map and make note of any existing or proposed development that will be a traffic generator. NOTE:

The following to be completed (Please mark information to be provided):

☐ 1. Basic Highway Traffic Data for pavement design
(No line diagram analysis required)
  A. Base year/ Beginning year: 2020
  B. Forecasted 20 year: 2040
  C. Forecasted 30 year: 2050
  D. Directional Distribution
  E. K-factor
  F. Percent Trucks ADT/DHV
  G. Average Ten Heaviest Wheel Loads (ATHWLD)
  H. Percent Tandem Axles in the ATHWLD
  I. One Directional cumulative 18 KSA at the end of the 20 years/30 years
  J. Slab Thickness (8" unless otherwise specified):
  K. Structural Number (3 unless otherwise specified):

☐ 2. Vehicle classification for environmental studies (Air and Noise Analysis)

☐ 3. Line diagram analysis (straight line turning movements; please provide line diagram).

☐ 4. Complete Corridor Analysis (includes basic highway traffic data for pavement design, environmental studies and detailed schematic turning movements; *please provide detailed schematic*).

☒ 5. Consultant Corridor Information Packet

☐ 6. No build traffic analysis.
  ☐ EA
  ☐ EIS
  ☐ EA/EIS Reevaluation

Note: If complete corridor analysis is requested, please attach a traffic schematic diagram.

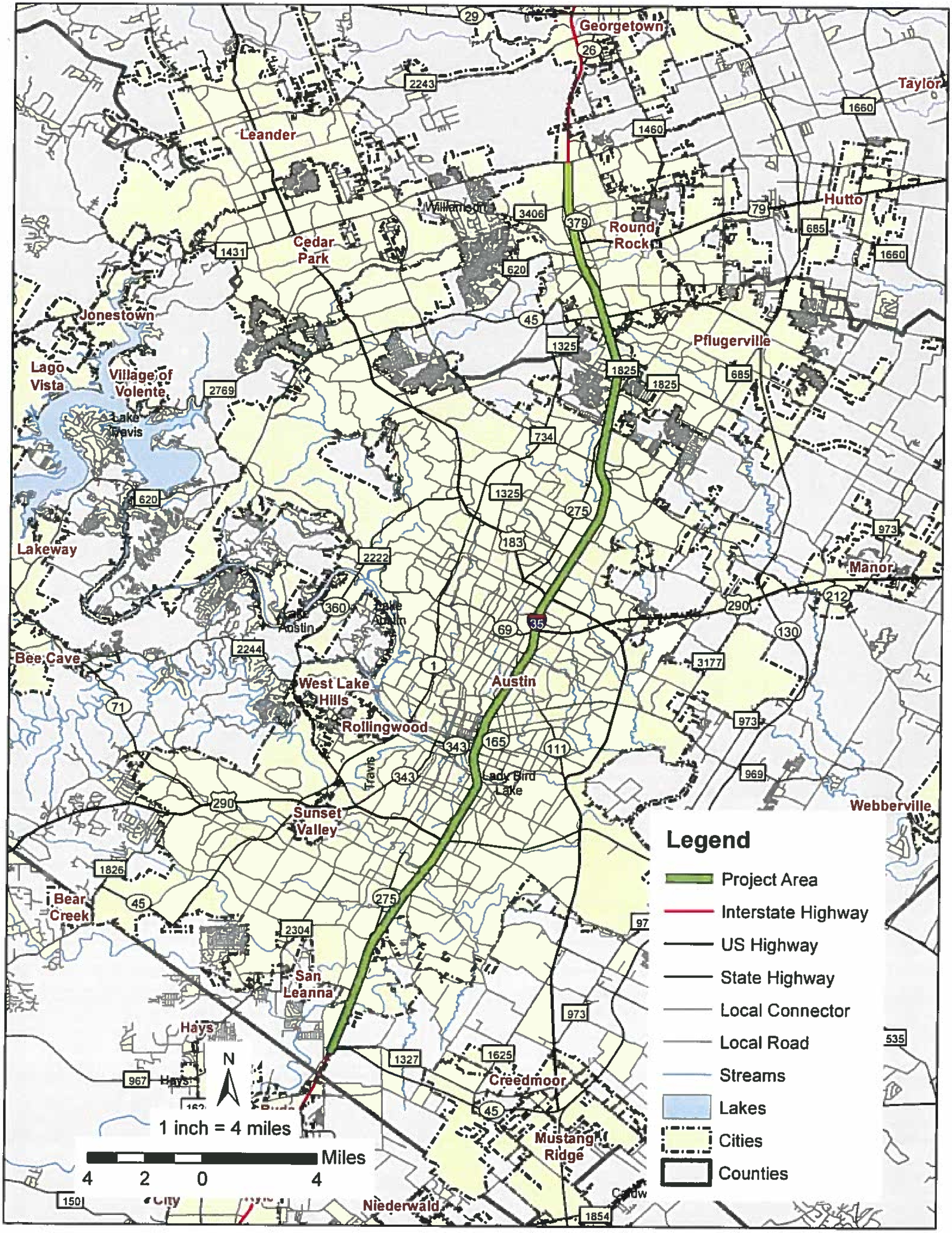
Traffic Data Request Form

Request ID *(auto generated on save)*	2018051	
Date Created *(auto generated on save)*	05/02/2018 16:41	2018-02-05T16:41:02
District*	Austin	
County*	☑ Travis ☑ Williamson	Terry.McCoy@txdot.gov Lorena.EcheverriadeMisl...
CSJ*	0015-13-388, etc.	
Project Highway*	I-35	
Limit (From)*	RM 1431	
Limit (To)*	SH 45SE	
Number of Lanes Existing*	6	
Number of Lanes Proposed*	8	
District Contact Person*	Carmen Ramos	
Contact Number*	512-832-7075	
Estimated Letting Date*	12/19/2019	
District Priority*	5	
Attach Drawings or other documents*	20171220 IH-35 Methodology Memo_Draft v6.docx Austin District Traffic Request Priority List xls I35_CapExpress_ProjectLimits_v1.pdf I35_CapExpress_Request for Traffic Data_Form 2124 (Rev 0916) pdf	
Special Instructions *Note: If complete corridor analysis is requested, please attach a traffic schematic diagram.*	This is a Consultant Corridor Information Packet Request - OPTION 2 The IH-35 project 0015-13-388, etc. is a design build project with a tentative procurement schedule with the following dates. The Form 2124 has been submitted with a letting date that corresponds to the Conditional Award of the contract, 12/19/19. For reference the Draft RFP date is 4/2019, the final RFP date is 6/2019.	

The following to be completed (Please mark information to be provided)

1. Basic highway traffic data for pavement design	**A. Base Year**	2020
	B. Forecasted 20 Years	☑ **2040**
	C. Forecasted 30 years	☑ ***2050***
	D. Directional Distribution	
	E. K-factor	
	F. Percent Trucks ADT/DHV	
	G. Average Ten Heaviest Wheel Loads (ATHWLD)	
	H. Percent Tandem Axles in the ATHWLD	
	I. One Directional cumulative 18 KSA at the end of the 20/30 years	

	J. Slab Thickness *(8" unless otherwise specified)*	8
	K. Structural Number *(3" unless otherwise specified)*	3
2. Vehicle Classification for environmental studies (Air and Noise Analysis)	☐	
3. Line Diagram Analysis (straight line turning movements: please provide line diagram)	☐	
4. Complete Corridor analysis (includes basic highway traffic data for pavement design and environmental studies and detailed schematic turning movements; please provide detailed schematic)	☐	
5. Consultant Corridor Information Packet	☑	
6. No build Traffic Analysis	☐	


Georgetown
29
26
2243
Taylor
1660
1460
Leander
Williamson
3406
379
Round Rock
79
Hutto
685
1660
Cedar Park
1431
620
45
Jonestown
1325
Pflugerville
1825
1825
685
Lago Vista
Village of Volente
2769
Lake Travis
734
620
1325
275
973
Lakeway
183
2222
Manor
212
290
360
Lake Austin
Austin
69
35
130
Bee Cave
2244
3177
1
Austin
West Lake Hills
71
Rollingwood
973
165
343
111
Travis
343
Lady Bird Lake
969
290
Sunset Valley
Webberville
1826
Bear Creek
45
275
2304
97
San Leanna
973
535
Hays
1327
1625
967
Hays
Creedmoor
Buda
45
Mustang Ridge
150
City
Niederwald
Caldw
1854
N
1 inch = 4 miles
Miles
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Legend
🟩 Project Area
Interstate Highway
US Highway
State Highway
Local Connector
Local Road
Streams
Lakes
Cities
Counties

ALLIANCE@20
TWO DECADES OF MAKING LIVES BETTER

MEMORANDUM

AUSTIN OFFICE
11500 Metric Blvd.
Bldg. M-1, Ste. 150
Austin, TX 78758
Phone: 512.821.2081
Fax: 512.821.2085
Toll Free: 866.576.0597
TBPE Firm Registration No. 812

DATE: December 20, 2017
TO: Janie Temple, TxDOT
CC: Brandon Marshall, TxDOT
FROM: Mike Chaney, Alliance Transportation Group, Inc.
RE: Traffic Forecasting Methodology for IH 35 Capital Express

---

This memorandum describes procedures used to forecast traffic volumes that will be incorporated into the design and development of Interstate 35 (IH 35) Capital Express project in Travis and Williamson Counties. These traffic volumes are forecasted to support the independent segment teams designing the proposed roadway improvements. The traffic forecasts will be used for pavement design, operational analysis, as well as air and noise analysis.

TxDOT's Austin District requested forecasted traffic volumes for pavement design and air and noise analysis along IH 35. Districts have three options when requesting traffic data:
(A) a request is made to TxDOT's Transportation Planning & Programming Division (TPP) to generate traffic data and TPP will then sign and seal the project, (B) a request is made to TPP to assist in the development of future traffic volumes and TPP will then sign and seal the project, or (C) the respective TxDOT district is responsible for the development of the future volumes and the District will then sign and seal the project. For this project, Option B is being used to develop future year volumes.

The following sections describe the process and merits of the analysis that will be employed by Alliance Transportation Group, Inc. (ATG).

Corridor Analysis Process

Once the Consultant Corridor Packet (CCP) is received, the provided data, available regional travel demand model (TDM), and additional count data from TxDOT databases will be inventoried and processed to begin the corridor analysis procedure. After the data has been aggregated, the subsequent step, described below, will follow the Corridor Analysis Standard Operating Procedures (SOP) created by TPP in February 2017.

These count data will be used to develop the base year working map volumes. The next step will use these base year volumes to calculate the Straight Line Analysis volumes, and subsequent amendments and diversions will be made by following methodologies described in the SOP, using engineering judgement, and accounting for effects on traffic patterns observed with the TDM. Once balanced, these base year volumes will be used as a basis for the requested future year forecasts. Subsequently, the base year volumes will also serve to calculate Complete Corridor Analysis volumes with a similar amendment and diversion process following. Once balanced, these base year volumes will inform the requested future year forecasts and deliverables unique to the Complete Corridor Analysis.

Project Details

The project area consists of IH 35 from SH 45 near Buda, Texas, to RM 1431 in Round Rock, Texas, a distance of approximately 33 miles. The project was divided into three segments that are being developed by three project teams:

- South10: From SH 45SE to Lady Bird Lake
- Central7: From Lady Bird Lake to US 183
- North16: From US 183 to RM 1431

Express Lanes and geometric improvements will be proposed for the corridor as a part of the Capital Express project. The project also includes forecasted volumes for 2030 and 2050.

The location and project team segmentation of the IH 35 project is depicted in the **Figure 1** on the following page.

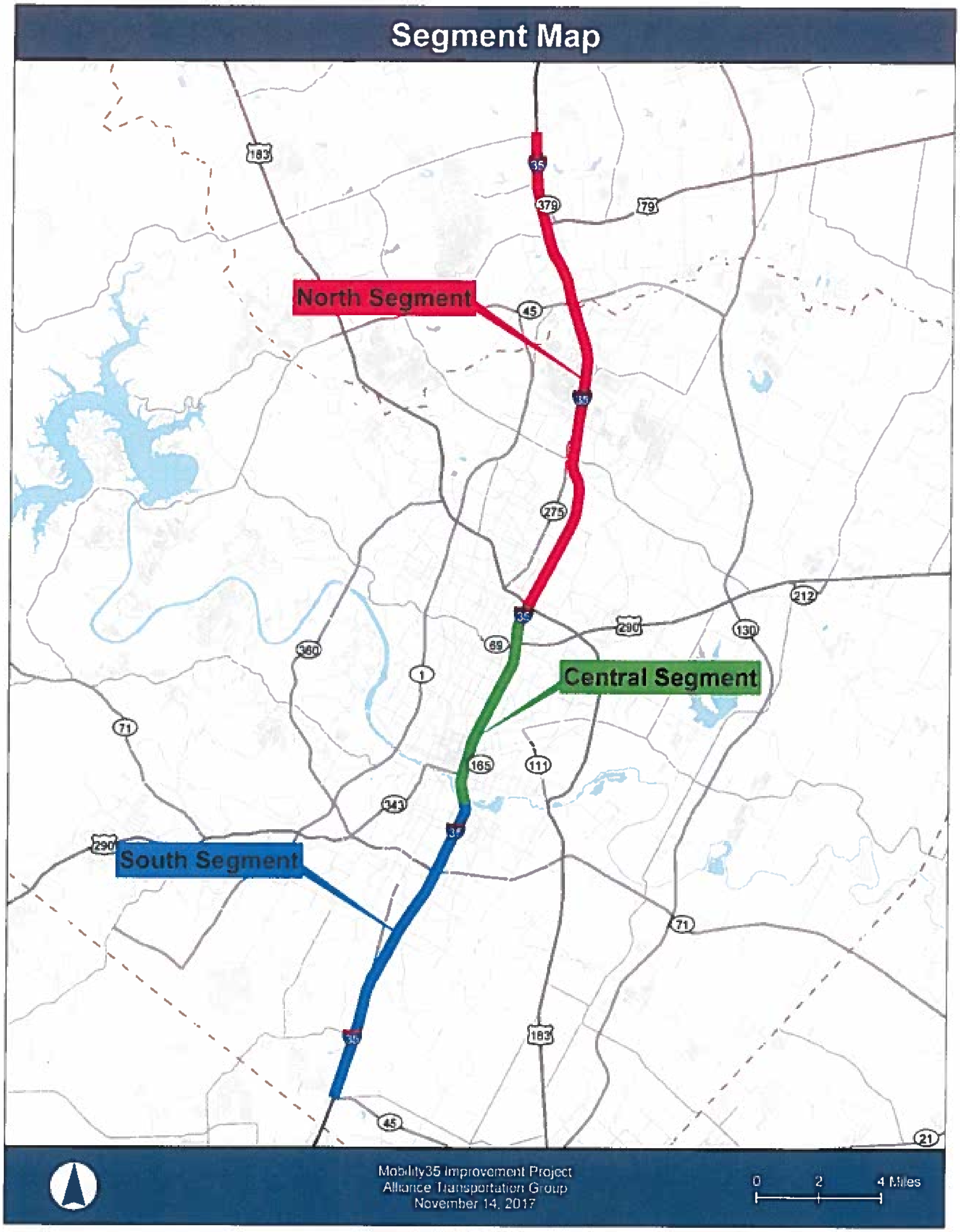


Figure 1: IH 35 Project Limits

Forecasting Future Year Volumes

The following sections detail the available data, describe the review of the TDM, and discuss future steps, which will employ SOP methodologies, and the TDM to forecast future year volumes.

Available Data Sources

Several data sources will be used to determine growth in the project area and develop forecast year traffic volumes.. The following sections describe the data available for use and consideration in forecasting future year volumes.

Traffic Counts

Two different traffic count sources will be used to develop a balanced 2017 volume to be used in representing the base year traffic conditions. This data was provided by TxDOT in the CCP and collected in 2016 and 2017. Count locations include the following types of counts:

- 2015 and 2016 TxDOT Annual Counts (obtained from the STARS II website and the CCP)
- 2016 and 2017 Collected Traffic Movement Counts and Tube Counts

Permanent and Classification Count Locations

The analysis will use the TxDOT Permanent Count Stations on or near the corridor to determine the directional distribution and peak hour factor. Similarly, nearby TxDOT Vehicle Classification Count Stations will determine the heavy vehicle percentages along the corridor. The Traffic Analysis for Highway Design (TAHD) worksheet included with the final traffic forecast will identify these stations.

Historical Counts

A linear regression analysis will use historical count information from the TxDOT STARS II database at locations along the corridor. The resulting historical average growth rate, along with other measures of growth in the area, will inform the selection of growth rates for use in forecasting traffic on the facility.

Traffic Demand Model Review

The 2010 and 2040 CAMPO Travel Demand Model (TDM) scenarios used in this analysis were produced with the latest adopted regional TDM, which includes both roadway and transit networks that reflect the adopted 2040 MTP. Below, the 2010 scenario volumes are compared against 2010 traffic counts to gauge how valid the CAMPO TDM is along the IH 35 corridor. In addition, the 2010 and 2040 scenarios are compared to gauge relative growth along the corridor.

Count to TDM Comparison

Table 1 below depicts this model volume to count comparison sorted by locations along the study corridor, and **Table 2** shows the same comparison by aggregated links. **Table 1** represents counts and volumes summed by cutline for both main-lane and frontage roadways. While **Table 2** aggregates individual links by facility along the corridor.

Table 1: Count to TDM Volume Comparison Cutline

Roadway	Location	2010 Count	2010 TDM Volume	Count to Volume Difference	% Difference
IH 35	SH 45	132,600	154,505	21,905	17%
IH 35	Onion Creek Pkwy	122,385	145,387	23,002	19%
IH 35	William Cannon	148,909	158,544	9,635	6%
IH 35	Stassney	161,900	173,276	11,376	7%
IH 35	SH 71	181,571	175,294	-6,277	-3%
IH 35	Lady Bird lake	176,187	199,561	23,374	13%
IH 35	Airport	230,065	253,497	23,432	10%
IH 35	Braker	165,458	164,888	-570	0%
IH 35	Grand Ave	161,150	150,908	-10,242	-6%
IH 35	US 79	161,071	164,826	3,755	2%

Table 2: Count to TDM Volume Comparison Aggregated Links

IH 35 Facility	County	2010 Count	2010 TDM Volume	Count to Volume Difference	% Difference
Main	Travis	3,056,159	3,092,170	36,011	1%
Frontage	Travis	666,204	782,448	116,244	17%
Ramp	Travis	753,272	774,405	21,133	3%
	Total Travis	***4,475,635***	***4,649,023***	***173,388***	***4%***
Main	Williamson	1,501,235	1,383,392	-117,843	-8%
Frontage	Williamson	294,167	248,730	-45,437	-15%
Ramp	Williamson	317,335	311,377	-5,958	-2%
	Total Williamson	***2,112,737***	***1,943,499***	***-169,238***	***-8%***

The data comparisons above show the CAMPO TDM to be well validated along the IH 35 corridor. Additional TDM and demographic comparisons are described below to help further evaluate the model.

Base Year to Future Year Model Relative Growth

2010 and 2040 TDM Volumes were compared along the corridor to calculate relative growth between the model scenarios. **Table 3** below depicts selected volumes for each TDM year and the corresponding relative growth at the location. Similar to the count and volume comparison above, **Table 3** shows the summation of available main-lane, frontage and express lane volumes (2040 only).

Table 3: Relative Model Growth along IH 35 Study Corridor

Roadway	Location	2010 Count	2040 TDM Volume	Count to Volume Difference	Linear Annual Growth Rate
IH 35	SH 45	132,600	250,328	117,728	3%
IH 35	Onion Creek Pkwy	122,385	226,003	103,618	3%
IH 35	William Cannon	148,909	233,003	84,094	2%
IH 35	Stassney	161,900	277,946	116,046	2%
IH 35	SH 71	181,571	246,550	64,979	1%
IH 35	Lady Bird lake	176,187	313,531	137,344	3%
IH 35	Airport	230,065	333,864	103,799	2%
IH 35	Braker	165,458	240,910	75,452	2%
IH 35	Grand Ave	161,150	229,611	68,461	1%
IH 35	US 79	161,071	275,462	114,391	2%

The CAMPO TDM shows reasonable growth (1%-3%) along IH 35 given the already congested conditions along the corridor.

CAMPO Demographics

2010 demographic data were reviewed in comparison with the CAMPO TDM, Census Estimates, Bureau of Labor Statistics (BLS) data, and Texas Demographic Center (TDC) data, to verify accuracy within the TDM. **Table 4** compares the TDM population and employment levels to the several published sources indicated above. The TDM demographics were found to be reasonably accurate for 2010.

Table 4: Travis and Williamson County 2010 Population and Employment Comparison

Reference	CAMPO TDM		Census Estimate	TDC	BLS
Location	Population	Employment	Population	Population	Employment
Travis	1,001,490	564,517	1,024,266	1,024,000	576,500
Williamson	417,508	126,808	422,679	423,000	122,679
Total	1,418,998	691,325	1,446,945	1,447,000	698,900

Table 5 presents the CAGR (Compound Annual Growth Rate) for population and employment in Travis and Williamson counties from 2010 to 2040. Given recent demographic trends of the two counties, the CAMPO TDM socioeconomic forecast represents reasonable growth for the counties containing the project area.

Table 5: Demographic County Growth

Location	Item	2010 to 2040
Travis County	Population	1.8%
	Employment	2.5%
Williamson County	Population	4.1%
	Employment	6.1%
Total	Population	2.6%
	Employment	3.5%

Model Validation

The CAMPO TDM is realistically capable of capturing local travel patterns along the study corridor as demonstrated by the count to volume tables above **(Tables 1-5)**. Demographics within the counties is reasonable and similar to those found in 3rd party demographic estimates **(Table 4)**. Therefore, based on the aforementioned findings and discussions, it can be inferred that the CAMPO TDM is adequately validated and will serve as a useful tool in forecasting traffic volumes and relative growth in traffic along the project corridor.

Forecast Year Traffic Volume Development

Future year traffic volumes will be developed by using the methodologies outlined in the SOP in conjunction with TDM input and professional judgement. Prior to TDM input, a growth rate based on historical traffic counts will be derived using a year-over-year methodology and long-term growth rate analysis with outlier data omitted. Forecasted 24-hour baseline segment volume projections will be based on these growth rate(s) derived from historical traffic counts and consideration of TDM volumes, as discussed above. The recommended growth rates from this evaluation and the directional and classification factors from available permanent and classification stations will be conveyed in the TAHD worksheet submitted with the developed volumes.

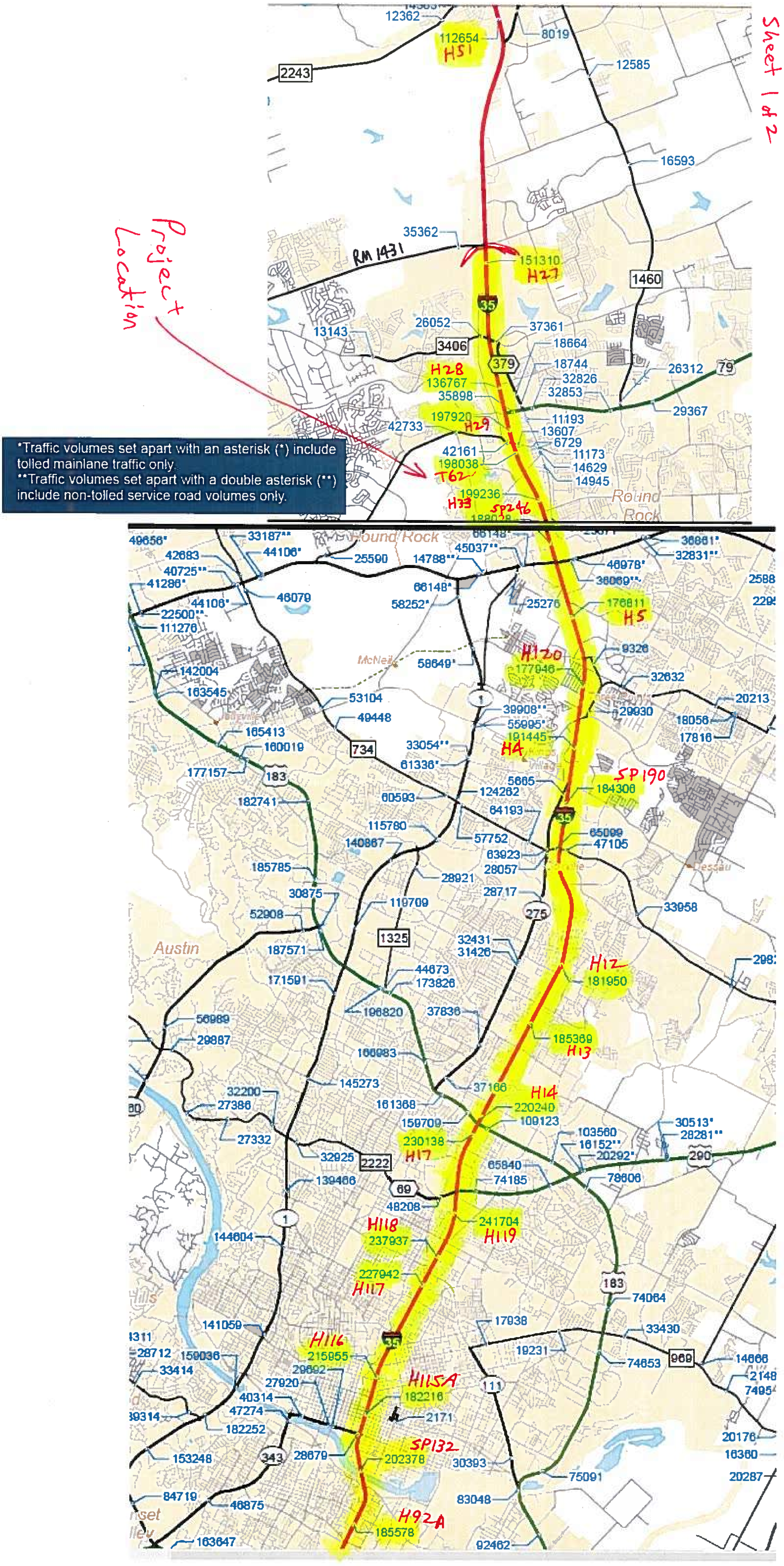
The SOP will be used to determine 24-hour projected turning movement volumes. Turning movements and through movements at all major intersections along the corridor will be forecasted using the three-legged and four-legged methodologies outlined in the SOP. Amendments to these volumes will be evaluated and implemented based on nearby trip attractors and the accuracy of TDM inputs. Due to the express lane component, diversions based on TDM input will be applied to volumes along the corridor. After the amendment and diversion process, the volumes will then be balanced based on SOP methodologies.

The projected traffic volumes for the corridor will be developed based on TPP's SOP for the proposed geometry of the schematic layout.
The analysis will produce 2030 and 2050 forecast volumes, as requested. Vehicle classification and percent trucks will be determined based on collected counts and available TxDOT traffic data.
Additional DHV factors will be applied to the forecasted volumes to develop forecast volumes for the operational analysis.

PRIORITY	Request #	CSJ	COUNTY	ROADWAY	FROM	TO	NEEDED	REQUESTED	REQUESTED BY	LETTING DATE
1	452	3136-01-176	Travis	Loop 1	Cesar Chavez Street	Slaughter Lane	02/01/17	01/12/17	Heather Ashley-Nguyen	1/1/2020
2	459	1200-03-056	Travis	FM 973	SH 130	US 290	08/28/17	06/28/17	Adeliza Ramirez	TBD
3	462	0015-09-185	Williamson	IH 35	RM 2243	RM 1431	12/21/17	11/21/17	Adeliza Ramirez/Tony Estes-C	3/1/2020
4	470a	3417-02-030	Williamson	FM 734	RM 1431 (East Whitestone Blvd.	SH 45	02/23/18	01/24/18	Adeliza Ramirez	12/1/2020
5	471	0015-13-388, etc.	Travis/Williams	I-35	RM 1431	SH 45SE	3/5/2018	2/5/2018	Brandon Marshall	12/19/2019
6	472	0683-02-066	Travis	RM 620	SH 71	Colorado River	3/5/2018	1/5/2018	Hector Tamez	8/4/2023
7	473	0150-04-046	Llano	SH 29	RM 1431	RM 2241	3/23/2018	1/23/2018	Mark Herber	4/1/2019

Sheet 1 of 2

Project Location & 2016 AustinDistrict Traffic Map

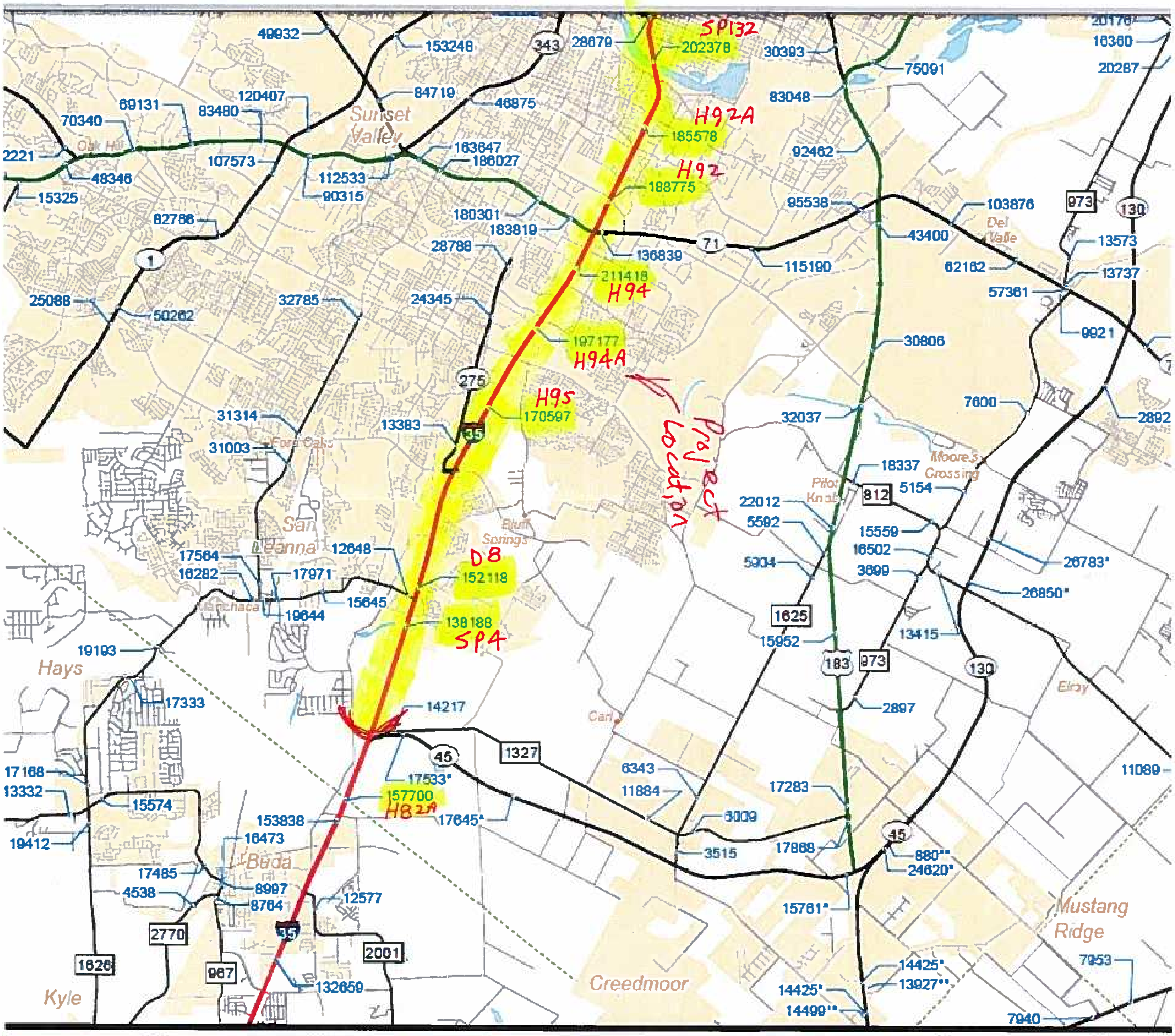


Project Location

*Traffic volumes set apart with an asterisk (*) include tolled mainlane traffic only.
**Traffic volumes set apart with a double asterisk (**) include non-tolled service road volumes only.

Project Location
&
2016 Austin District
Traffic Map
Sheet 2 of 2

*Traffic volumes set apart with an asterisk (*) include tolled mainlane traffic only.
**Traffic volumes set apart with a double asterisk (**) include non-tolled service road volumes only.



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ouble asterisk (**)
mes only

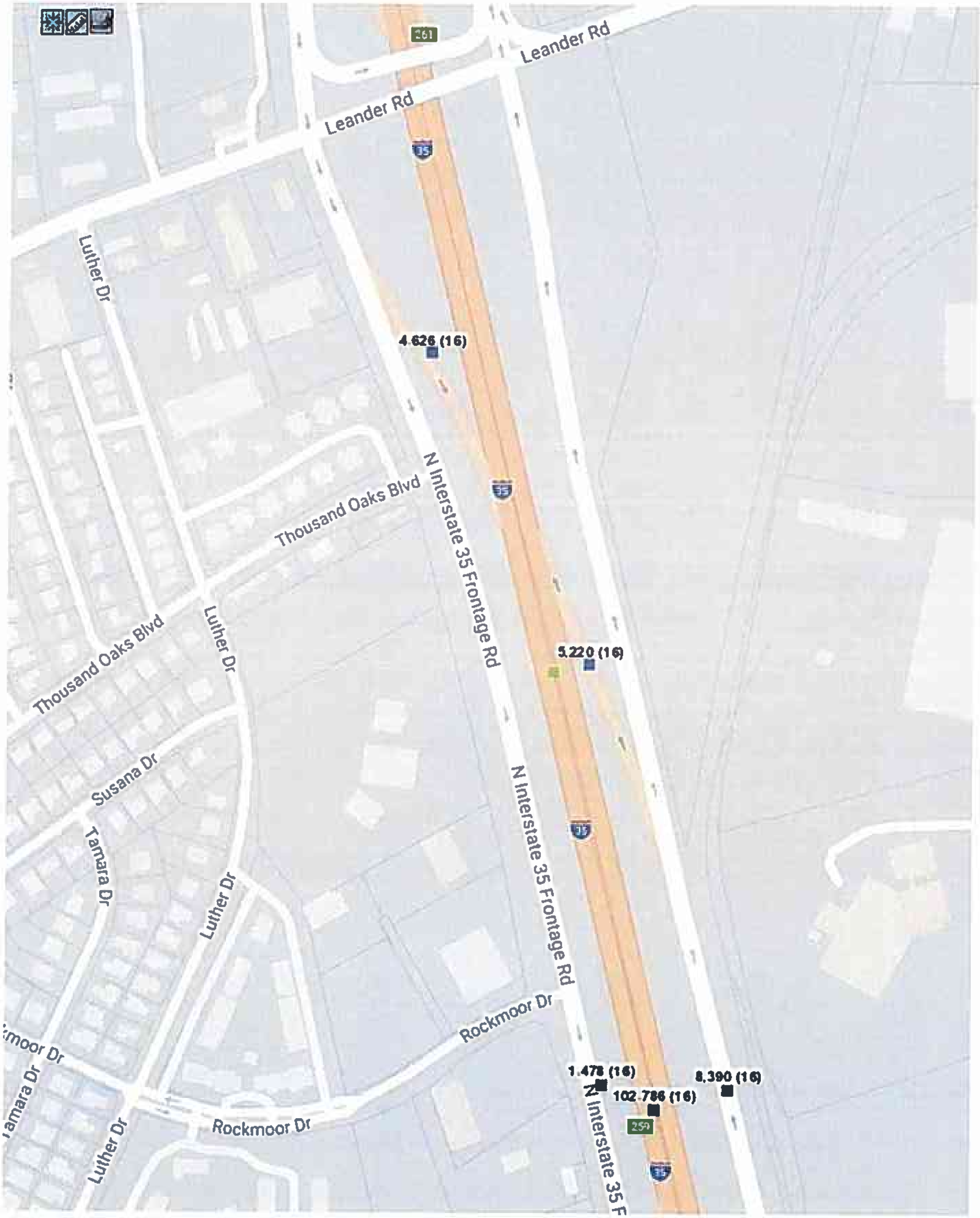
5

2016 AUSTIN DISTRICT TRAFFIC MAP

PREPARED BY THE
Texas Department of Transportation
Transportation Planning and Programming Division
Traffic Analysis System Support Branch
IN COOPERATION WITH THE
United States Department of Transportation Federal Highway Administration

STARS II AADT Sheets (including ramp volumes)

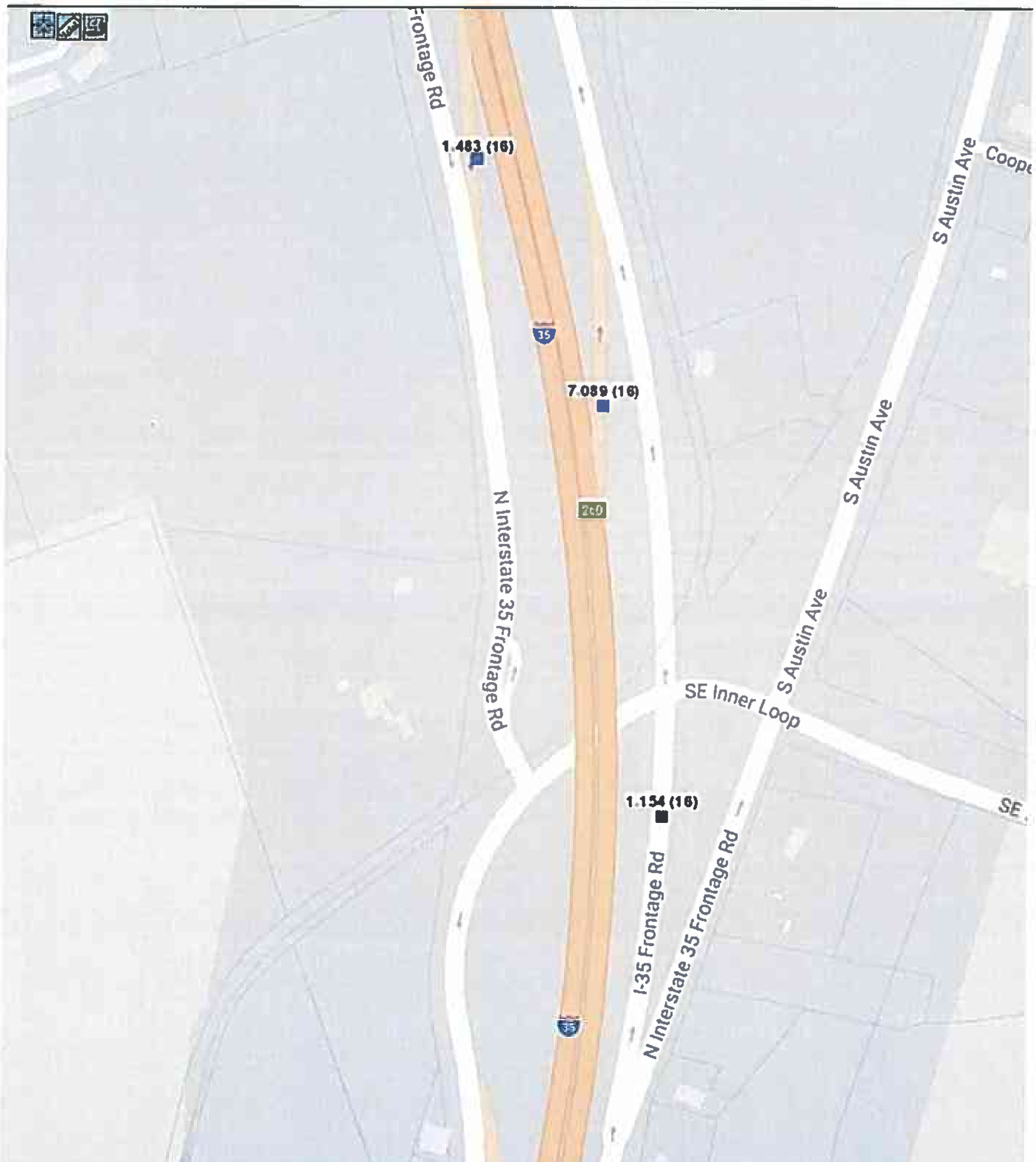
for I-35 from RM 1431 to SH 45SE project



5/8-9/2018

STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

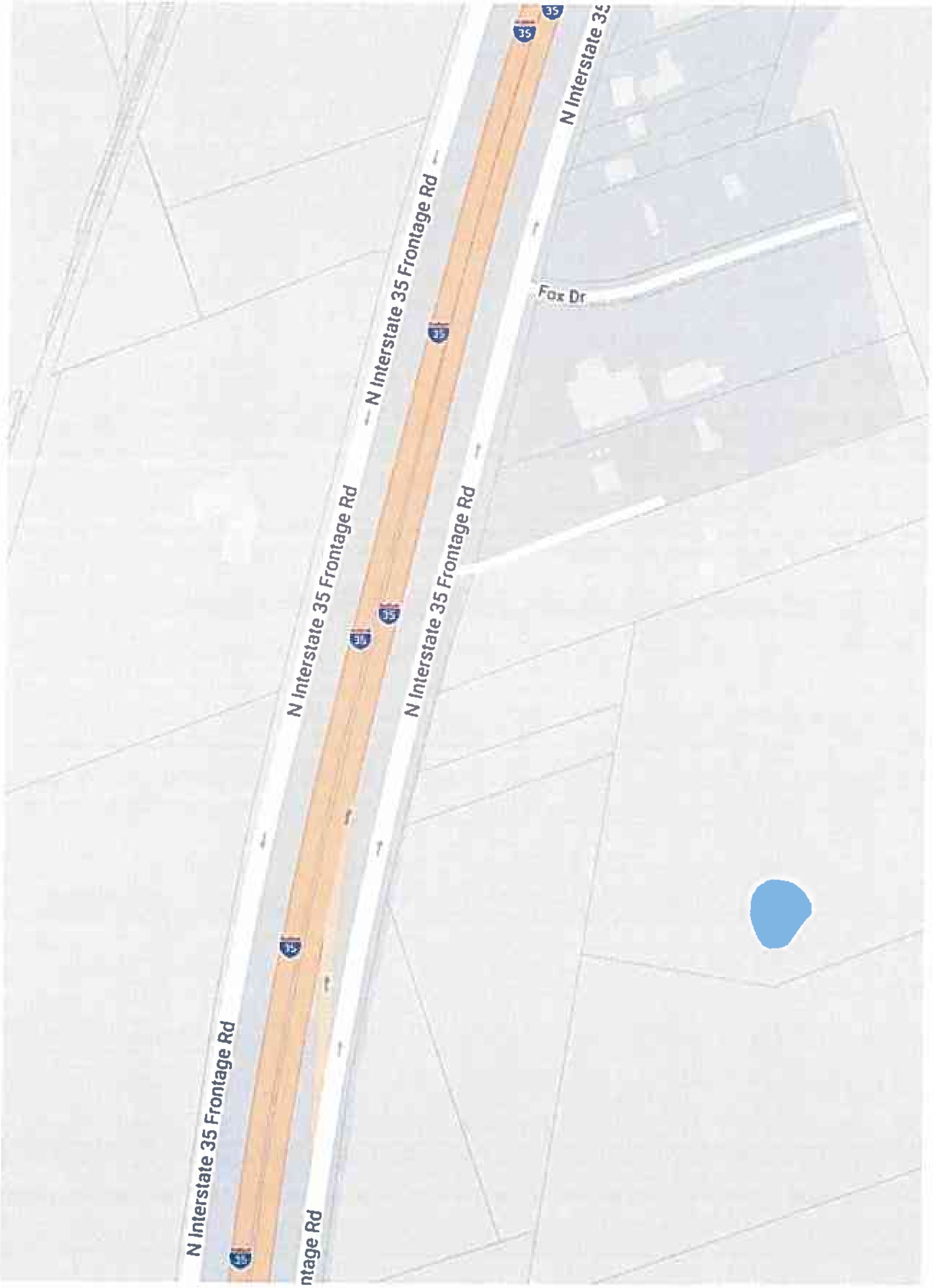


STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project



STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

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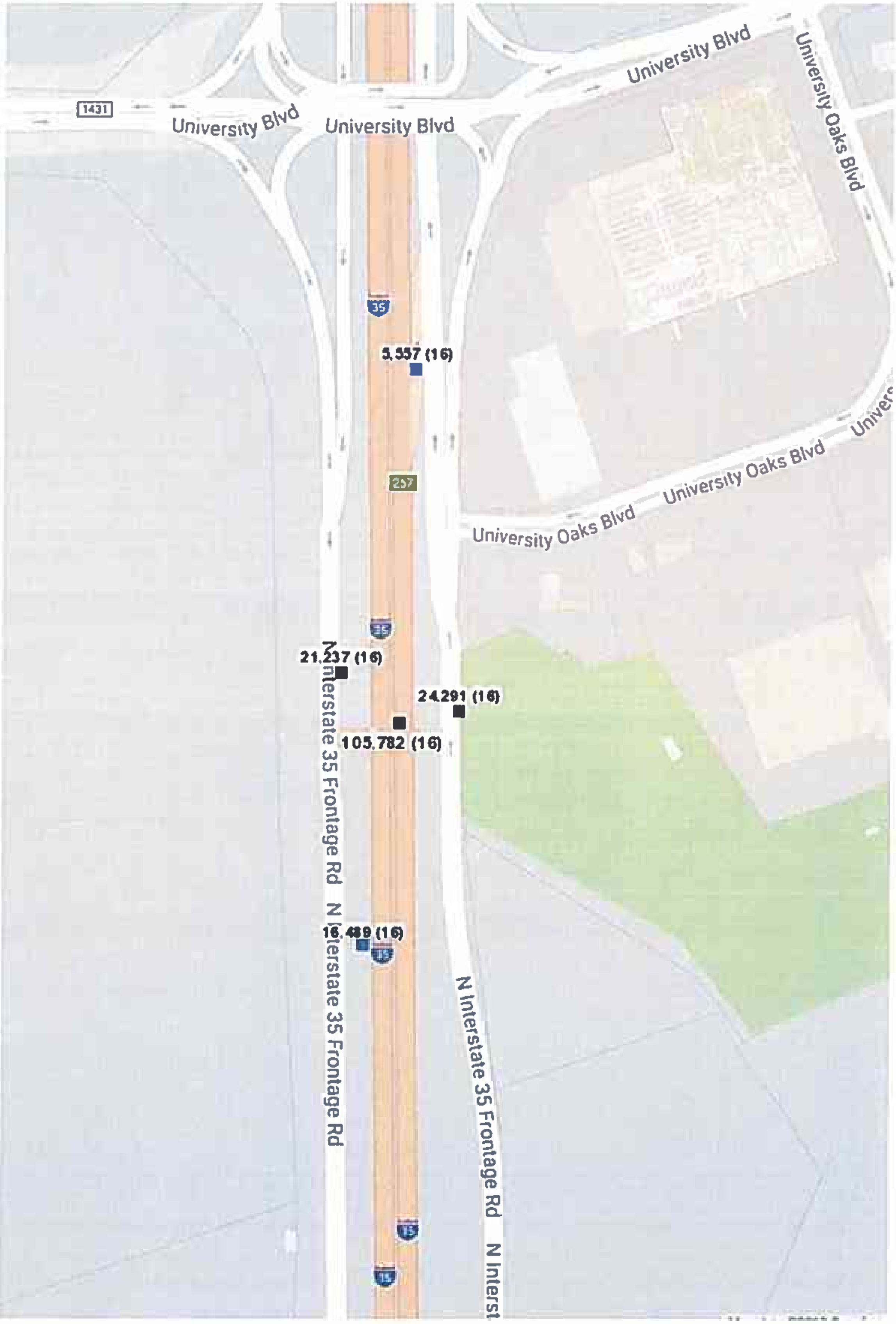

STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

STARS II AADT Sheets (including ramp volumes)

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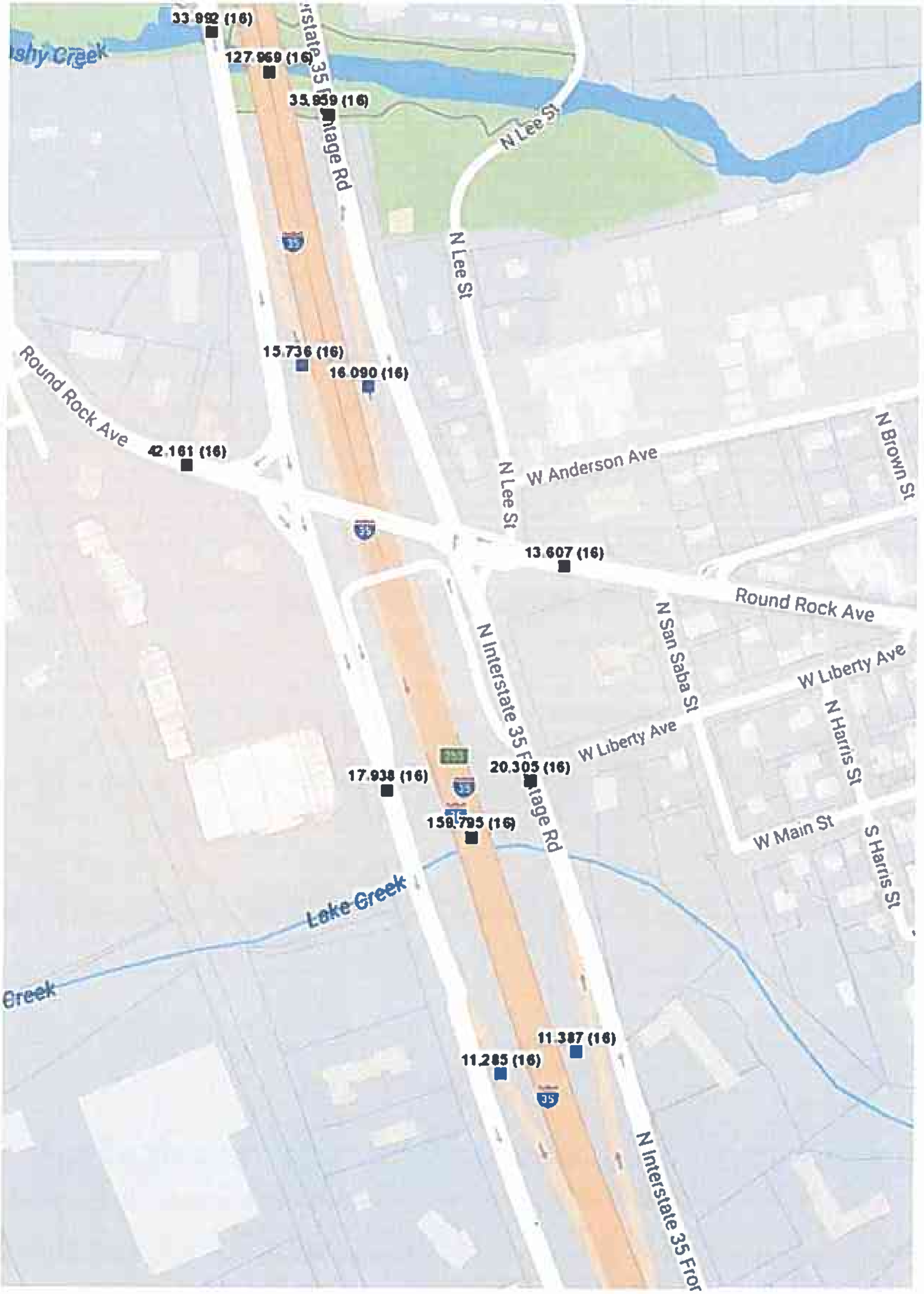
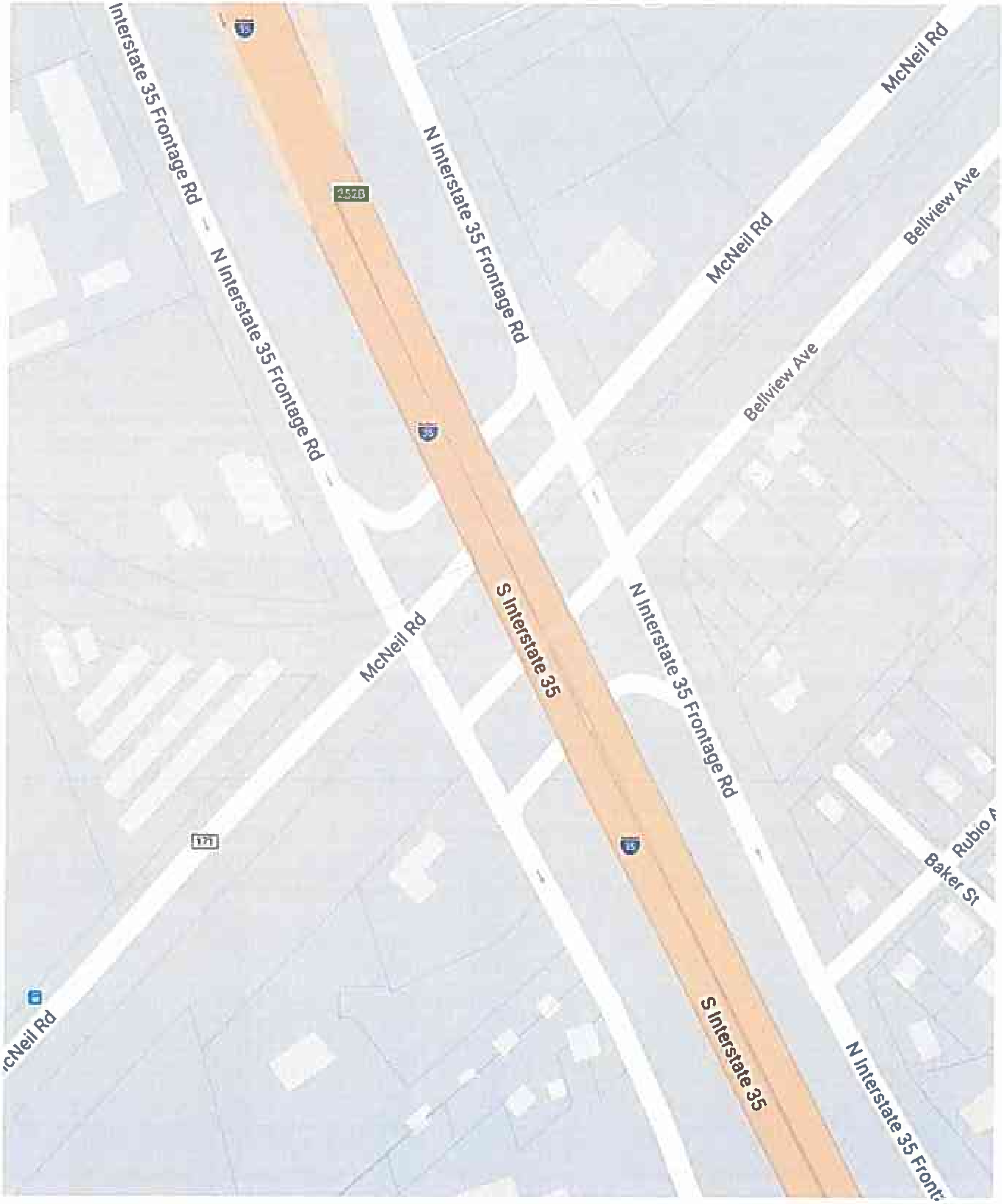


STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project



STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

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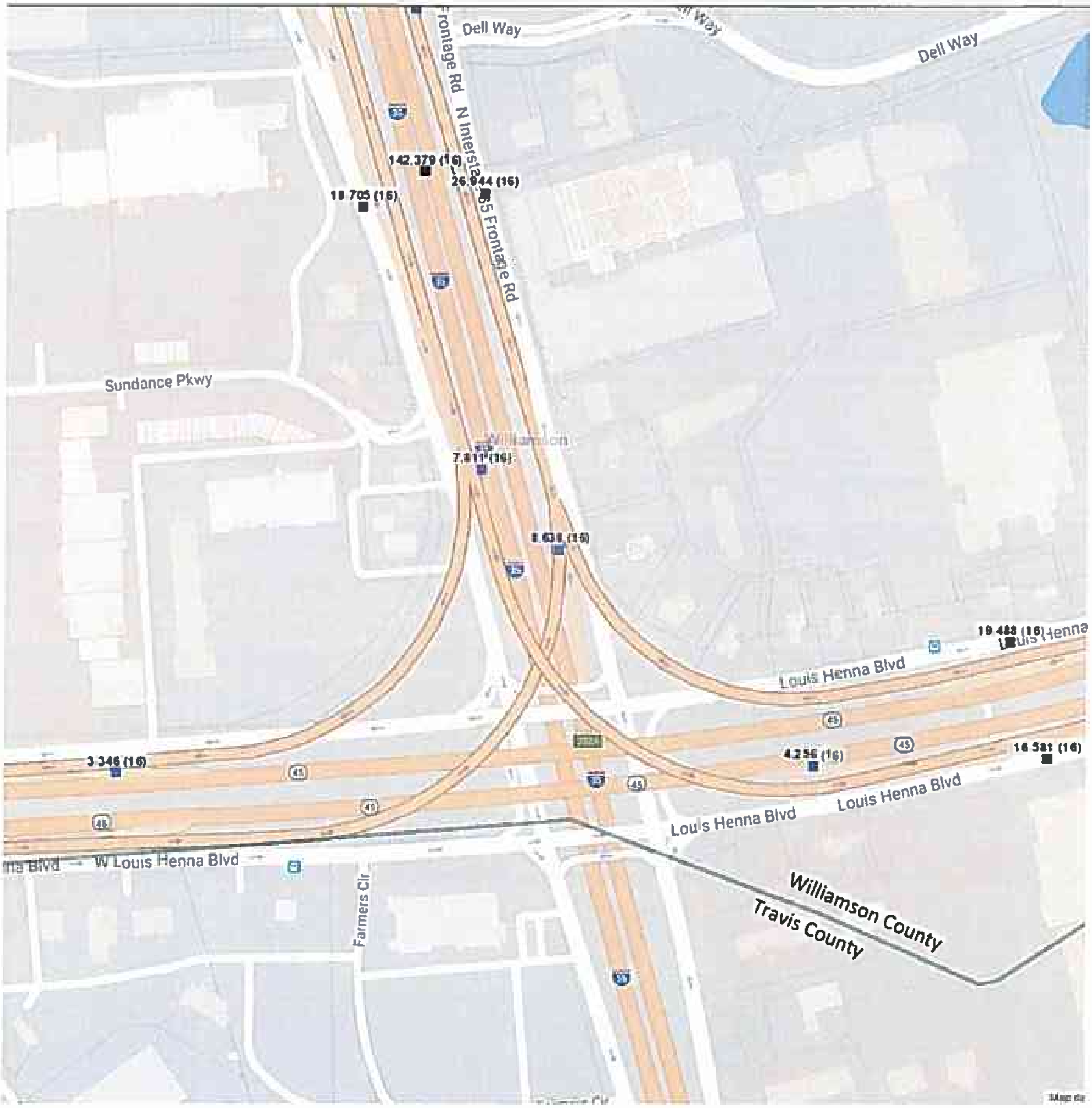
for I-35 from RM 1431 to SH 45SE project



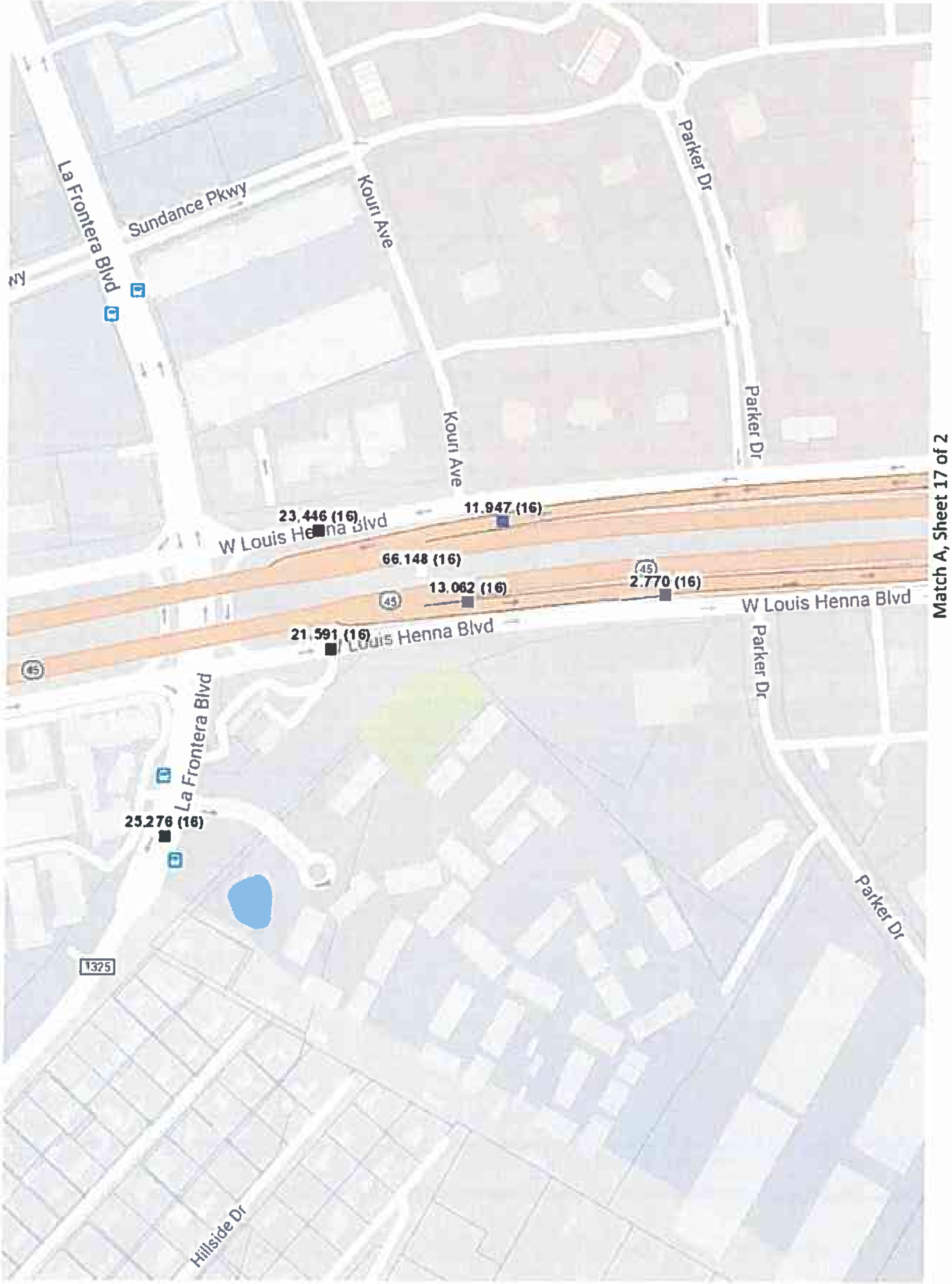
Match A, Sheet 18 of 2

Match B, Sheet 19 of 2

Match C, Sheet 20 of 2

STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project



STARS II AADT Sheets (including ramp volumes)

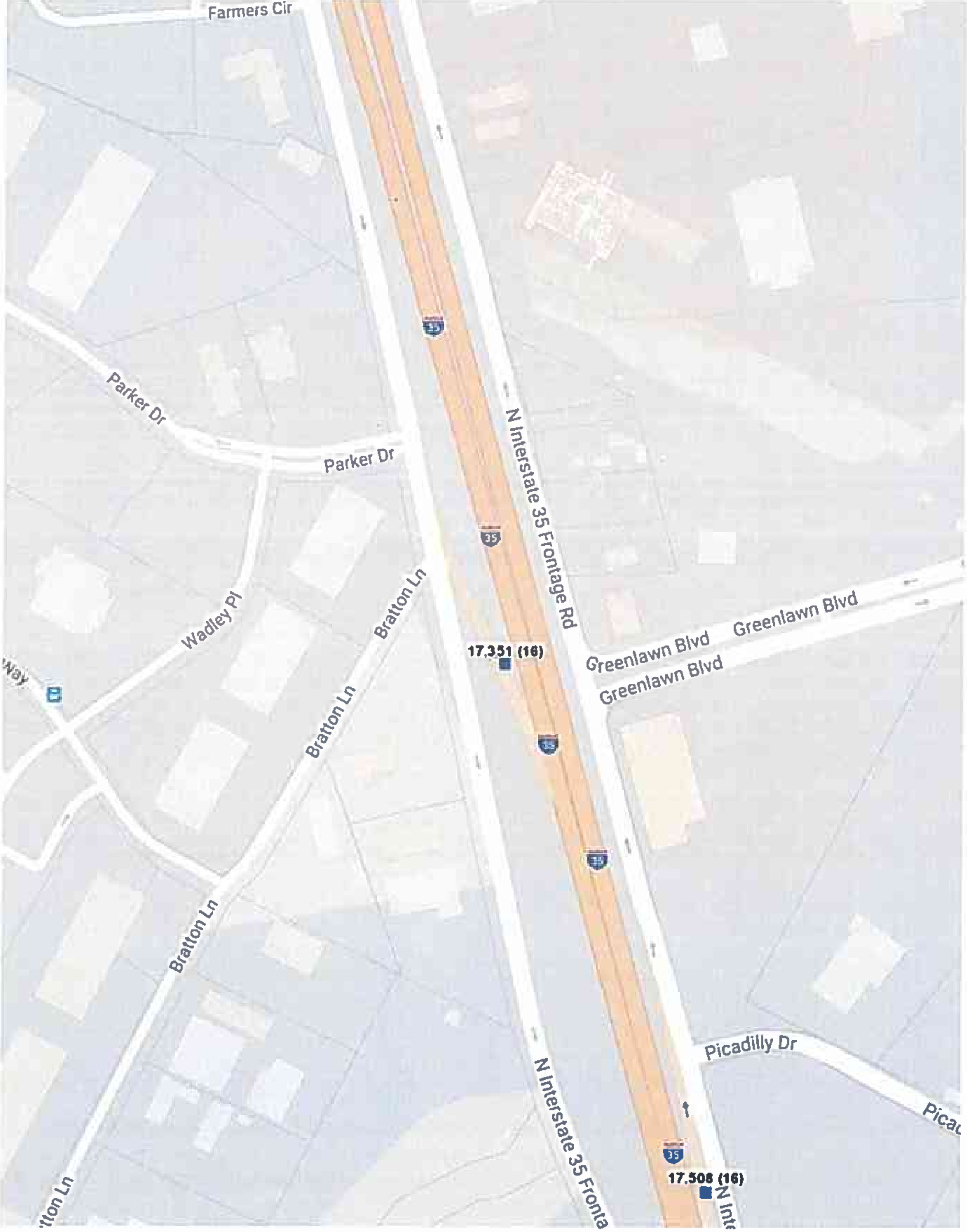
for I-35 from RM 1431 to SH 45SE project

Match B, Sheet 17 of 2

STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

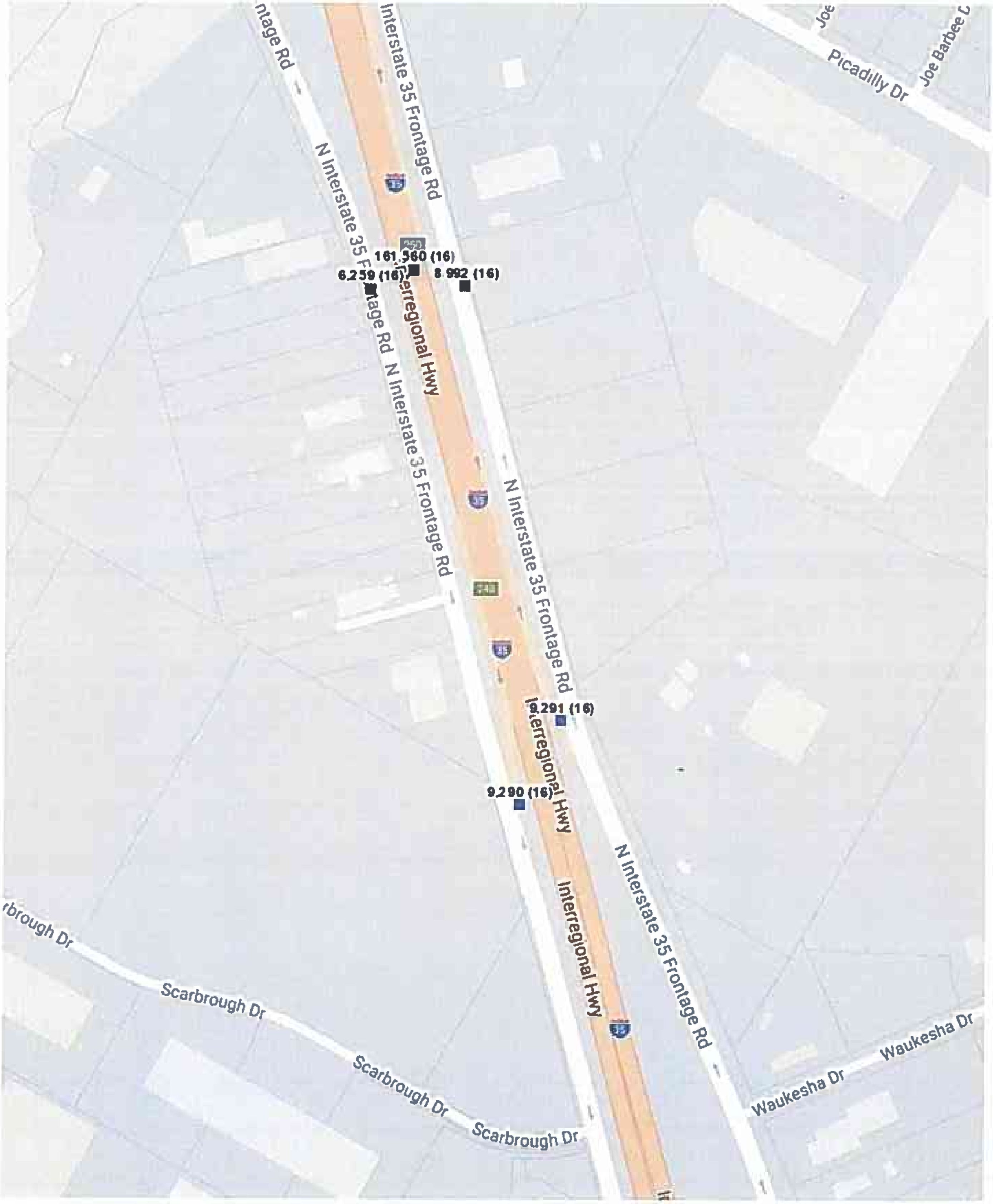
Match C, Sheet 17 of 2



5/8-9/2018

STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project



STARS II AADT Sheets (including ramp volumes)

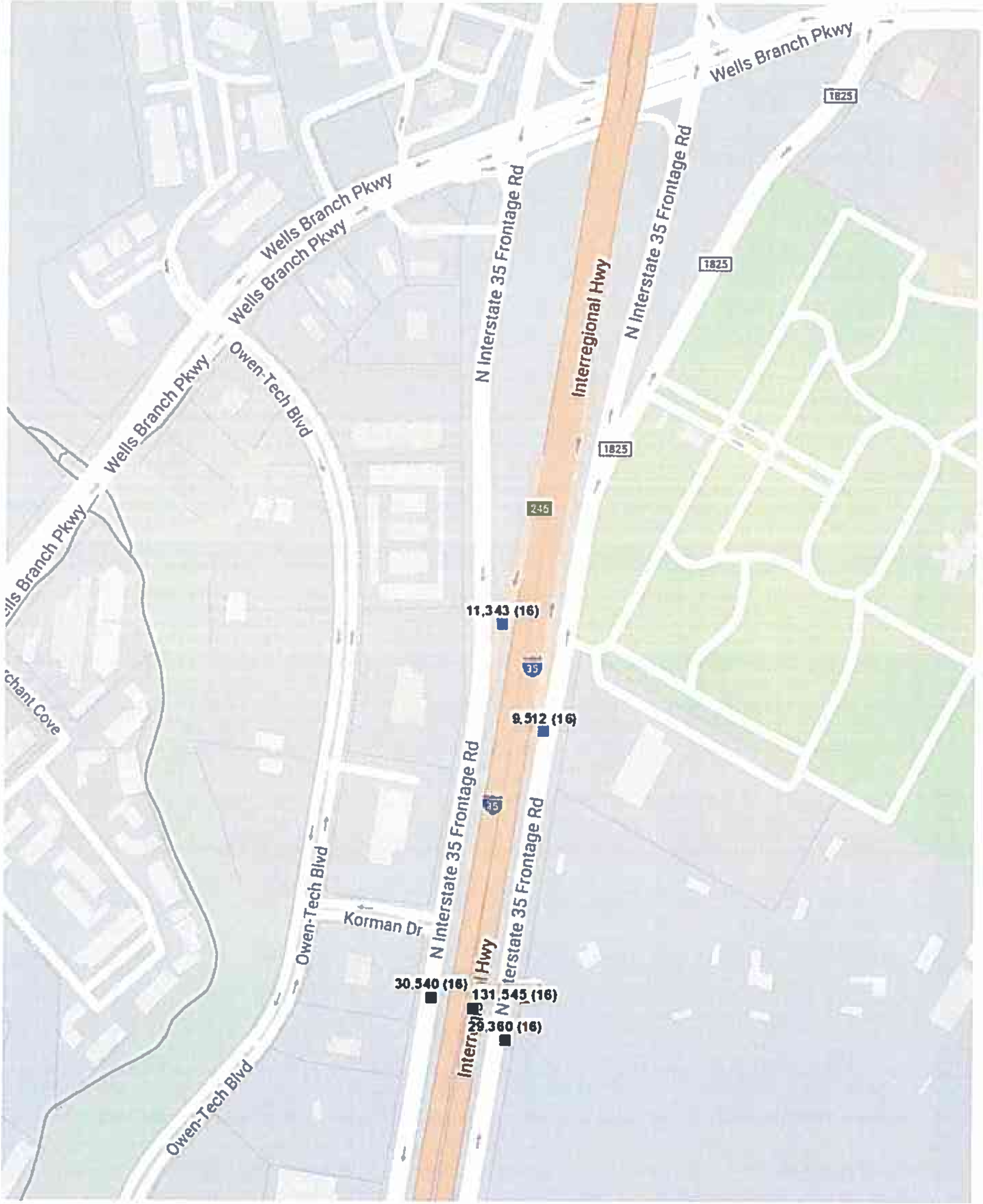
for I-35 from RM 1431 to SH 45SE project

STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project



STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

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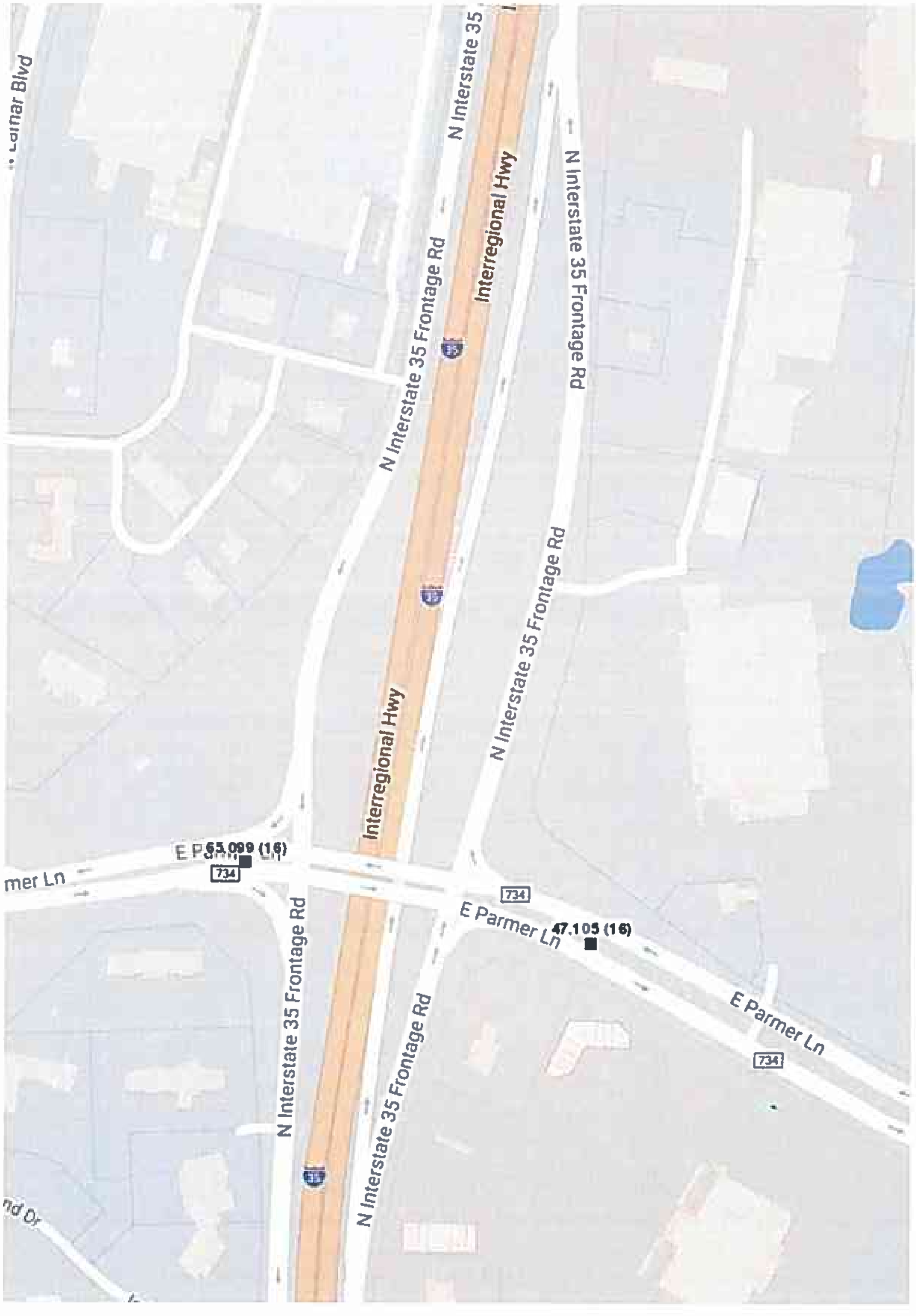
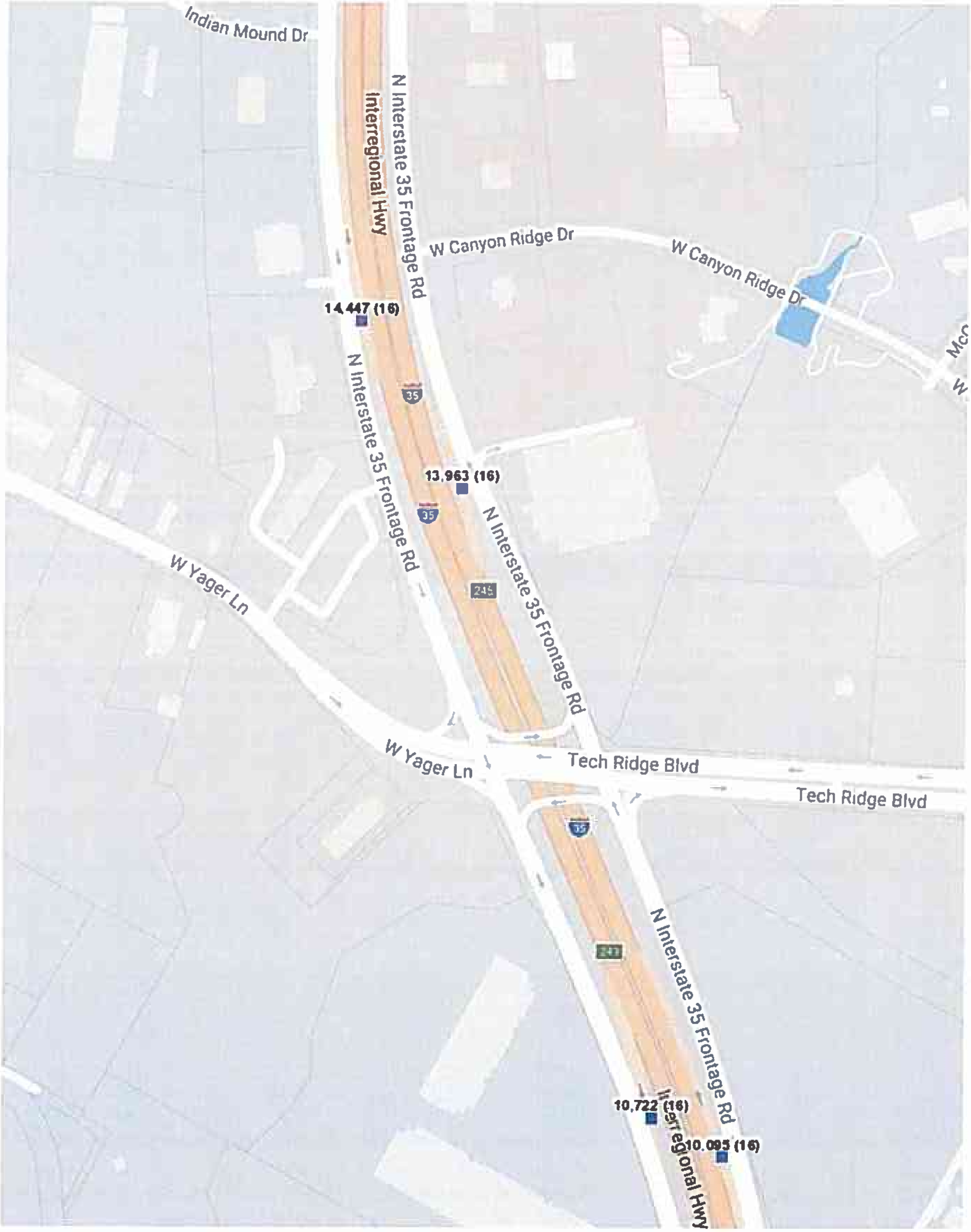
for I-35 from RM 1431 to SH 45SE project



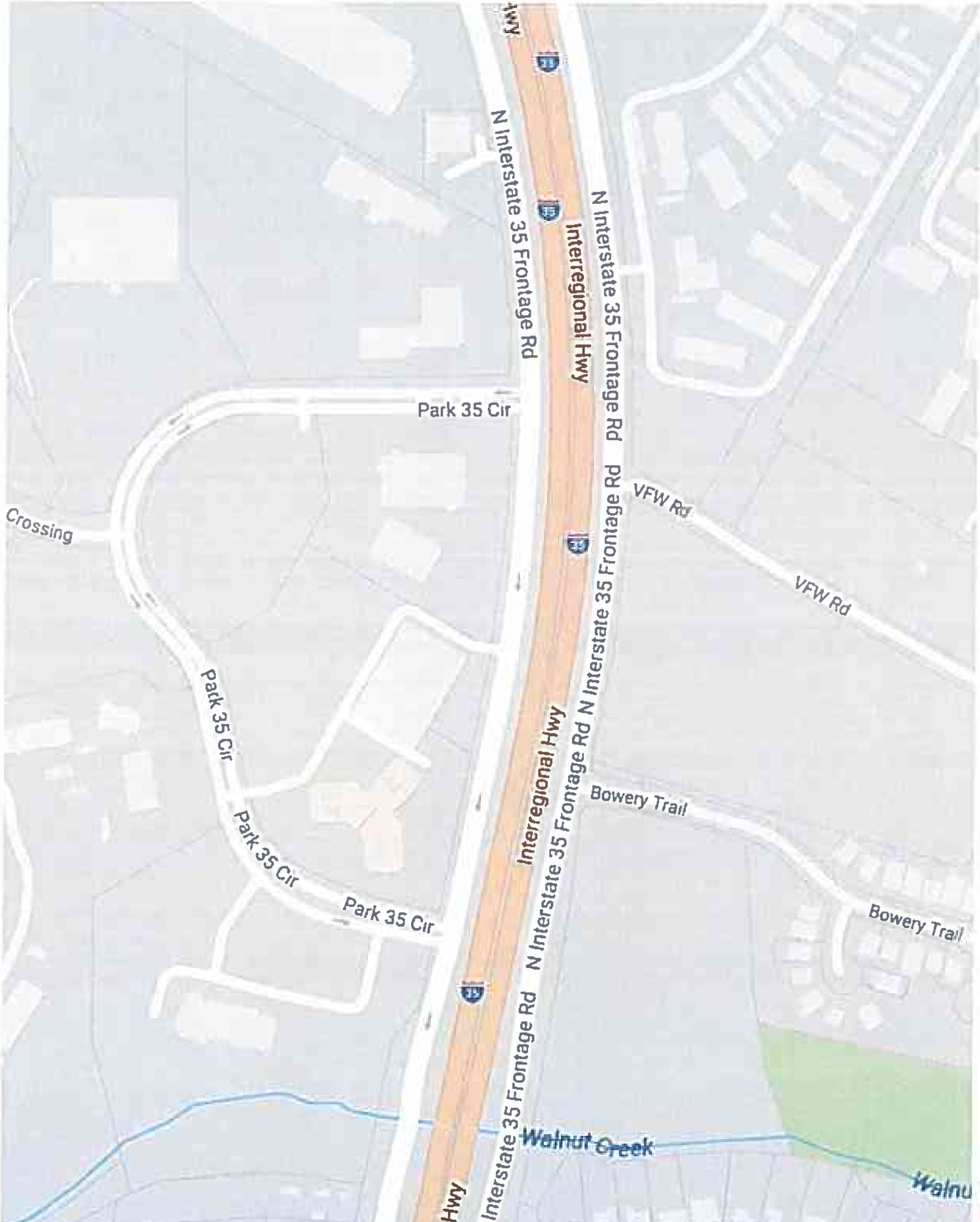
STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project



STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

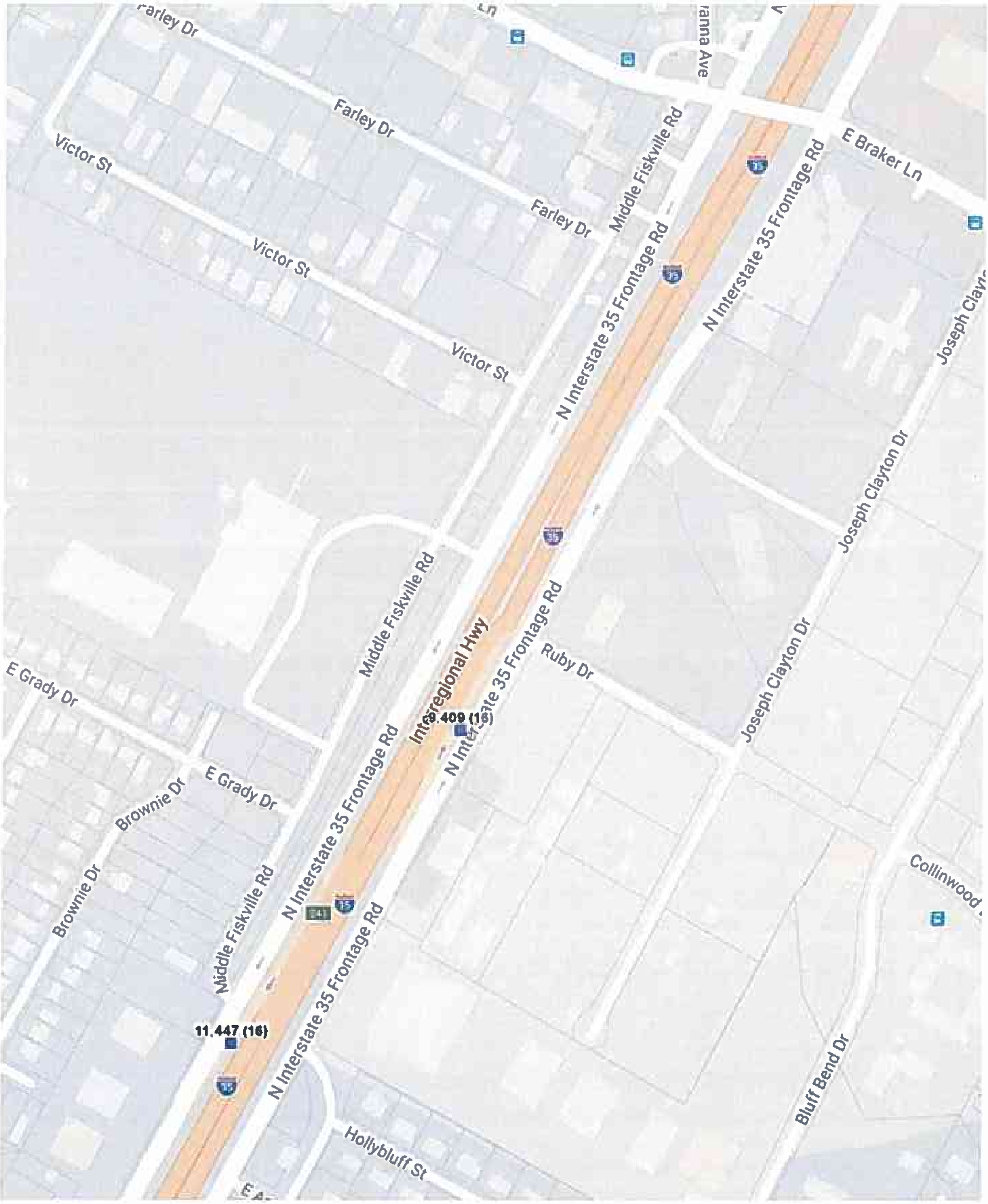


STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project



STARS II AADT Sheets (including ramp volumes)

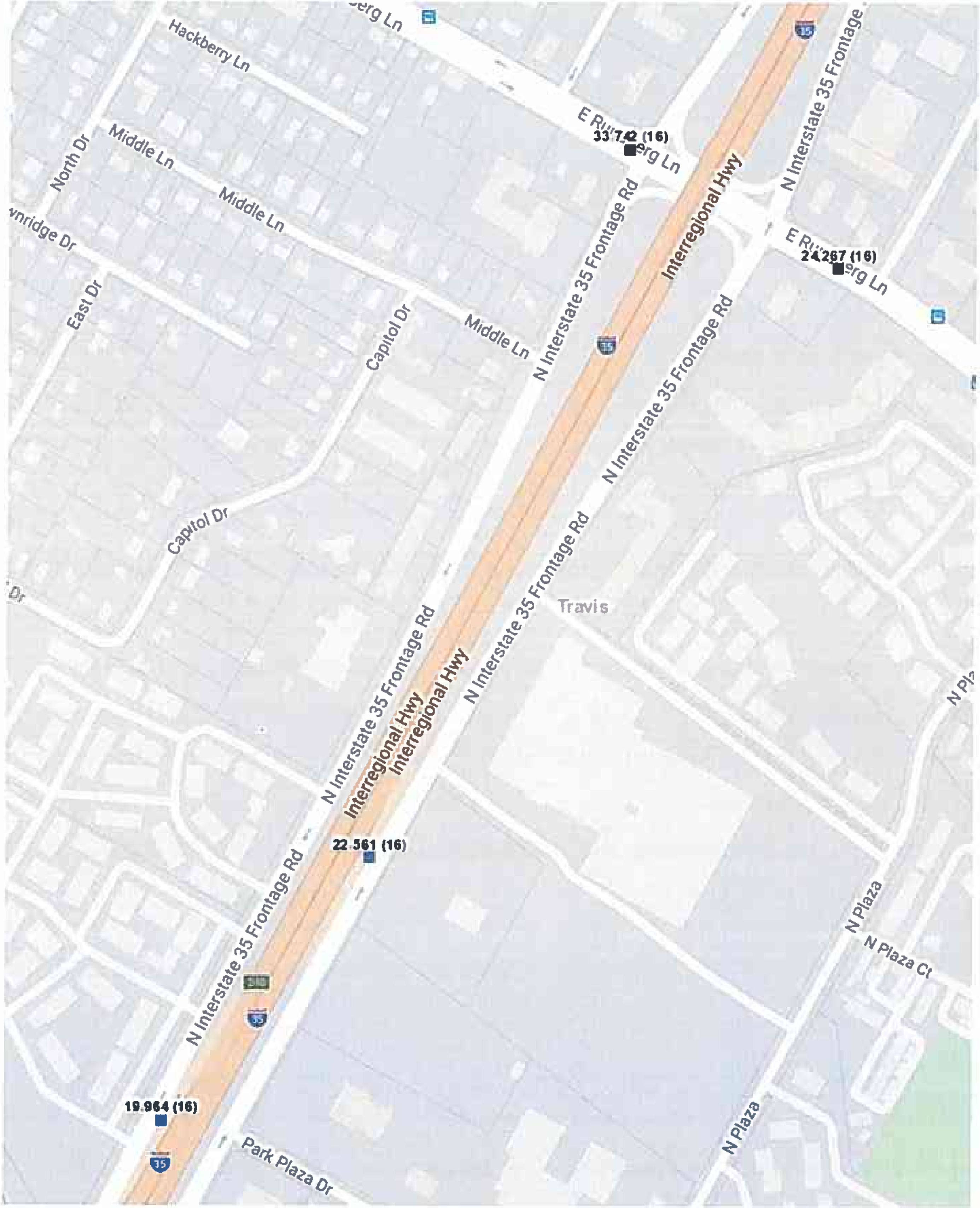
for I-35 from RM 1431 to SH 45SE project

5/8-9/2018

Sheet 32 of 61

STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project



STARS II AADT Sheets (including ramp volumes)

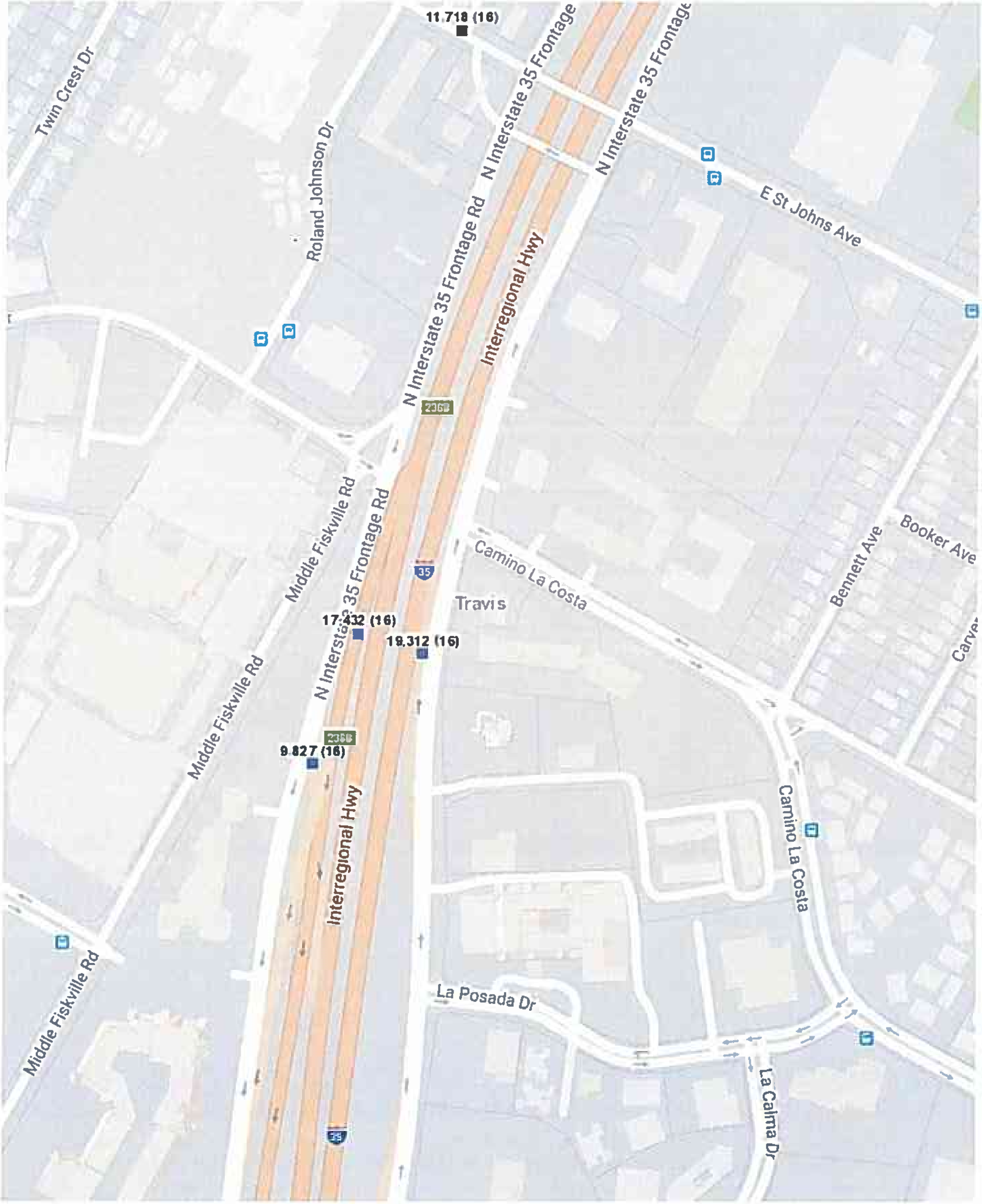
for I-35 from RM 1431 to SH 45SE project

STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

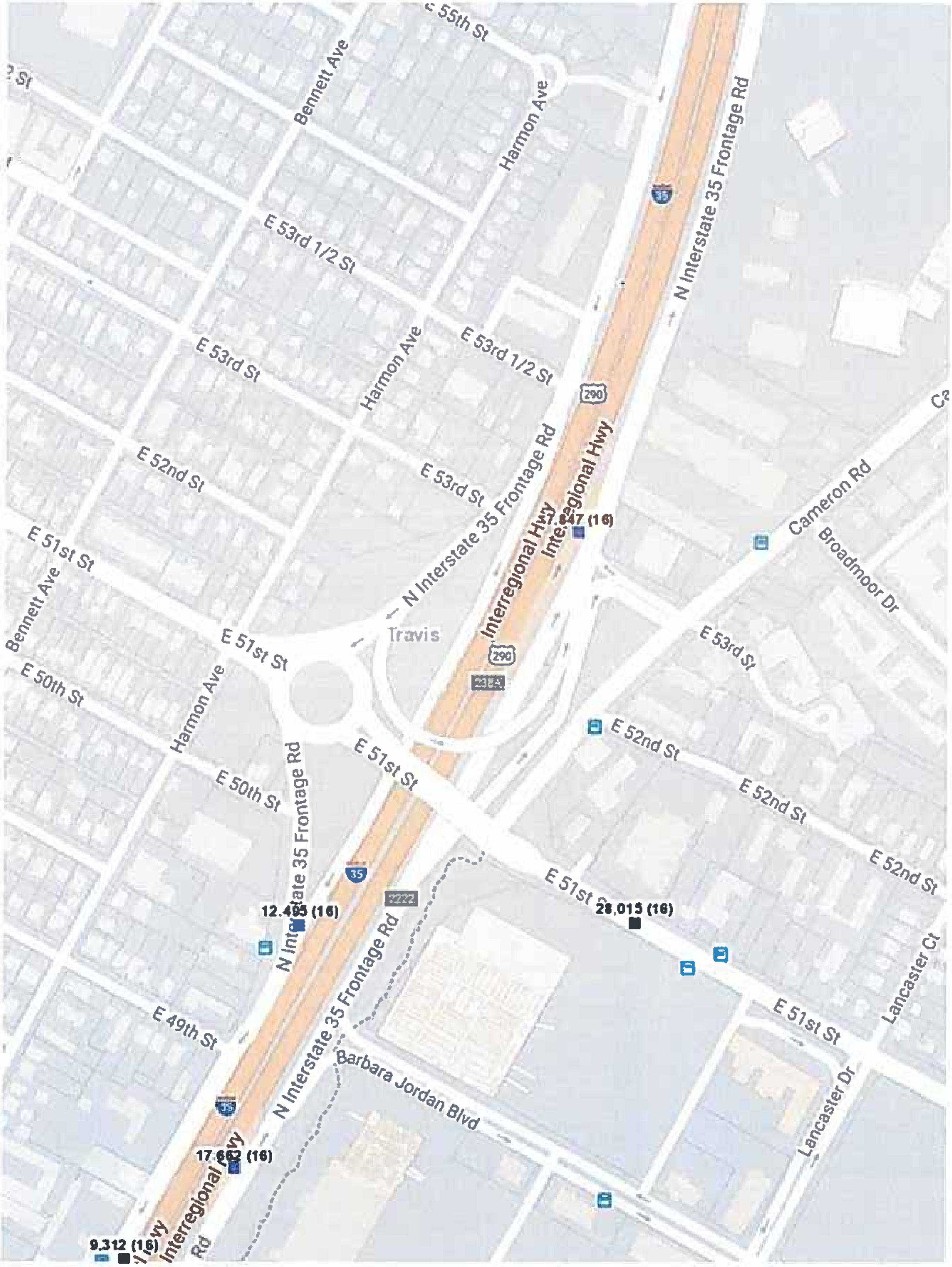
STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project



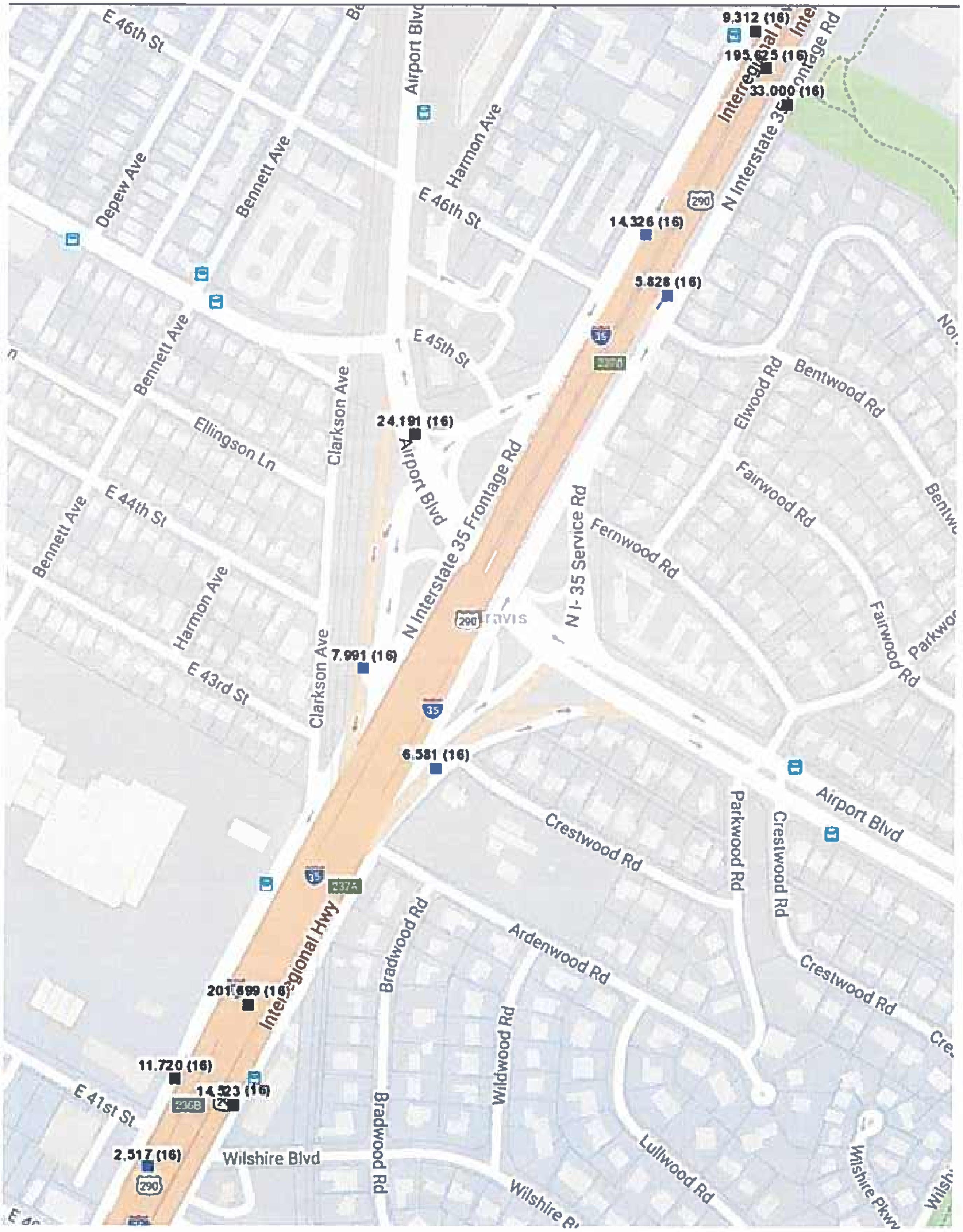
STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project


E 55th St
Bennett Ave
Harmon Ave
N Interstate 35 Frontage Rd
35
E 53rd 1/2 St
E 53rd 1/2 St
E 53rd St
Harmon Ave
290
E 52nd St
E 53rd St
N Interstate 35 Frontage Rd
Interregional Hwy
Interregional Hwy
7,847 (16)
Cameron Rd
Broadmoor Dr
E 51st St
Bennett Ave
E 51st St
Travis
290
238A
E 53rd St
E 50th St
Harmon Ave
E 52nd St
E 52nd St
E 51st St
E 50th St
N Interstate 35 Frontage Rd
35
2222
E 52nd St
E 51st St
12,495 (16)
28,015 (16)
N Interstate 35 Frontage Rd
E 49th St
E 51st St
Lancaster Ct
Barbara Jordan Blvd
Lancaster Dr
35
17,662 (16)
Interregional Hwy
Rd
9,312 (16)

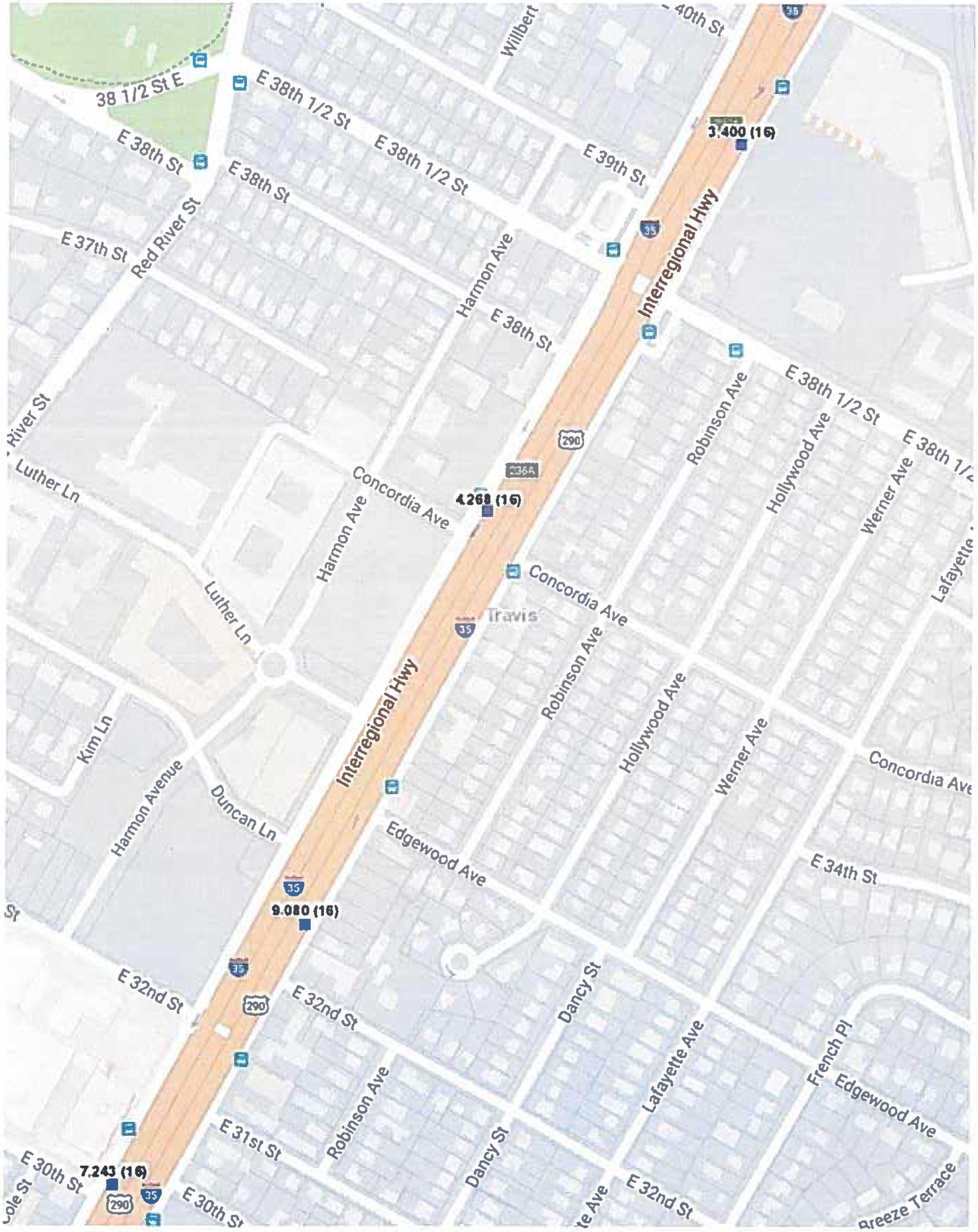
STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project



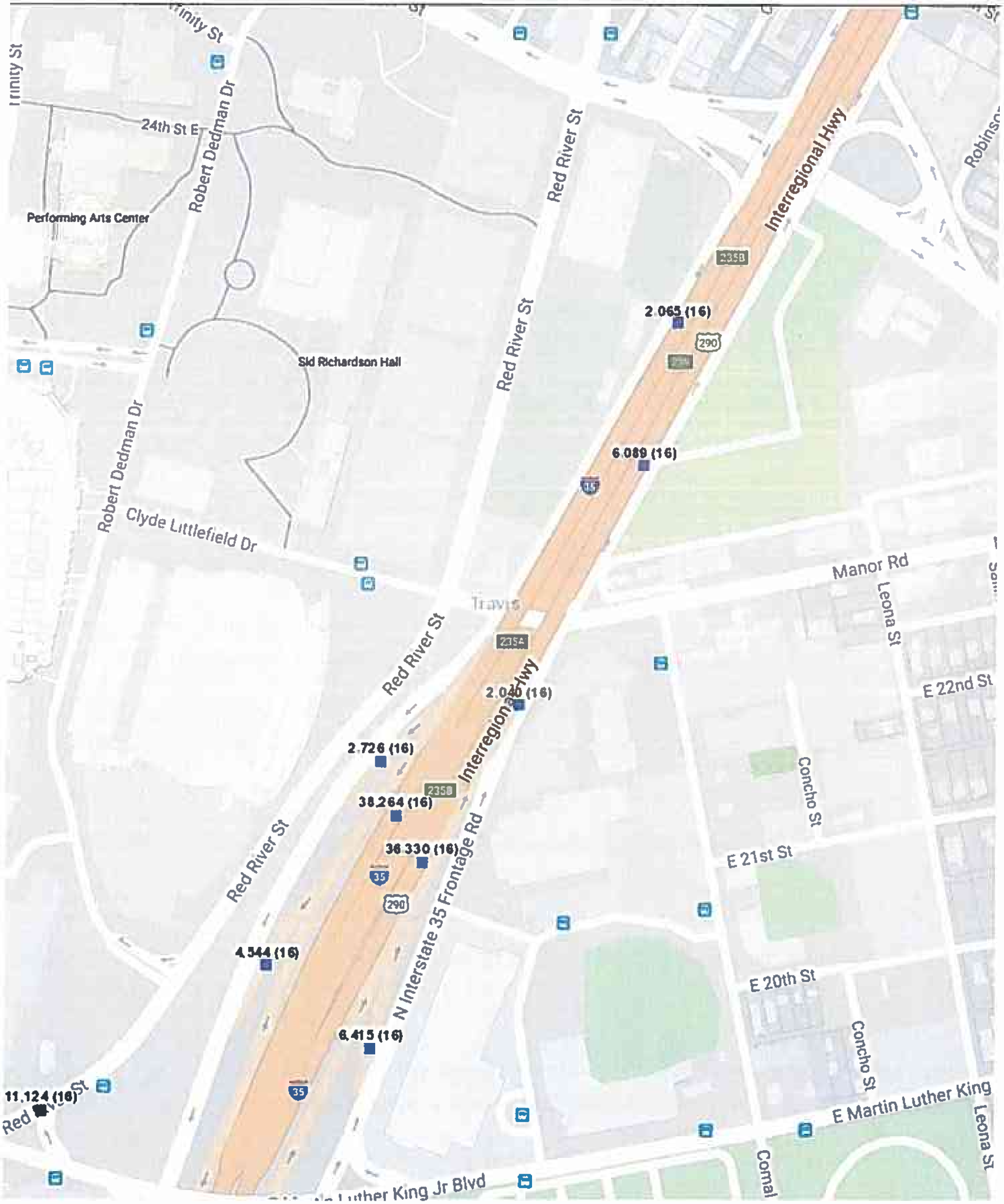
STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project



STARS II AADT Sheets (including ramp volumes)

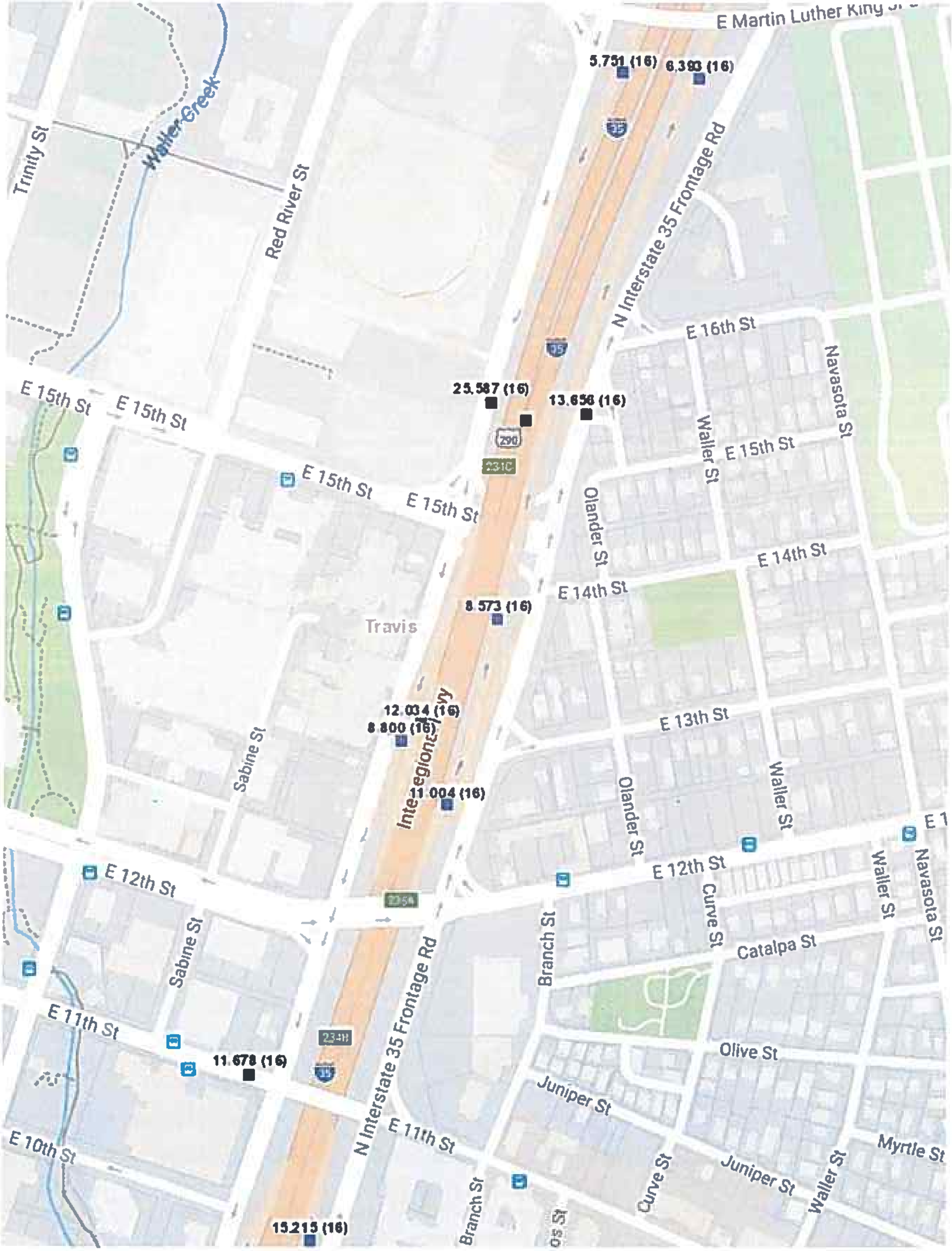
for I-35 from RM 1431 to SH 45SE project



5/8-9/2018

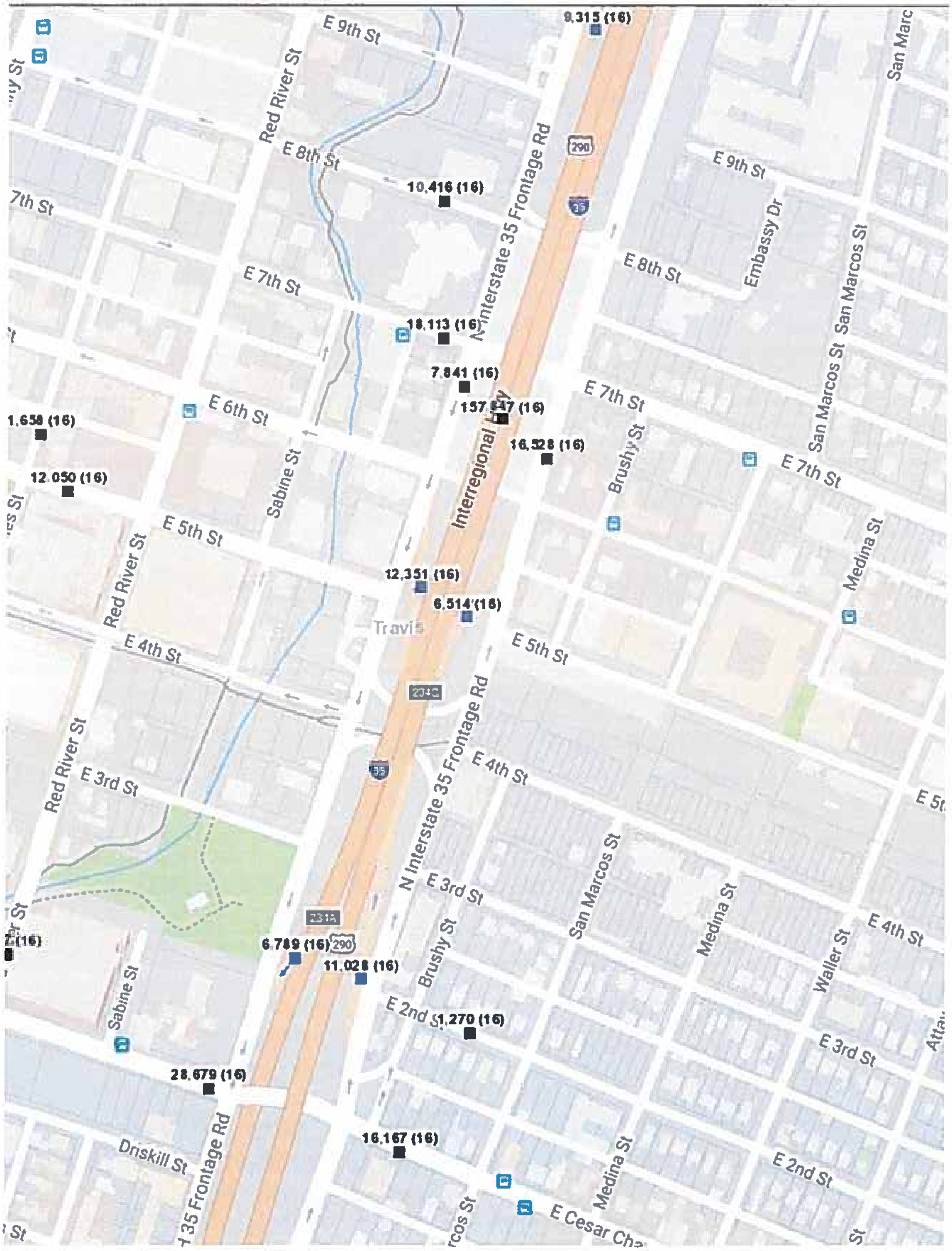
STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project



STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

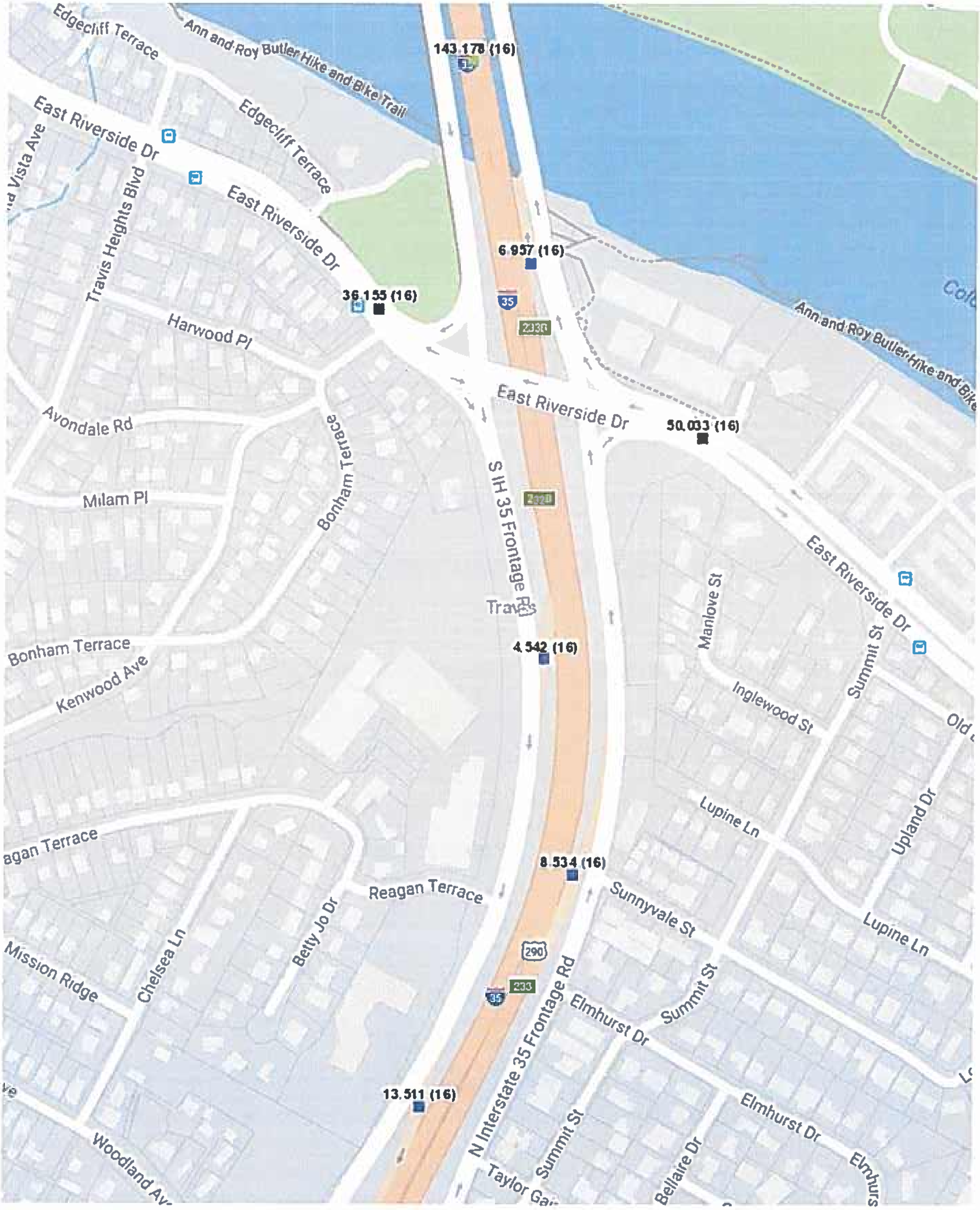


STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

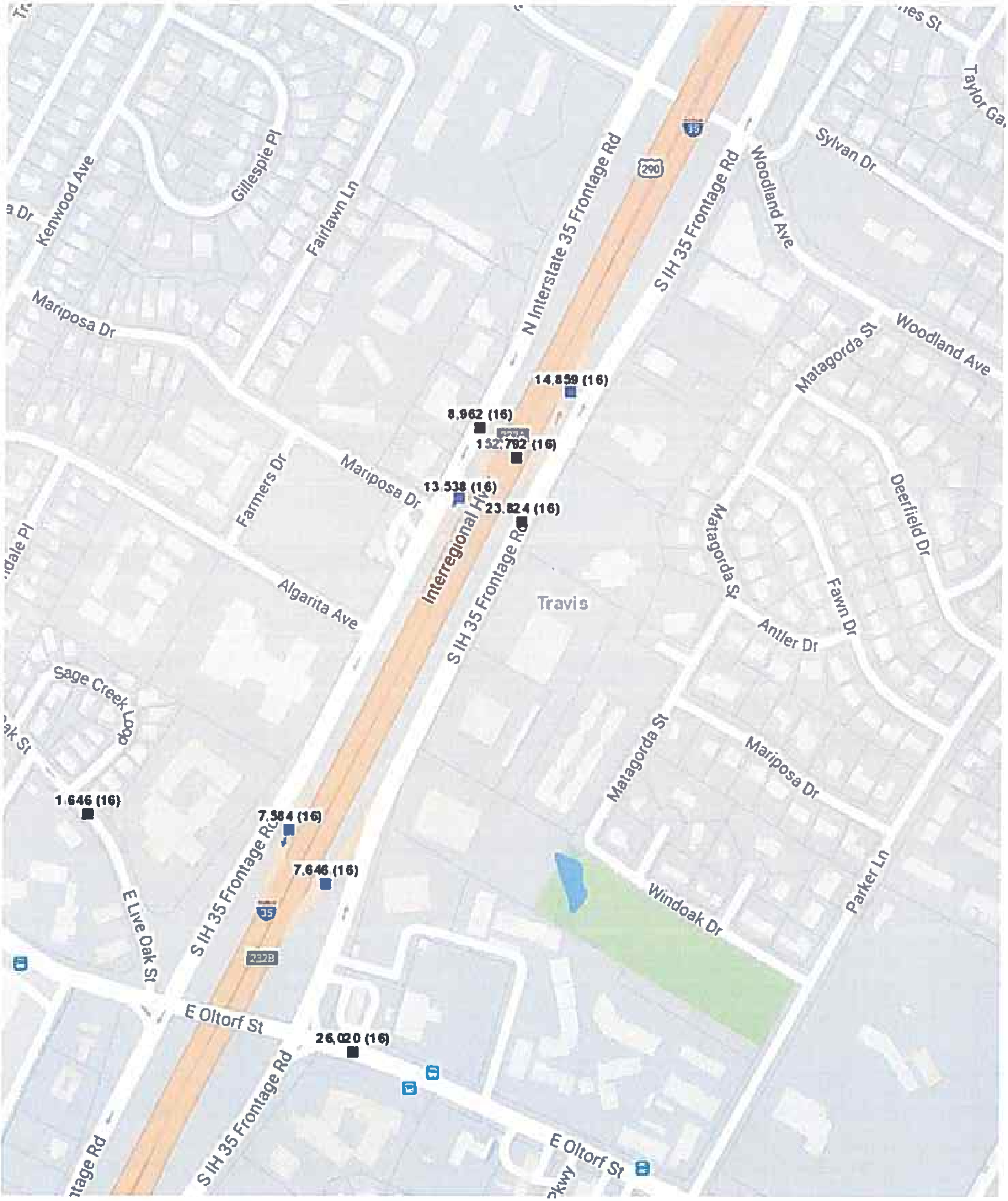
STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project



STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

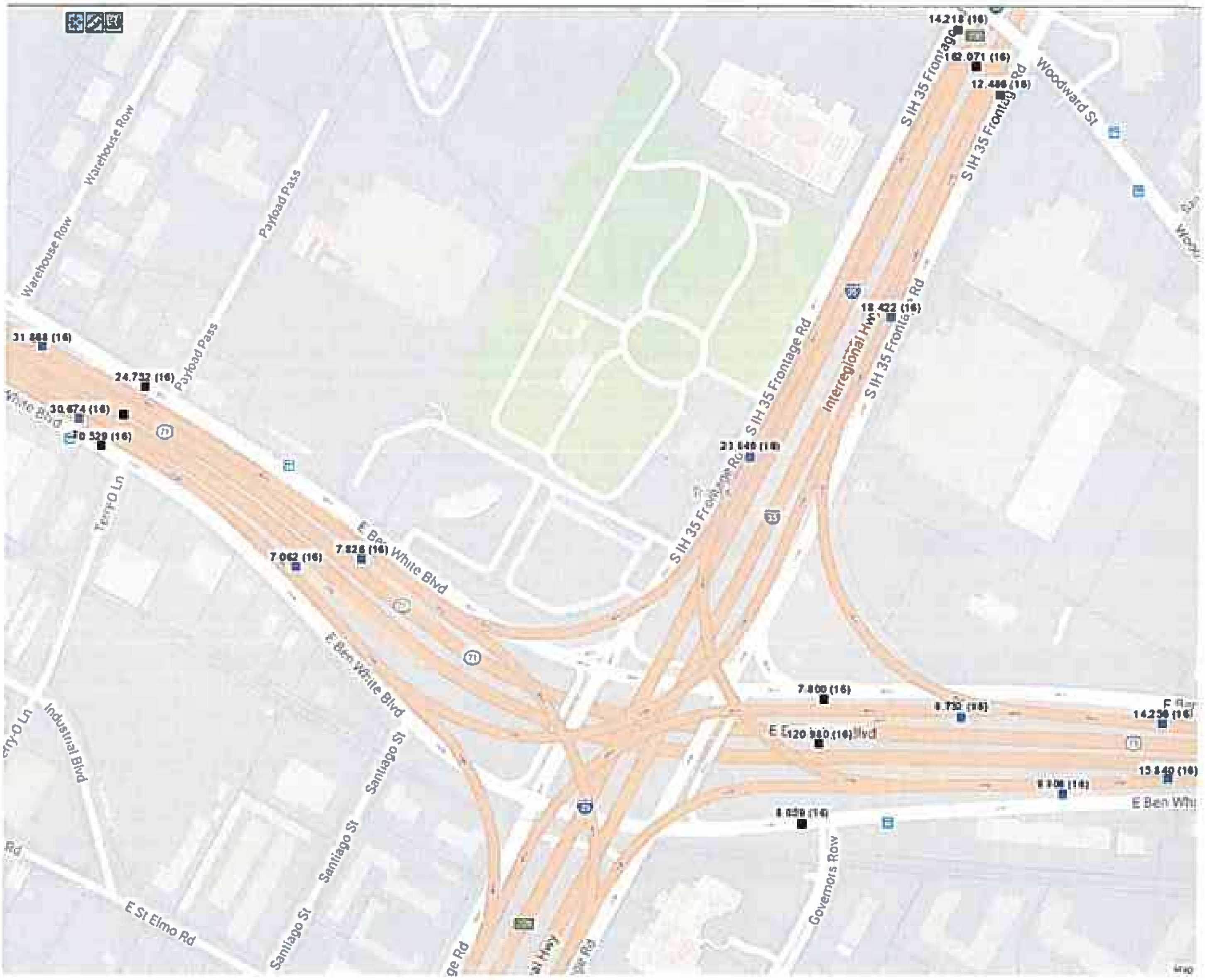


STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

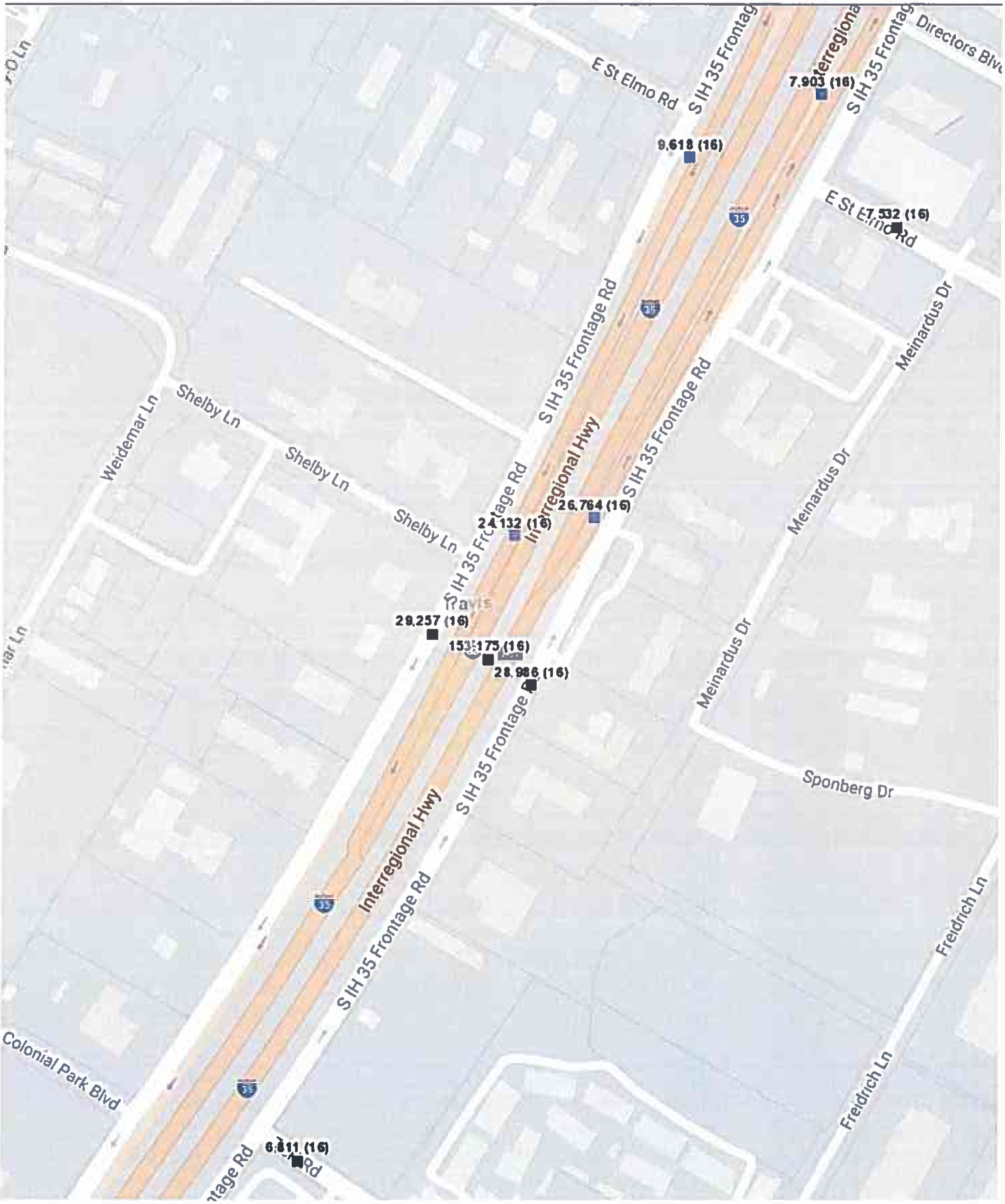
STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project



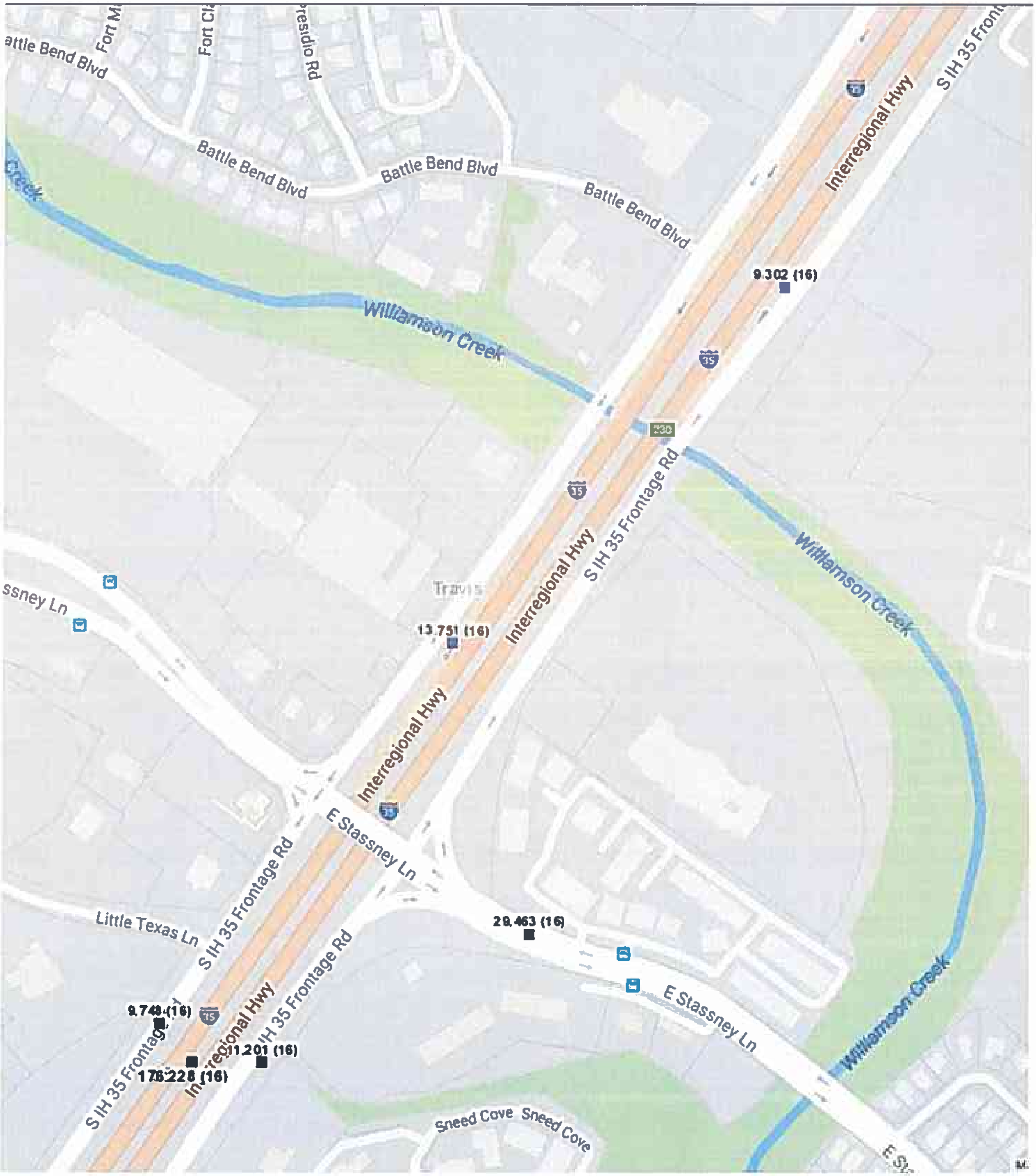
STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project



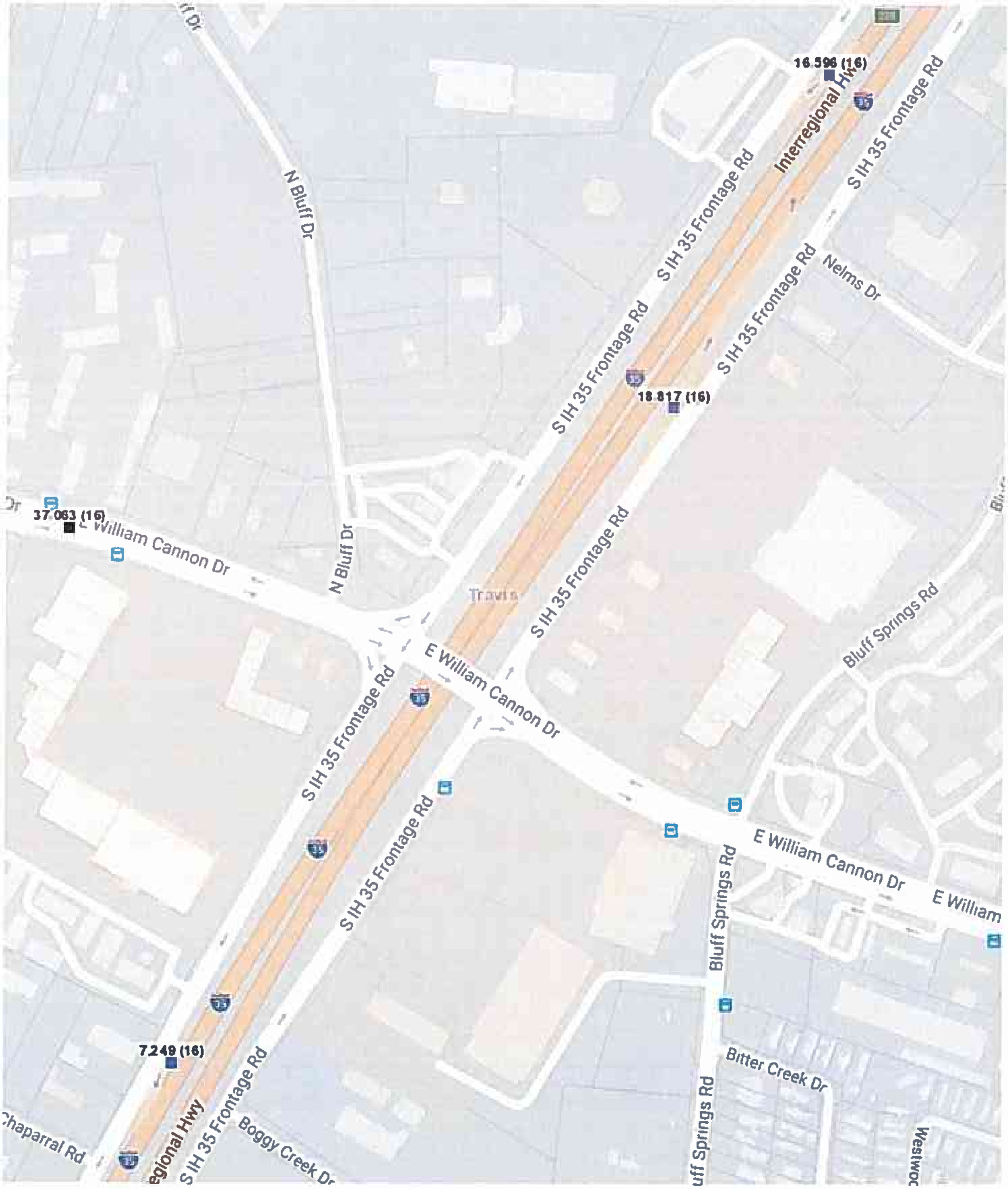
STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project



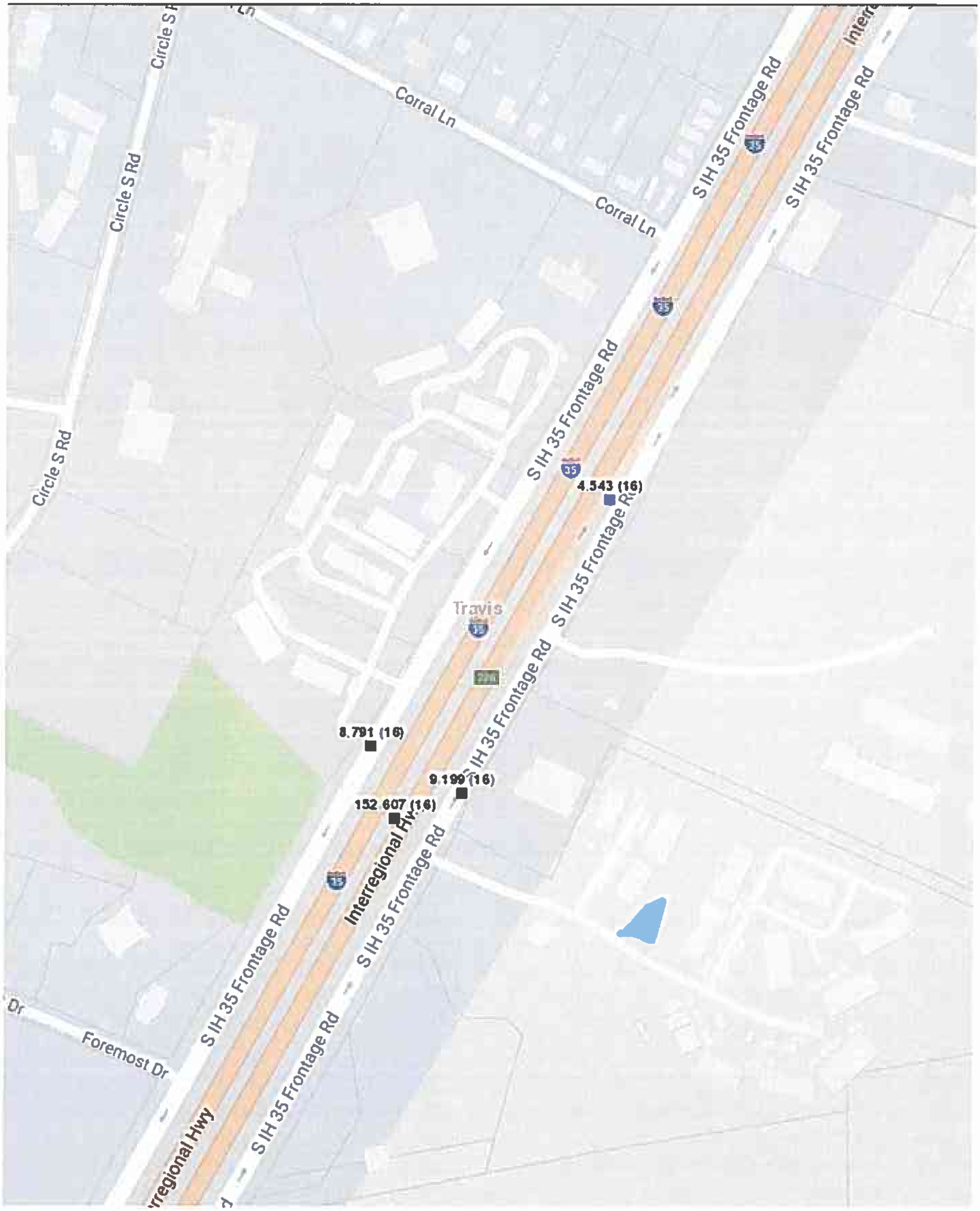
STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project



STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

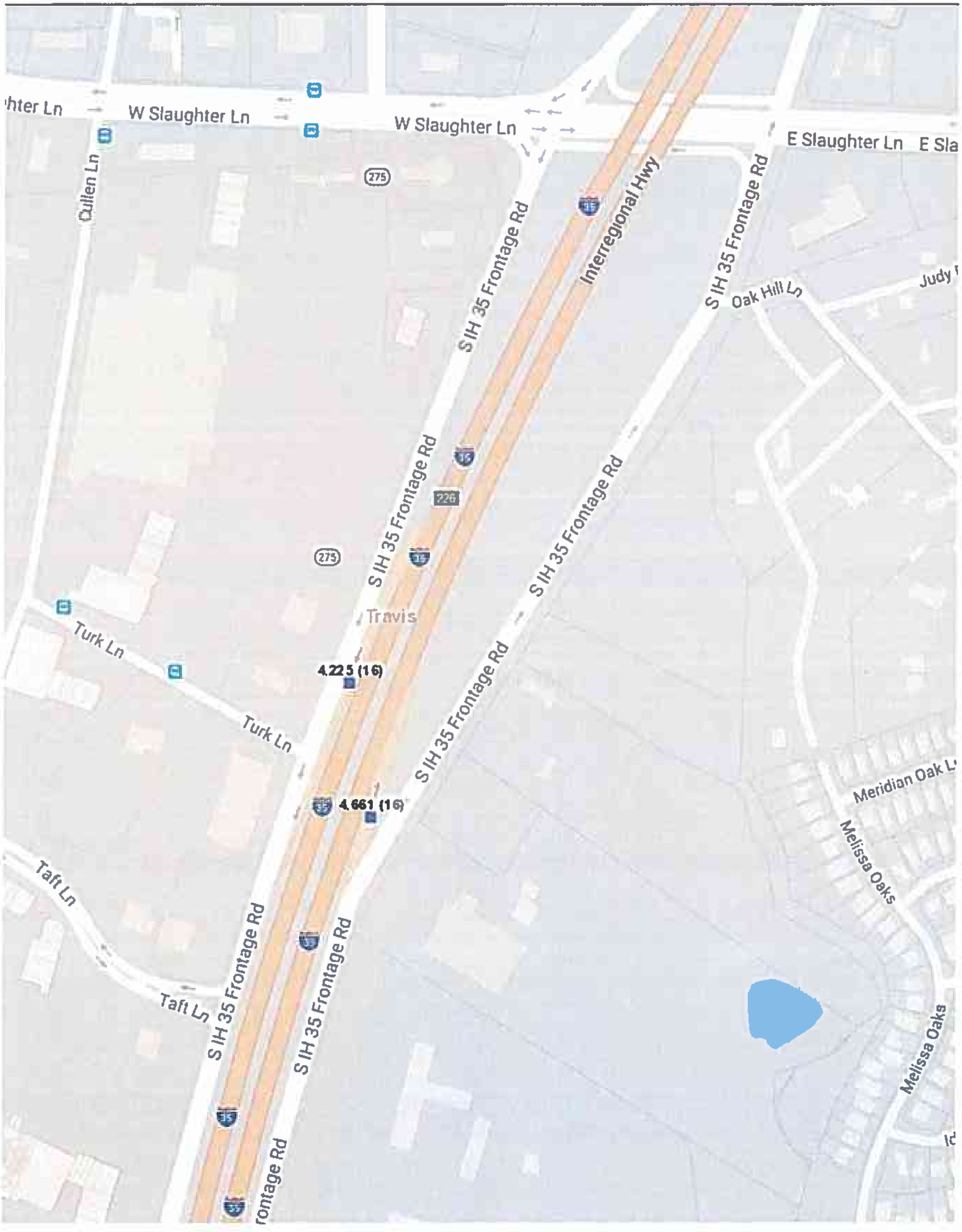


STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project




S IH 35 F
Brandt Rd
35
35
12,908 (16)
Brandt Rd
Anahuac Trail
Buffalo Lake Ln
Petrified Fo
Isle Royale Way
Mt Rainier Dr
11,014 (16)
National Park Blvd
35
S IH 35 Frontage F
227
Travis
Anahuac Trail
National Park Blvd
Old San Antonio Rd
Rd
Anahuac Trail
Big Thick
S IH 35 Frontage Rd
35
S IH 35 Frontage Rd
Big Thicket Dr
Indiana D
Yellowstone Dr
Brezza Lane
35
S IH 35 Frontage Rd
Dr
Channel Island Dr
Map

STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project

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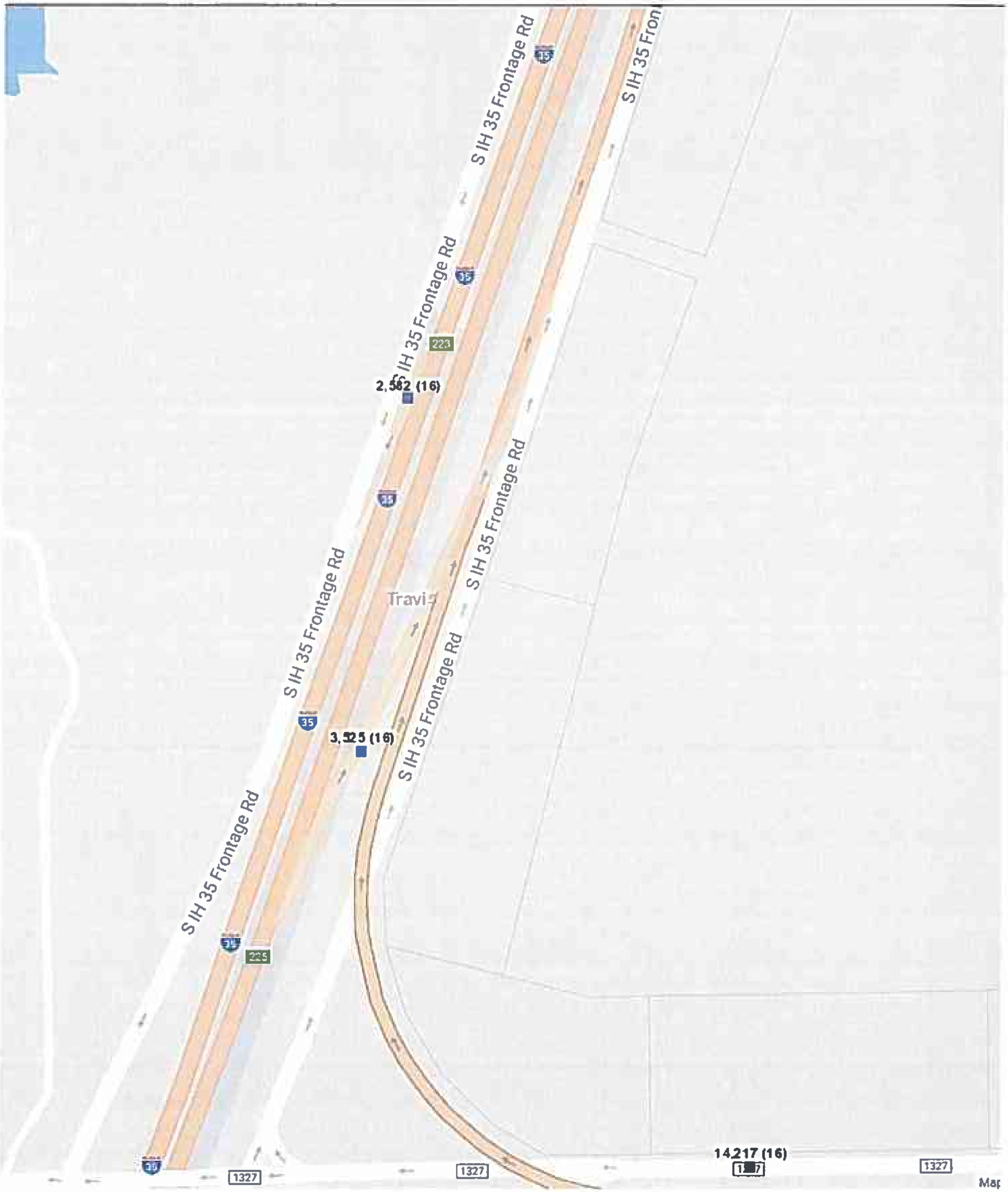
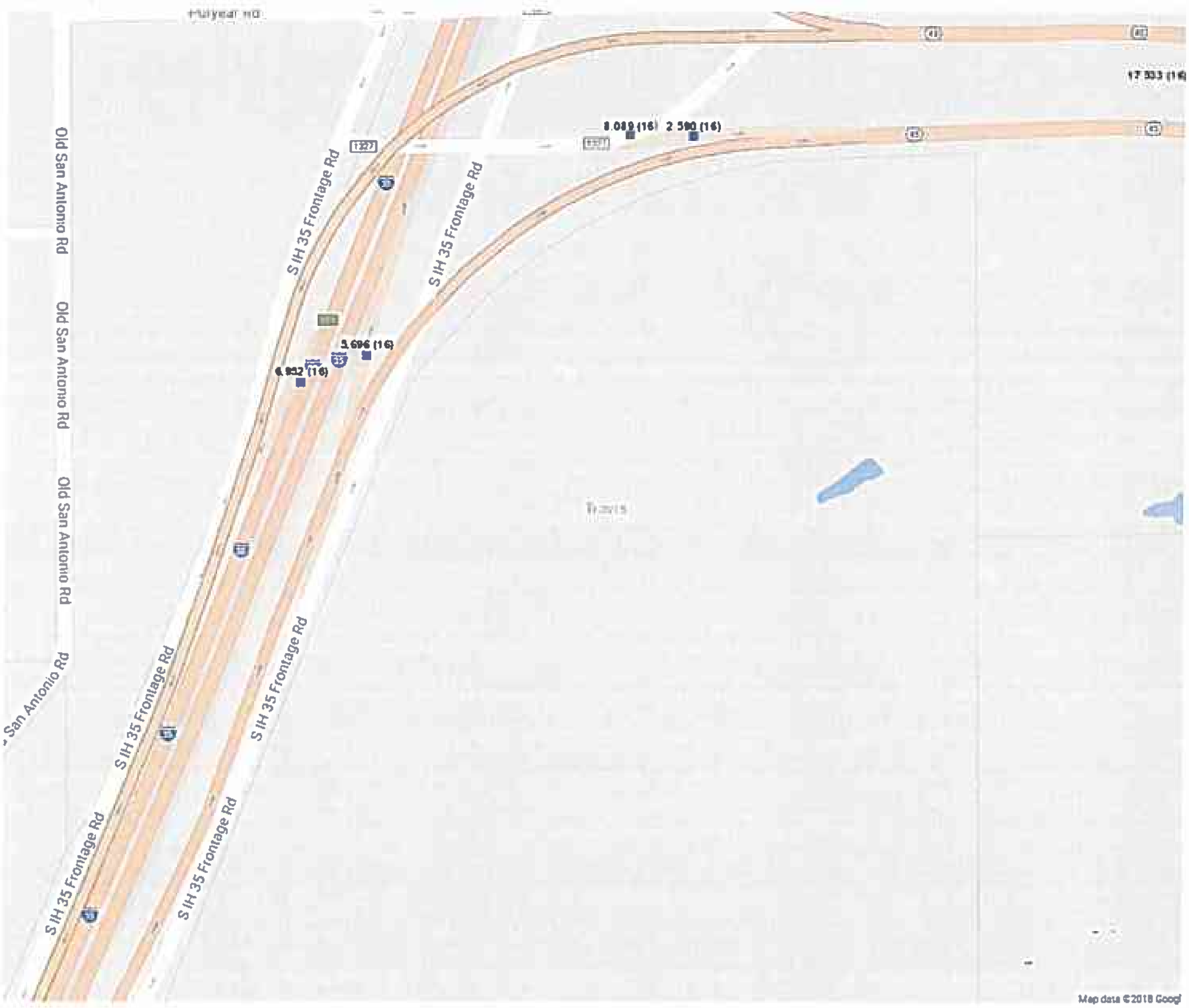
for I-35 from RM 1431 to SH 45SE project



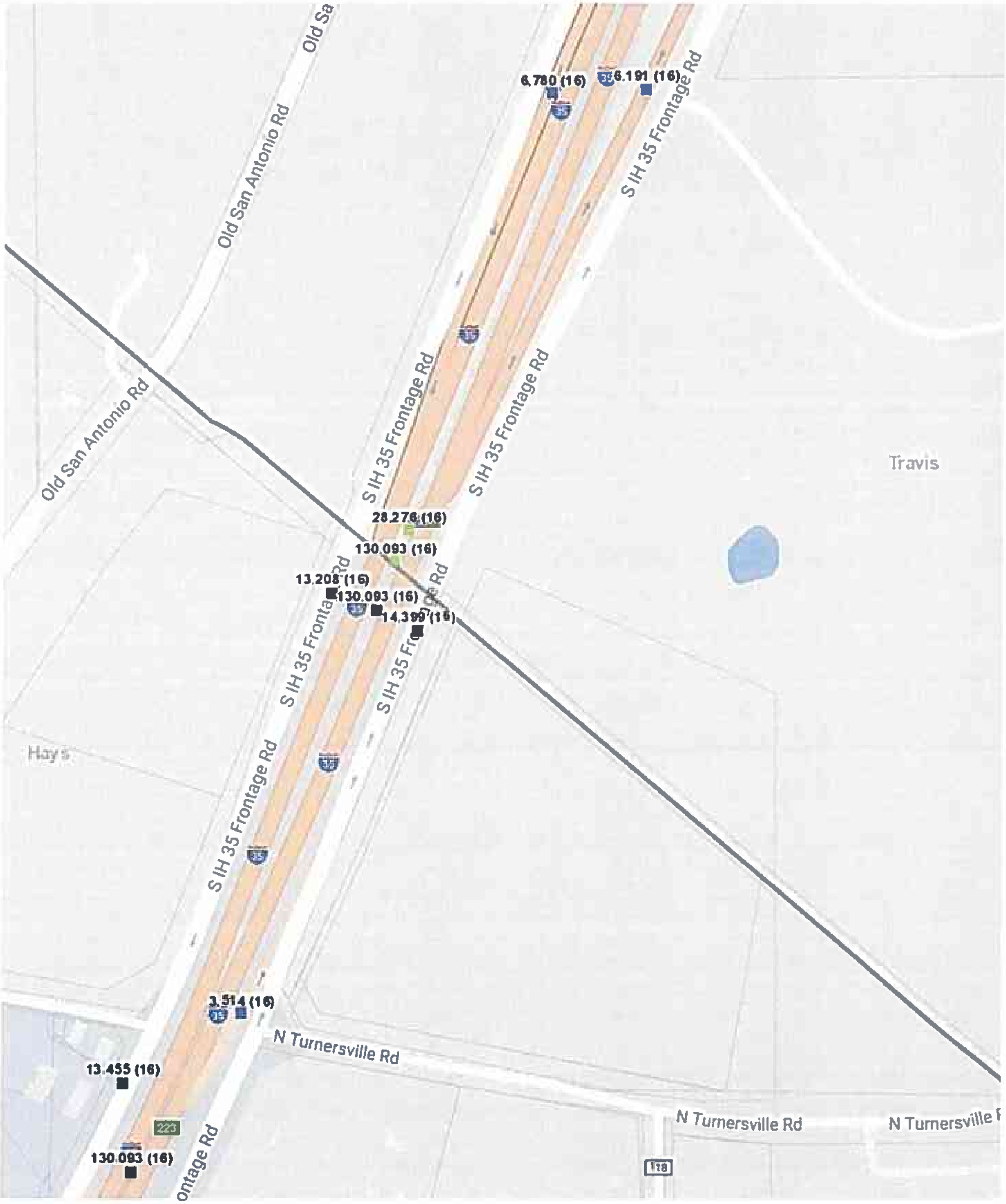
STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project



STARS II AADT Sheets (including ramp volumes)

for I-35 from RM 1431 to SH 45SE project



5/8-9/2018

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 - Option B Corridor Packet - Section 1 of 6	District	Austin
Rd Type	IH	County	Travis and Williamson
Direction		CSJ	0015-13-388, etc.
Project Limits	From RM 1431 to SH 45SE		
Section 1 Limits	From RM 1431 to US 79	Analyst	JWB

Date: Request	12/1/2017	Received	2/5/2018	Started	5/4/2018	Completed	5/25/2018
District Contact	Carmen Ramos			Phone #	(512) 832-7075		

	Year	ADT's		% Trks ADT	% Trks DHV
Count	2016				
Base	2020		# Trks		
Forecast	2040				
Forecast	2050				

SPR Station	S-190	MC Stn	HP-877	% Trks	13.5
Year	2016	Dir		Num Trks	14993
Peak Hour	8.0	Year	2016	Axle Factor	2.90
DD	58	ADT	110972	% Single Axles	0.45
100-DD	42				
K-Factor	6.9				

Main Road Growth Rate	2.0	TDM Assignment	
Growth Rate after 20 Years	2.0		
20 Year Growth Factor			
30 Year Growth Factor		LOD	
Design Period 1	20		
Design Period 2	30		

					# Lanes
Structural Number (SN)	3			Existing	6 +/-
Slab Thickness (ST)	8			Proposed	8 +/-

Past Projects

Project	I-35 (Mainlanes and Frontage Roads separate)
From	FM 1431
To	US 183
Date	10/7/2016
County	Travis and Williamson
CSJ	0015-10-062

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	
Traffic Analysis for Highway Design		Field Trip	
Vehicle Mix		Travel Demand Model Used	
Manual Count Worksheet			

NOTES:

See included regressions sheets for determination of growth rates, sections, and selected MC and SP stations for each section.

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

FHWA Format Vehicle Class. Counts		
Light Duty Vehicles	Motorcycles	319
	Passenger	76942
	Pickup or Van	18718
Single Units	Buses	213
	Other 2 Axle	1389
	3 Axles	750
	4 Axles or more	274
Truck Combs.	3-4 Axles	485
	5 Axles	11179
	6 Axles or more	149
Semi-Trailer-Trailer	5 Axles or less	435
	6 Axles	119
	7 Axles or more	0

	Number	%
Light		
Medium		
Heavy		
Trucks		

SECTION 1

IH

	ADT	DHV
Light		
Medium		
Heavy		

Total Vehicles	
Total Trucks	
Total Singles	
Total Tandems	
AXLE FACTOR	
SINGLE AX FACT	

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1						
Year 2						
ADT						
% Trks						
Growth Rate						
Years						
Facil Type						
S.N.						
SLAB						
Weight Sta						
Axle Factor						
Single Axle						

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD						
% T in ATHWLD						
FLEXIBLE						
RIGID						

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 - Option B Corridor Packet - Section 2 of 6	District	Austin
Rd Type	IH	County	Travis and Williamson
Direction		CSJ	0015-13-388, etc.
Project Limits	From RM 1431 to SH 45SE		
Section 1 Limits	From US 79 to SH 45, N. Jnctn.	Analyst	JWB

Date: Request	12/1/2017	Received	2/5/2018	Started	5/4/2018	Completed	5/25/2018
District Contact	Carmen Ramos			Phone #	(512) 832-7075		

	Year	ADT's		% Trks ADT	% Trks DHV
Count	2016				
Base	2020		# Trks		
Forecast	2040				
Forecast	2050				

SPR Station	S-190	MC Stn	HP-878	% Trks	12.0
Year	2016	Dir		Num Trks	16887
Peak Hour	8.0	Year	2016	Axle Factor	2.80
DD	58	ADT	140420	% Single Axles	0.47
100-DD	**42**				
K-Factor	6.9				

Main Road Growth Rate	2.0	TDM Assignment	
Growth Rate after 20 Years	2.0		
20 Year Growth Factor			
30 Year Growth Factor		LOD	
Design Period 1	20		
Design Period 2	30		

					# Lanes
Structural Number (SN)	3			Existing	6 +/-
Slab Thickness (ST)	8			Proposed	8 +/-

Past Projects

Project	I-35 (Mainlanes and Frontage Roads separate)
From	FM 1431
To	US 183
Date	10/7/2016
County	Travis and Williamson
CSJ	0015-10-062

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	
Traffic Analysis for Highway Design		Field Trip	
Vehicle Mix		Travel Demand Model Used	
Manual Count Worksheet			

NOTES:

See included regressions sheets for determination of growth rates, sections, and selected MC and SP stations for each section.

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

FHWA Format Vehicle Class. Counts		
Light	Motorcycles	416
Duty	Passenger	92005
Vehicles	Pickup or Van	31112
Single	Buses	184
Units	Other 2 Axle	2640
	3 Axles	1076
	4 Axles or more	503
Truck	3-4 Axles	501
Combs.	5 Axles	11355
	6 Axles or more	157
Semi-	5 Axles or less	373
Trailer-	6 Axles	98
Trailer	7 Axles or more	0

	Number	%
Light		
Medium		
Heavy		
Trucks		

SECTION 1

IH

	ADT	DHV
Light		
Medium		
Heavy		

Total Vehicles	
Total Trucks	
Total Singles	
Total Tandems	
AXLE FACTOR	
SINGLE AX FACT	

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1						
Year 2						
ADT						
% Trks						
Growth Rate						
Years						
Facil Type						
S.N.						
SLAB						
Weight Sta						
Axle Factor						
Single Axle						

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD						
% T in ATHWLD						
FLEXIBLE						
RIGID						

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 - Option B Corridor Packet - Section 3 of 6	District	Austin
Rd Type	IH	County	Travis and Williamson
Direction		CSJ	0015-13-388, etc.
Project Limits	From RM 1431 to SH 45SE		
Section 1 Limits	From SH 45, N. Jnctn. to US 183	Analyst	JWB

Date:	Request	12/1/2017	Received	2/5/2018	Started	5/4/2018	Completed	5/25/2018

District Contact: Carmen Ramos

Phone #: (512) 832-7075

	Year	ADT's		% Trks ADT	% Trks DHV
Count	2016				
Base	2020		# Trks		
Forecast	2040				
Forecast	2050				

SPR Station	S-190	MC Stn	MS-190 (MLs & FRs)	% Trks	10.7
Year	2016	Dir		Num Trks	19696
Peak Hour	8.0	Year	2016	Axle Factor	2.64
DD	58	ADT	183861	% Single Axles	0.55
100-DD	42				
K-Factor	6.9				

Main Road Growth Rate	1.5
Growth Rate after 20 Years	1.5
20 Year Growth Factor	
30 Year Growth Factor	
Design Period 1	20
Design Period 2	30

TDM Assignment:

LOD:

Structural Number (SN)	3		
Slab Thickness (ST)	8		

	# Lanes
Existing	6 +/-
Proposed	8 +/-

Past Projects

Project	I-35 (Mainlanes and Frontage Roads separate)
From	FM 1431
To	US 183
Date	10/7/2016
County	Travis and Williamson
CSJ	0015-10-062

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	
Traffic Analysis for Highway Design		Field Trip	
Vehicle Mix		Travel Demand Model Used	
Manual Count Worksheet			

NOTES:

See included regressions sheets for determination of growth rates, sections, and selected MC and SP stations for each section.

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

FHWA Format Vehicle Class. Counts		
Light	Motorcycles	536
Duty	Passenger	108919
Vehicles	Pickup or Van	54710
Single	Buses	274
Units	Other 2 Axle	6514
	3 Axles	867
	4 Axles or more	137
Truck	3-4 Axles	557
Combs.	5 Axles	10807
	6 Axles or more	169
Semi-	5 Axles or less	209
Trailer-	6 Axles	162
Trailer	7 Axles or more	0

	Number	%
Light		
Medium		
Heavy		
Trucks		

SECTION 1

IH

	ADT	DHV
Light		
Medium		
Heavy		

Total Vehicles	
Total Trucks	
Total Singles	
Total Tandems	
AXLE FACTOR	
SINGLE AX FACT	

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1						
Year 2						
ADT						
% Trks						
Growth Rate						
Years						
Facil Type						
S.N.						
SLAB						
Weight Sta						
Axle Factor						
Single Axle						

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD						
% T in ATHWLD						
FLEXIBLE						
RIGID						

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 - Option B Corridor Packet - Section 4 of 6	District	Austin
Rd Type	IH	County	Travis and Williamson
Direction		CSJ	0015-13-388, etc.
Project Limits	From RM 1431 to SH 45SE		
Section 1 Limits	From US 183 to E. Riverside Dr.	Analyst	JWB

Date: Request	12/1/2017	Received	2/5/2018	Started	5/4/2018	Completed	5/25/2018
District Contact	Carmen Ramos			Phone #	(512) 832-7075		

	Year	ADT's		% Trks ADT	% Trks DHV
Count	2016				
Base	2020		# Trks		
Forecast	2040				
Forecast	2050				

SPR Station	S-132	MC Stn	MS-132 (MLs & FRs)	% Trks	10.3
Year	2016	Dir		Num Trks	21055
Peak Hour	6.3	Year	2016	Axle Factor	2.55
DD	58	ADT	204239	% Single Axles	0.60
100-DD	**42**				
K-Factor	6.1				

Main Road Growth Rate	1.5	TDM Assignment	
Growth Rate after 20 Years	1.5		
20 Year Growth Factor			
30 Year Growth Factor		LOD	
Design Period 1	20		
Design Period 2	30		

				# Lanes
Structural Number (SN)	3		Existing	6 +/-
Slab Thickness (ST)	8		Proposed	8 +/-

Past Projects

Project	I-35 (Mainlanes and Frontage Roads separate)
From	FM 1431
To	US 183
Date	10/7/2016
County	Travis and Williamson
CSJ	0015-10-062

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	
Traffic Analysis for Highway Design		Field Trip	
Vehicle Mix		Travel Demand Model Used	
Manual Count Worksheet			

NOTES:

See included regressions sheets for determination of growth rates, sections, and selected MC and SP stations for each section.

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

FHWA Format Vehicle Class. Counts		
Light Duty Vehicles	Motorcycles	770
	Passenger	124861
	Pickup or Van	57553
Single Units	Buses	952
	Other 2 Axle	8375
	3 Axles	832
	4 Axles or more	77
Truck Combs.	3-4 Axles	380
	5 Axles	9903
	6 Axles or more	124
Semi-Trailer-Trailer	5 Axles or less	242
	6 Axles	170
	7 Axles or more	0

	Number	%
Light		
Medium		
Heavy		
Trucks		

SECTION 1

IH

	ADT	DHV
Light		
Medium		
Heavy		

Total Vehicles	
Total Trucks	
Total Singles	
Total Tandems	
AXLE FACTOR	
SINGLE AX FACT	

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1						
Year 2						
ADT						
% Trks						
Growth Rate						
Years						
Facil Type						
S.N.						
SLAB						
Weight Sta						
Axle Factor						
Single Axle						

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD						
% T in ATHWLD						
FLEXIBLE						
RIGID						

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 - Option B Corridor Packet - Section 5 of 6	District	Austin
Rd Type	IH	County	Travis and Williamson
Direction		CSJ	0015-13-388, etc.
Project Limits	From RM 1431 to SH 45SE		
Section 1 Limits	From E. Riverside Dr. to SH 71	Analyst	JWB

Date: Request	12/1/2017	Received	2/5/2018	Started	5/4/2018	Completed	5/25/2018
District Contact	Carmen Ramos			Phone #	(512) 832-7075		

	Year	ADT's
Count	2016	
Base	2020	
Forecast	2040	
Forecast	2050	

% Trks ADT

Trks

% Trks DHV

SPR Station	S-132	MC Stn	HP-871	% Trks	10.5
Year	2016	Dir		Num Trks	15908
Peak Hour	6.3	Year	2014	Axle Factor	2.77
DD	58	ADT	152170	% Single Axles	0.51
100-DD	42				
K-Factor	6.1				

Main Road Growth Rate	1.5
Growth Rate after 20 Years	1.5
20 Year Growth Factor	
30 Year Growth Factor	
Design Period 1	20
Design Period 2	30

TDM Assignment

LOD

Structural Number (SN)	3		
Slab Thickness (ST)	8		

	# Lanes
Existing	6 +/-
Proposed	8 +/-

Past Projects

Project	I-35 (Mainlanes and Frontage Roads separate)
From	FM 1431
To	US 183
Date	10/7/2016
County	Travis and Williamson
CSJ	0015-10-062

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	
Traffic Analysis for Highway Design		Field Trip	
Vehicle Mix		Travel Demand Model Used	
Manual Count Worksheet			

NOTES:

1) See included regressions sheets for determination of growth rates, sections, and selected MC and SP stations for each section.

2) Used year 2014 MC station instead of year 2016, or 2015, since 2015 data was not accepted, and 2016 data was not available. Comparison of year 2014 MC data with preliminary 2017 data from same MC station showed year 2014 data was acceptable with respect to preliminary 2017 data.

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

FHWA Format Vehicle Class. Counts		
Light	Motorcycles	572
Duty	Passenger	105293
Vehicles	Pickup or Van	30397
Single	Buses	613
Units	Other 2 Axle	3282
	3 Axles	770
	4 Axles or more	12
Truck	3-4 Axles	571
Combs.	5 Axles	10072
	6 Axles or more	63
Semi-	5 Axles or less	432
Trailer-	6 Axles	93
Trailer	7 Axles or more	0

	Number	%
Light		
Medium		
Heavy		
Trucks		

SECTION 1

IH

	ADT	DHV
Light		
Medium		
Heavy		

Total Vehicles	
Total Trucks	
Total Singles	
Total Tandems	
AXLE FACTOR	
SINGLE AX FACT	

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	**3, 8**					
Design Periods	**1**	**2**				
Year 1						
Year 2						
ADT						
% Trks						
Growth Rate						
Years						
Facil Type						
S.N.						
SLAB						
Weight Sta						
Axle Factor						
Single Axle						

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	**3, 8**					
Design Periods	**1**	**2**				
ATHWLD						
% T in ATHWLD						
FLEXIBLE						
RIGID						

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 - Option B Corridor Packet - Section 6 of 6	District	Austin
Rd Type	IH	County	Travis and Williamson
Direction		CSJ	0015-13-388, etc.
Project Limits	From RM 1431 to SH 45SE		
Section 1 Limits	From SH 71 to SH 45SE	Analyst	JWB

Date: Request	12/1/2017	Received	2/5/2018	Started	5/4/2018	Completed	5/25/2018
District Contact	Carmen Ramos			Phone #	(512) 832-7075		

	Year	ADT's
Count	2016	
Base	2020	
Forecast	2040	
Forecast	2050	

% Trks ADT

\# Trks

% Trks DHV

SPR Station	S-4	MC Stn	MS-4	% Trks	12.0
Year	2016	Dir		Num Trks	15690
Peak Hour	7.5	Year	2016	Axle Factor	2.77
DD	53	ADT	131235	% Single Axles	0.49
100-DD	**47**				
K-Factor	7.1				

Main Road Growth Rate	2.0
Growth Rate after 20 Years	2.0
20 Year Growth Factor	
30 Year Growth Factor	
Design Period 1	20
Design Period 2	30

TDM Assignment

LOD

Structural Number (SN)	3		
Slab Thickness (ST)	8		

	# Lanes
Existing	6 +/-
Proposed	8 +/-

Past Projects

Project	I-35 (Mainlanes and Frontage Roads separate)
From	FM 1431
To	US 183
Date	10/7/2016
County	Travis and Williamson
CSJ	0015-10-062

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	
Traffic Analysis for Highway Design		Field Trip	
Vehicle Mix		Travel Demand Model Used	
Manual Count Worksheet			

NOTES:

See included regressions sheets for determination of growth rates, sections, and selected MC and SP stations for each section.

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

FHWA Format Vehicle Class. Counts		
Light	Motorcycles	402
Duty	Passenger	84633
Vehicles	Pickup or Van	30510
Single	Buses	182
Units	Other 2 Axle	3006
	3 Axles	1106
	4 Axles or more	88
Truck	3-4 Axles	574
Combs.	5 Axles	10259
	6 Axles or more	113
Semi-	5 Axles or less	297
Trailer-	6 Axles	65
Trailer	7 Axles or more	0

	Number	%
Light		
Medium		
Heavy		
Trucks		

SECTION 1

IH

	ADT	DHV
Light		
Medium		
Heavy		

Total Vehicles	
Total Trucks	
Total Singles	
Total Tandems	
AXLE FACTOR	
SINGLE AX FACT	

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	**3, 8**					
Design Periods	**1**	**2**				
Year 1						
Year 2						
ADT						
% Trks						
Growth Rate						
Years						
Facil Type						
S.N.						
SLAB						
Weight Sta						
Axle Factor						
Single Axle						

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	**3, 8**					
Design Periods	**1**	**2**				
ATHWLD						
% T in ATHWLD						
FLEXIBLE						
RIGID						

determining 20yr growth rates + sections

TRAFFIC VOLUME REGRESSION WORKSHEET

May 23, 2018

PROJECT: IH 35
LIMITS: From RM 1431 to SH 45SE
Sheet 1 of 3

Note: SP-246 2013, 2014, 2015=MLs+NBFR+SBFR+SBentr ramp+NB DC+SB DC. SP-190 2013=MLs+NBFR+SBexit ramp, N of H-12 (no data for SBFR).

District: Austin
County: Williamson & Travis
CSJ: 0015-13-388, etc.

ROUTE	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35
LOCATION	H-51	H-27	H-28	H-29	T-62	H-33	SP-246	H-5	H-120	H-4	SP-190	H-12
1996	68000	84000	96000	124000	125000	132000	121000	111000		123000	121000	128000
1997	76000	93000	107000	136000	136000	139000	144000	120000		135000	129000	133000
1998	82000	99000	110000	142000	139000	142000	152000	127000		141000	138000	137000
1999	81000	98000	109000	144000	144000	146000	156000	133000		150000	148000	143000
2000	83000	101000	115000	141000	148000	154000	168000	138000		145000	151000	145000
2001	88000	101000	120000	149000	159000	161000	171000	154000	156000	171000	164000	162000
2002	84000	99000	118000	154000	158000	162000	179000	155000	159000	176000	170000	160000
2003	81000	101000	120000	153000	156000	164000	169000	165000	163000	181000	174000	161000
2004	80000	104000	86000	138000	154000	166000	188000	161000	160000	183000	170000	159000
2005	81930	105300	86980	133250	157510	167720	176730	163760	166410	188360	173520	164630
2006	84000	80000	77000	72000	123000	124000	120000	157000	127000	131000	160000	146000
2007	80000	115000	124000	122000	146000	149000	128000	146000	148000	171000	161000	175000
2008	98000	133000	149000	157000	174000	179000	143000	159000	165000	184000	172000	161000
2009	116000	148000	169000	181000	195000	161000	173000	158000	150000	161000	158000	152000
2010	100000	128000	147000	157000	174000	175000	170000	161000	160000	169000	170000	160000
2011	92000	130000	148000	160000	177000	178000	168000	162000	156000	164000	168000	159000
2012	91000	121000	144000	174000	180000	181000	172000	163000	162000	177000	171000	161000
2013	91388	127269	146863	182296	185590	184080	215655	165061	171383	180419	177668	163797
2014	110321	153261	164640	204183	196144	204563	215216	162791	182169	193003	172078	162495
2015	106487	146943	165103	196216	195754	197294	226375	173510	174443	188823	161036	177533
2016	112654	151310	136767	197920	198038	199236	227336	176811	177946	191445	184306	181950
	Regr01	Regr02	Regr03	Regr04	Regr05	Regr06	Regr07	Regr08	Regr09	Regr10	Regr11	Regr12
Low Linear Annual Growth Rate	0.8%	1.2%	0.9%	0.7%	0.9%	0.8%	0.7%	0.7%	0.1%	0.6%	0.5%	0.5%
Forecast Lnr. An. Grwth Rate	1.6% ☑	2.1% ☑	2.0% ☑	1.7% ☑	1.7% ☑	1.5% ☑	1.6% ☑	1.3% ☑	0.8% ☐	1.3% ☑	1.1% ☑	1.0% ☑
High Linear Annual Growth Rate	2.3%	3.1%	3.0%	2.7%	2.4%	2.2%	2.6%	1.9%	1.5%	1.9%	1.6%	1.5%
Estimated Standard Deviation	7665.10	11550.33	19335.15	23105.54	12076.35	12221.85	23497.49	9414.53	11171.05	15234.94	10842.82	8683.22
B (Slope)	1677	3100	3082	3146	3257	2937	3343	2366	1439	2404	1929	1764
A (Intercept)	73077	84191	94868	121772	130336	135674	137201	129290	150356	142815	142313	139142
R=	0.805	0.857	0.703	0.645	0.858	0.831	0.662	0.842	0.523	0.700	0.741	0.783
Confidence Interval	+/- 90% CI 784	+/- 90% CI 1361	+/- 90% CI 1650	+/- 90% CI 1835	+/- 90% CI 1426	+/- 90% CI 1331	+/- 90% CI 1902	+/- 90% CI 1058	+/- 90% CI 1206	+/- 90% CI 1294	+/- 90% CI 980	+/- 90% CI 848

Avg. of selected Forecast Linear Annual Growth Rates: 1.5%
Avg. of all Forecast Linear Annual Growth Rates: 1.5%
GR's for Non-Regression vol's only

PROJECTIONS OF ABOVE TRAFFIC VOLUME DATA TO FORECASTED YEARS

Use last Count Year from above. ☑
Do not use last Count Year from above. ☐
Enter any one of previous count years from above. 2010
Enter Base Year 2020

Pivot Growth Rate at 20 Years from Count Year (most commonly used). ☑
Pivot Growth Rate (GR) at other than 20 Years from Count Year. ☐
Enter years from Count Year for pivoting Growth Rate (e.g. for pivoting growth ten years from Count Year, enter 10) 10
Enter Model Year

Optional Input: SPR Station, Yr
Optional Input: K-Factor
Optional Input: Dir. Dist.
Enter Earliest Variable Year 2015
Enter Latest Variable Year 2025

Pre-20/Pivot Yr Growth Rates Selection

Use Relative Low & Non-Regression GR's	○	
Use Relative Frcst & Non-Regression GR's	○	
Use Relative High & Non-Regression GR's	○	
Use Avg. of Selected Low Growth Rates	○	0.8%
Use Avg. of Selected Forecast Growth Rates	○	1.5%
Use Avg. of Selected High Growth Rates	○	2.3%
Use Avg. of All Low Growth Rates	○	0.7%
Use Avg. of All Forecast Growth Rates	○	1.5%
Use Avg. of All High Growth Rates	○	2.2%
Use Highest Forecast Growth Rate	○	2.1%
Use Lowest Forecast Growth Rate	○	0.8%
Use Manually Selected Growth Rate	●	~~2.0%~~

Post-20/Pivot Year Growth Rate

Note: If Pre-20/Pivot Yr GR is 2.0% or less, that rate is used in the projections, not the rate below.
Enter Growth Rate (2.0% most common) 2.0%

ROUTE	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35
LOCATION	H-51	H-27	H-28	H-29	T-62	H-33	SP-246	H-5	H-120	H-4	SP-190	H-12
20/PIVOT YR AN. GROWTH RATE	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Count Year - 2016	112654	151310	136767	197920	198038	199236	227336	176811	177946	191445	184306	181950
Base Year - 2020	121700	163400	147700	213800	213900	215200	245500	191000	192200	206800	199100	196500
Ten Year Forecast - 2030	144200	193700	175100	253300	253500	255000	291000	226300	227800	245000	235900	232900
Twenty Year Forecast - 2040	166700	223900	202400	292900	293100	294900	336500	261700	263400	283300	272800	269300
Thirty Year Forecast - 2050	189300	254200	229800	332500	332700	334700	381900	297000	298900	321600	309600	305700
Forty Year Forecast - 2060	211800	284500	257100	372100	372300	374600	427400	332400	334500	359900	346500	342100
GR Pivot Year Forecast - 2036	157700	211800	191500	277100	277300	278900	318300	247500	249100	268000	258000	254700
Earliest Var Yr Frcst - 2015	110400	148300	134000	194000	194100	195300	222800	173300	174400	187600	180600	178300
Latest Var Yr Frcst - 2025	132900	178500	161400	233500	233700	235100	268300	208600	210000	225900	217500	214700
Model Year Forecast - Model Traffic Assignment												
Difference of Model Yr Forecast from Model Traffic Assignment												
Above Difference in DDHV												
% Difference of Model Yr Forecast from Model Traffic Assignment												

RM 1431
US 79
SH 45 N

Sectn 1
Sectn 2
Sectn 3

HP 877
5190
Avg = 1.76
2.0%
HP 878
5190
MS190
5190

TRAFFIC VOLUME REGRESSION WORKSHEET

May 23, 2018

PROJECT: IH 35
LIMITS: From RM 1431 to SH 45SE
Sheet 2 of 3

Note: H-14 2013, 2014, 2015=MLs+SBFR+NBFR-NB exit ramp, N of H-14 MLs (this confirmed by Laura Dablain, though not equal AUS Dist. traffic map AADT). H-17 2013, 2014, 2015=MLs+NBFR+SBFR+NBDC. H-119 2013, 2014, 2015 = MLs + NBFR + SBFR + SBDC. H-116 2013, 2014, 2015 = MLs + NBFR + SBFR + NB ramp(227RP3562) + NB ramp(227RP3564). SP-132 2013 = MLs + SBFR + NB entr ramp, N of SP-132 (NBFR vol. not available). H-94 2013, 2014, 2015 = MLs + NBFR + SBFR + SBDC.

District: Austin
County: Williamson & Travis
CSJ: 0015-13-388, etc.

ROUTE	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35
LOCATION	H-13	H-14	H-17	H-119	H-118	H-117	H-116	H-115A	SP-132	H-92A	H-92	H-94
1996	142000	170000	191000						199000		169000	170000
1997	147000	174000	206000						202000		164000	166000
1998	149000	171000	223000						197000		161000	169000
1999	157000	181000	217000						200000		153000	157000
2000	155000	180000	220000						201000		167000	161000
2001	172000	196000	223000	231000	245000	233000		201000	198000	176000	169000	166000
2002	170000	193000	229000	226000	253000	245000	232000	211000	200000	178000	176000	175000
2003	167000	197000	216000	227000	248000	236000	223000	206000	190000	170000	154000	167000
2004	178000	225000	246000	247000	251000	145000	218000	200000	192000	176000	158000	159000
2005	182050	229970	249960	251670	256380	147430	222720	204220	194880	179540	158380	169740
2006	164000	160000	227000	226000	224000	123000	192000	177000	153000	163000	128000	114000
2007	191000	210000	246000	250000	247000	149000	230000	219000	220000	200000	182000	186000
2008	161000	194000	226000	244000	243000	149000	227000	204000	183000	175000	184000	174000
2009	159000	179000	220000	232000	231000	133000	196000	198000	177000	171000	177000	179000
2010	164000	182000	205000	218000	216000	211000	202000	185000	175000	181000	183000	176000
2011	168000	161000	215000	222000	220000	214000	196000	183000	177000	188000	179000	187000
2012	167000	185000	218000	225000	224000	217000	214000	189000	178000	180000	178000	161000
2013	168724	183318	245840	240972	225578	217402	220174	190473	177991	182856	178130	215292
2014	170460	194972	232673	225679	212123	205748	215288	168432	216040	185424	175449	196951
2015	179327	204388	254306	249202	232011	222006	224966	176455	252075	180449	183346	232301
2016	185369	208949	259500	255803	237937	227942	230921	182216	202378	185578	188775	235550
	Regr01	Regr02	Regr03	Regr04	Regr05	Regr06	Regr07	Regr08	Regr09	Regr10	Regr11	Regr12
Low Linear Annual Growth Rate	0.3%	-0.2%	0.2%	-0.3%	-1.5%	-1.2%	-0.7%	-1.9%	-0.6%	0.0%	0.2%	0.5%
Forecast Lnr. An. Grwth Rate	0.7% ☑	0.4% ☑	0.7% ☑	0.2% ☐	-0.9% ☐	0.8% ☐	-0.1% ☐	-1.2% ☐	0.1% ☑	0.4% ☐	0.7% ☑	1.3% ☑
High Linear Annual Growth Rate	1.1%	0.9%	1.1%	0.7%	-0.3%	2.7%	0.6%	-0.4%	0.7%	0.8%	1.2%	2.1%
Estimated Standard Deviation	9946.75	18336.73	14679.31	12176.36	10448.87	41822.75	13520.58	10053.46	20115.26	7727.35	12049.30	20820.61
B (Slope)	1243	709	1583	427	-1991	1553	-166	-2080	140	697	1236	2695
A (Intercept)	154088	182414	211324	232507	250310	180573	217434	209024	193141	174261	157450	150042
R=	0.613	0.233	0.556	0.165	-0.672	0.174	-0.055	-0.702	0.043	0.395	0.537	0.626
Confidence Interval	+/- 90% CI 784	+/- 90% CI 1144	+/- 90% CI 1072	+/- 90% CI 115	+/- 90% CI 1290	+/- 90% CI 3910	+/- 90% CI 1377	+/- 90% CI 1290	+/- 90% CI 1221	+/- 90% CI 774	+/- 90% CI 867	+/- 90% CI 1

Avg. of selected Forecast Linear Annual Growth Rates: 0.7%
Avg. of all Forecast Linear Annual Growth Rates: 0.3%

GR's for Non-Regression vol's only

PROJECTIONS OF ABOVE TRAFFIC VOLUME DATA TO FORECASTED YEARS

Use last Count Year from above. ☑

Do not use last Count Year from above. ☐

Enter any one of previous count years from above. 2010

Enter Base Year 2020

Pivot Growth Rate at 20 Years from Count Year (most commonly used). ☑

Pivot Growth Rate (GR) at other than 20 Years from Count Year. ☐

Enter years from Count Year for pivoting Growth Rate (e.g. for pivoting growth ten years from Count Year, enter 10) 10

Enter Model Year

Pre-20/Pivot Yr Growth Rates Selection

Use Relative Low & Non-Regression GR's	○	
Use Relative Frcst & Non-Regression GR's	○	
Use Relative High & Non-Regression GR's	○	
Use Avg. of Selected Low Growth Rates	○	0.1%
Use Avg. of Selected Forecast Growth Rates	○	0.7%
Use Avg. of Selected High Growth Rates	○	1.2%
Use Avg. of All Low Growth Rates	○	-0.4%
Use Avg. of All Forecast Growth Rates	○	0.3%
Use Avg. of All High Growth Rates	○	0.9%
Use Highest Forecast Growth Rate	○	1.3%
Use Lowest Forecast Growth Rate	○	-1.2%
Use Manually Selected Growth Rate	●	~~2.0%~~

Optional input: SPR Station, Yr
Optional input: K-Factor
Optional input: Dir. Dist.

Enter Earliest Variable Year 2015
Enter Latest Variable Year 2025

Post-20/Pivot Year Growth Rate Note: If Pre-20/Pivot Yr GR is 2.0% or less, that rate is used in the projections, not the rate below.
Enter Growth Rate (2.0% most common) 2.0%

ROUTE	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35	IH 35
LOCATION	H-13	H-14	H-17	H-119	H-118	H-117	H-116	H-115A	SP-132	H-92A	H-92	H-94
20/PIVOT YR AN. GROWTH RATE	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Count Year - 2016	185369	208949	259500	255803	237937	227942	230921	182216	202378	185578	188775	235550
Base Year - 2020	200200	225700	280300	276300	257000	246200	249400	196800	218600	200400	203900	254400
Ten Year Forecast - 2030	237300	267500	332200	327400	304600	291800	295600	233200	259000	237500	241600	301500
Twenty Year Forecast - 2040	274300	309200	384100	378600	352100	337400	341800	269700	299500	274700	279400	348600
Thirty Year Forecast - 2050	311400	351000	436000	429700	399700	382900	387900	306100	340000	311800	317100	395700
Forty Year Forecast - 2060	348500	392800	487900	480900	447300	428500	434100	342600	380500	348900	354900	442800
GR Pivot Year Forecast - 2036	259500	292500	363300	358100	333100	319100	323300	255100	283300	259800	264300	329800
Earliest Var Yr Frcst - 2015	181700	204800	254300	250700	233200	223400	226300	178600	198300	181900	185000	230800
Latest Var Yr Frcst - 2025	218700	246600	306200	301800	280800	269000	272500	215000	238800	219000	222800	277900
Model Year Forecast - Model Traffic Assignment												
Difference of Model Yr Forecast from Model Traffic Assignment		US 183							E. Riverside Dr.		SH 71	
Above Difference in DDHV												
% Difference of Model Yr Forecast from Model Traffic Assignment												

Sectn 3

Sectn4

Avg = 0.81 → 1.5% ✓

of 20yr regression locs (9 locs)

MS132
S132

Sectn 5

HP871
S132

TRAFFIC VOLUME REGRESSION WORKSHEET

May 23, 2018

PROJECT: IH 35
LIMITS: From RM 1431 to SH 45SE
Sheet 3 of 3

Note: D-8 2013 = MLs + NBFR + SBFR

District: Austin
County: Williamson & Travis
CSJ: 0015-13-388, etc.

ROUTE	IH 35	IH 35	IH 35	IH 35	IH 35							
LOCATION	H-94A	H-95	D-8	SP-4	H-82A							
1996	140000	94000		75000	75000							
1997	136000	97000		78000	78000							
1998	148000	101000		85000	84000							
1999	132000	104000		87000	87000							
2000	145000	115000		93000	94000							
2001	145000	118000		98000	100000							
2002	156000	119000		100000	100000							
2003	147000	107000		94000	96000							
2004	142000	114000		96000	98000							
2005	145200	116330		97940	99830							
2006	132000	110000		106000	100000							
2007	162000	146000		115000	119000							
2008	163000	140000		114000	114000							
2009	170000	144000		115000	102000							
2010	160000	140000		118000	125000							
2011	167000	141000		119000	140000							
2012	178000	150000	139000	120000	133000							
2013	179807	152925	163537	124336	135688							
2014	180564	156920	141187	127315	138426							
2015	193350	167560	147812	134461	152442							
2016	197177	170597	152118	138188	157700							
	Regr01	Regr02	Regr03	Regr04	Regr05	Regr06	Regr07	Regr08	Regr09	Regr10	Regr11	Regr12
Low Linear Annual Growth Rate	0.9%	1.3%	-3.2%	1.3%	1.5%							
Forecast Lnr. An. Grwth Rate	**1.5%** ☑	**2.2%** ☑	**0.7%** ☐	**2.1%** ☑	**2.5%** ☑	☐	☐	☐	☐	☐	☐	☐
High Linear Annual Growth Rate	2.1%	3.1%	4.6%	2.9%	3.5%							
Estimated Standard Deviation	9118.14	7372.76	9644.82	3432.05	7248.38							
B (Slope)	2773	3627	1051	2851	3736							
A (Intercept)	130327	92511	146629	77934	73553							
R=	0.884	0.950	0.170	0.982	0.954							
Confidence Interval	+/- 90% CI 1181	+/- 90% CI 1437	+/- 90% CI 5802	+/- 90% CI 1093	+/- 90% CI 1473							

Avg. of selected Forecast Linear Annual Growth Rates: **2.1%**

Avg. of all Forecast Linear Annual Growth Rates: **1.8%**

GR's for Non-Regression vol's only

PROJECTIONS OF ABOVE TRAFFIC VOLUME DATA TO FORECASTED YEARS

Use last Count Year from above. ☑

Do not use last Count Year from above. ☐
Enter any one of previous count years from above. 2010

Enter Base Year 2020

Pivot Growth Rate at 20 Years from Count Year (most commonly used). ☑

Pivot Growth Rate (GR) at other than 20 Years from Count Year. ☐
Enter years from Count Year for pivoting Growth Rate (e.g. for pivoting growth ten years from Count Year, enter 10) 10

Enter Model Year

Optional input: SPR Station, Yr
Optional input: K-Factor
Optional input: Dir. Dist.

Enter Earliest Variable Year 2015
Enter Latest Variable Year 2025

Pre-20/Pivot Yr Growth Rates Selection

Use Relative Low & Non-Regression GR's	○	
Use Relative Frcst & Non-Regression GR's	○	
Use Relative High & Non-Regression GR's	○	
Use Avg. of Selected Low Growth Rates	○	1.3%
Use Avg. of Selected Forecast Growth Rates	○	2.1%
Use Avg. of Selected High Growth Rates	○	2.9%
Use Avg. of All Low Growth Rates	○	0.4%
Use Avg. of All Forecast Growth Rates	○	1.8%
Use Avg. of All High Growth Rates	○	3.2%
Use Highest Forecast Growth Rate	○	2.5%
Use Lowest Forecast Growth Rate	○	0.7%
Use Manually Selected Growth Rate	●	~~3.0%~~

Post-20/Pivot Year Growth Rate Note: If Pre-20/Pivot Yr GR is 2.0% or less, that rate is used in the projections, not the rate below.
Enter Growth Rate (2.0% most common) 2.0%

ROUTE	IH 35	IH 35	IH 35	IH 35	IH 35							
LOCATION	H-94A	H-95	D-8	SP-4	H-82A							
20/PIVOT YR AN. GROWTH RATE	2.0%	2.0%	2.0%	2.0%	2.0%							
Count Year - 2016	197177	170597	152118	138188	157700							
Base Year - 2020	213000	184200	164300	149200	170300							
Ten Year Forecast - 2030	252400	218400	194700	176900	201900							
Twenty Year Forecast - 2040	291800	252500	225100	204500	233400							
Thirty Year Forecast - 2050	331300	286600	255600	232200	264900							
Forty Year Forecast - 2060	370700	320700	286000	259800	296500							
GR Pivot Year Forecast - 2036	276000	238800	213000	193500	220800							
Earliest Var Yr Frcst - 2015	193300	167200	149100	135400	154500							
Latest Var Yr Frcst - 2025	232700	201300	179500	163100	186100							
Model Year Forecast - Model Traffic Assignment				SH45SE								
Difference of Model Yr Forecast from Model Traffic Assignment Above Difference in DDHV % Difference of Model Yr Forecast from Model Traffic Assignment												

2.0% sectn 6

Avg = 1.78

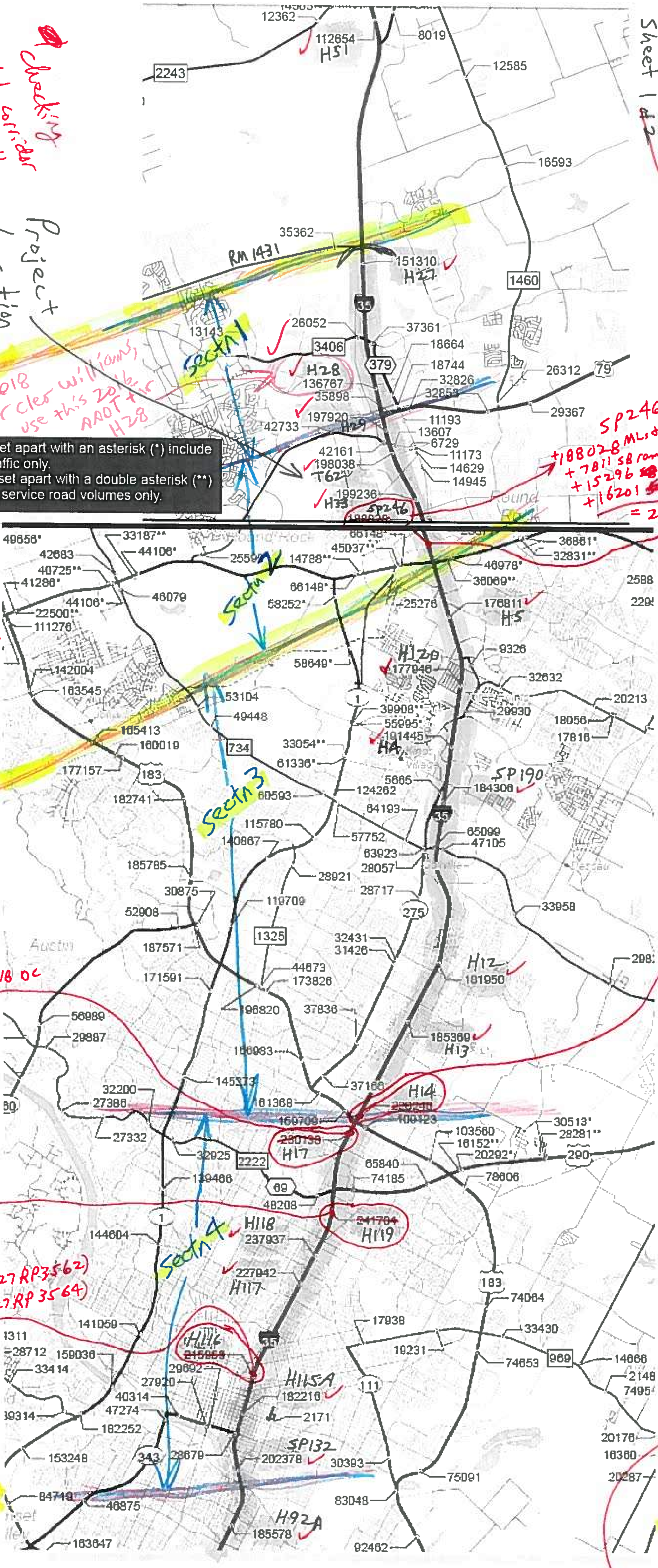
ms4 54 of 20yr regressions locs (5 locs)

Checking total corridor AADTs with STARS II MLs, FRs, DCs, ramps Sheet 1 of 2

Sheet 1 of 2

~~Project Location & 2016 Austin District Traffic Map~~

Project Location



*Traffic volumes set apart with an asterisk (*) include tolled mainlane traffic only.
**Traffic volumes set apart with a double asterisk (**) include non-tolled service road volumes only.

5/23/2018 per Cler Williams, use this 2016 AADT for H28

SP246
+188028 MLs & FRs
+ 7811 SB ramp Toll
+15296 45 SB DC
+16201 45 NB DC
= 227336

Avg growth rate from determining the growth rates regressions sheets → 1.76%

2.0%

H17
+230138 MLs & FRs
+ 29362 IH35NB - US183NB DC
= 259500

H14
+144013 MLs
- 11291 NB exit ramp
+ 29564 SB FR
+ 46663 NB FR
= 208949 ✓

5/18/2018 per Laura Dablain, H14 MLs Location in STARS II is correct & it is ok to use 208949 for the adjusted total corridor volume for H14.

H119
+ 241704 MLs & FRs
+ 14099 SB DC
= 255803

H116
+215955 MLs & FRs
+ 8573 NB ent. ramp (227 RP 3562)
+ 6393 NB ent. ramp (227 RP 3564)
= 230921

0.81%

1.5%

Selected growth rates posted on these maps.

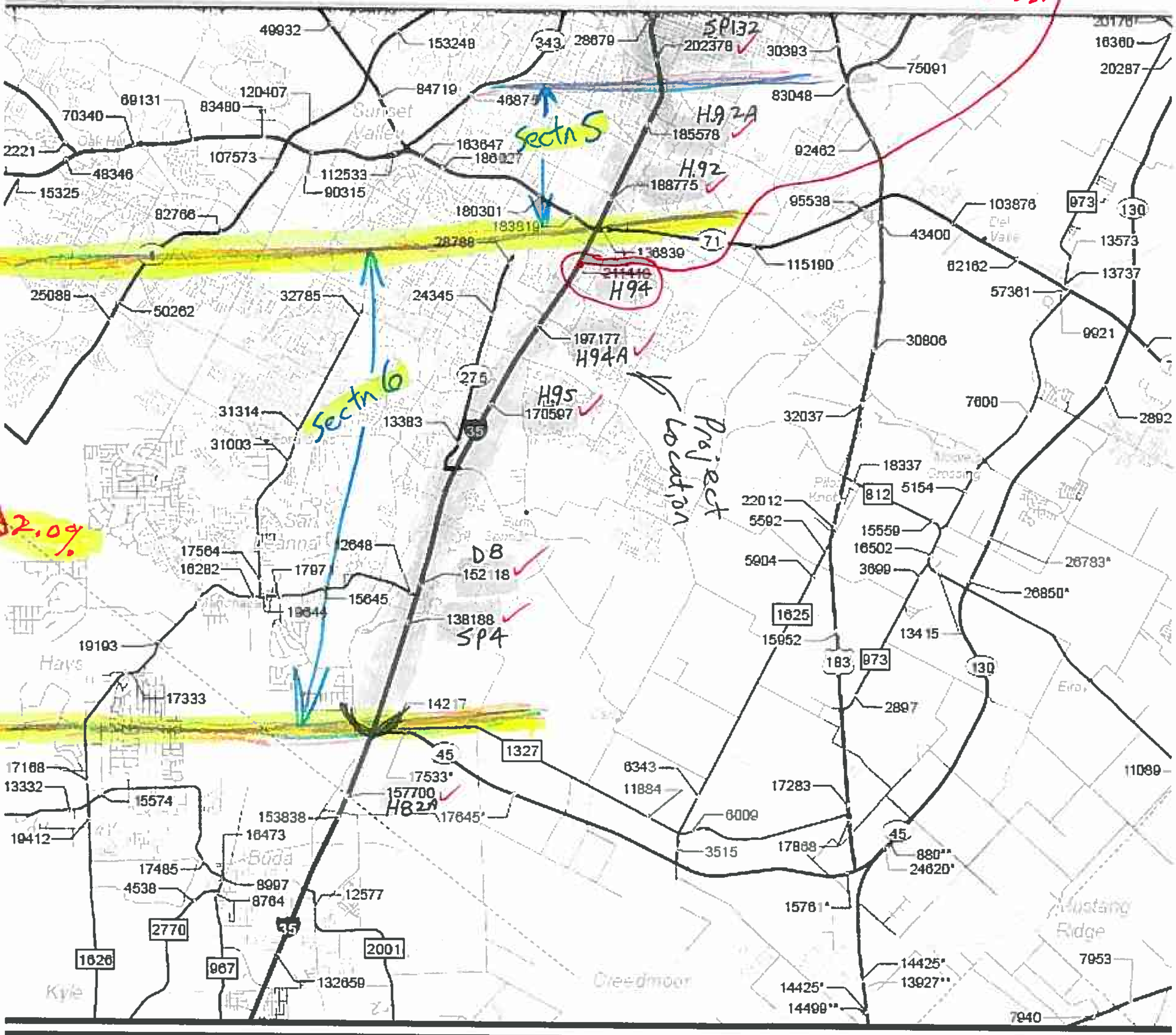
checking total corridor AADTs with STARS II MLs, FRs, OCs, Ramps Sheet 2 of 2

Project Location & 2016 Austin District Traffic Map

Sheet 2 of 2

*Traffic volumes set apart with an asterisk (*) include tolled mainlane traffic only.
**Traffic volumes set apart with a double asterisk (**) include non-tolled service road volumes only.

H94
+211418 MLs & FRs
+24132 SB OC
=235550



1.78%

2.0%

sterisk (*) include
ouble asterisk (**)
mes only.

N

5

2016 AUSTIN DISTRICT TRAFFIC MAP

PREPARED BY THE
Texas Department of Transportation
Transportation Planning and Programming Division
Traffic Analysis System Support Branch
IN COOPERATION WITH THE
United States Department of Transportation Federal Highway Administration

Avg growth rate from determining growth rates regressions sheets

Texas Department of Transportation

MS2
Traffic Count Database System (TCDS)

Classification Report

Location ID	HP877	**Located On**	IH 35	**County**	Williamson
Counted By	TCDS_Combined			**Community**	Georgetown
Start Date	Thu 9/22/2016	**Loc On Alias**	0.2 Miles South of SH 29	**Station**	
Start Time	12:00:00 AM	**Direction**	2-WAY	**Agency**	Texas DOT
Source	Syst_Combine	**Sensor Type**		**Owner**	Bertha.Arellano
Axle Factor	0.853	**Count Status**	Accepted		
Filename					

FHWA-Scheme F Classification

Start Time	Motor cycle	Car	Pick up	Bus	2A SU	3A SU	>3A SU	<5A 2U	5A 2U	>5A 2U	<6A >2U	6A >2U	>6A >2U	14	15	TOTAL
12:00 AM	2	665	134	8	13	7	0	20	541	3	37	11	0	0	0	1441
1:00 AM	1	388	66	6	11	6	1	14	457	0	37	14	0	0	0	1001
2:00 AM	1	287	71	7	17	5	0	26	429	1	46	16	0	0	0	906
3:00 AM	3	309	61	17	28	7	0	31	434	1	42	9	0	0	0	942
4:00 AM	4	632	138	9	22	8	0	34	419	0	46	12	0	0	0	1324
5:00 AM	10	1928	389	4	41	36	2	32	481	1	36	9	0	0	0	2969
6:00 AM	27	4118	900	7	57	42	23	20	394	7	24	2	0	0	0	5621
7:00 AM	32	5043	1103	12	95	57	16	26	372	7	6	2	0	0	0	6771
8:00 AM	11	4314	1266	6	106	56	8	21	435	8	7	1	0	0	0	6239
9:00 AM	12	4068	892	7	113	70	17	27	510	4	5	3	0	0	0	5728
10:00 AM	7	3898	886	9	98	66	30	23	565	5	5	0	0	0	0	5592
11:00 AM	14	4432	1042	10	107	60	22	24	609	12	4	0	0	0	0	6336
12:00 PM	13	4455	1220	14	105	47	30	19	626	16	3	2	0	0	0	6550
1:00 PM	13	4541	1370	8	81	47	27	17	582	15	4	0	0	0	0	6705
2:00 PM	11	4861	1091	13	105	44	34	16	558	19	2	3	0	0	0	6757
3:00 PM	12	5096	1255	13	104	37	20	16	457	17	1	1	0	0	0	7029
4:00 PM	25	5418	1315	13	79	37	29	19	391	9	2	1	0	0	0	7338
5:00 PM	26	5808	1381	3	39	30	10	6	334	6	1	1	0	0	0	7645
6:00 PM	27	4961	1178	7	56	17	3	14	452	6	4	1	0	0	0	6726
7:00 PM	21	3629	979	12	29	25	2	14	476	1	12	1	0	0	0	5201
8:00 PM	19	3323	897	9	26	17	0	12	438	1	18	5	0	0	0	4765
9:00 PM	17	2113	467	8	23	11	0	12	378	1	21	5	0	0	0	3056
10:00 PM	8	1790	420	6	21	9	0	18	395	5	28	10	0	0	0	2710
11:00 PM	3	865	197	5	13	9	0	24	446	4	44	10	0	0	0	1620
TOTAL	319	76942	18718	213	1389	750	274	485	11179	149	435	119	0	0	0	110972

MANUAL COUNT DESIGN DATA - FHWA FORMAT

Station Number HP-877 **Direction** ______ **Year** 2016

Optional Misc. Info. (loc., etc.) IH 35 0.2 Mi. S. of SH 29; AUS Dist., Williamson Co.

Type of Truck		Number of Trucks	Single Axles Mult.	Single Axles	Tandem Axle Sets Mult.	Tandem Axle Sets
Single Units						
Buses	4	213	2	426	0	0
2-D	5	1389	2	2778	0	0
3-Axle	6	750	1	750	1	750
4-Axle	7	274	1	274	1	274
Single Trailer						
3-4-Axle	8	485	2.5	1212.5	0.5	242.5
5-Axle	9	11179	1	11179	2	22358
6-Axle	10	149	1	149	2	298
Multi-Trailers						
5-Axle	11	435	5	2175	0	0
6-Axle	12	119	4	476	1	119
7-Axle	13	0	3	0	2	0
Total		14993		19419.5		24041.5

(Singles + Tandems) / Total Trucks = Axle Factor	2.90
(Singles Axles / (Singles + Tandems))	0.45

Light Duty Vehicles	Motorcycles	319
	Passenger Cars	76942
	Pickup or Van	18718
Single Units	Buses	213
	Other 2 Axle	1389
	3 Axles	750
	4 Axles or more	274
Single Trailer	3-4 Axles	485
	5 Axles	11179
	6 Axles or more	149
Multi-Trailers	5 Axles or less	435
	6 Axles	119
	7 Axles or more	0

Light	95979
Medium	1844
Heavy	13149
Trucks	14993
Total Vehicles	110972
%T of Tot. Veh.	13.5
Num. of Trucks	14993
Axle Factor	2.90
% Single Axles	0.45

Texas Department of Transportation

MS2

Traffic Count Database System (TCDS)

Classification Report

Location ID	HP878	**Located On**	IH 35	**County**	Williamson
Counted By	TCDS_Combined			**Community**	Round Rock
Start Date	Tue 9/20/2016	**Loc On Alias**	0.9 Miles South of RM 620	**Station**	
Start Time	12:00:00 AM	**Direction**	2-WAY	**Agency**	Texas DOT
Source	Syst_Combine	**Sensor Type**		**Owner**	Bertha.Arellano
Axle Factor	0.877	**Count Status**	Accepted		
Filename					

FHWA-Scheme F Classification

Start Time	Motor cycle	Car	Pick up	Bus	2A SU	3A SU	>3A SU	<5A 2U	5A 2U	>5A 2U	<6A >2U	6A >2U	>6A >2U	14	15	TOTAL
12:00 AM	2	589	169	3	16	10	0	5	460	0	40	7	0	0	0	1301
1:00 AM	4	521	173	6	18	6	3	6	409	1	45	7	0	0	0	1199
2:00 AM	1	329	133	3	18	2	0	8	401	0	40	8	0	0	0	943
3:00 AM	1	428	141	2	32	7	0	15	391	2	38	10	0	0	0	1067
4:00 AM	3	804	241	5	49	5	1	14	384	0	41	10	0	0	0	1557
5:00 AM	9	2753	732	8	77	49	5	19	489	1	31	8	0	0	0	4181
6:00 AM	29	6171	1943	11	130	93	40	14	381	3	14	3	0	0	0	8832
7:00 AM	37	6610	2288	7	159	57	20	23	363	5	5	3	0	0	0	9577
8:00 AM	16	5949	1981	3	176	80	30	17	446	9	6	0	0	0	0	8713
9:00 AM	19	5200	1677	4	203	78	48	32	555	11	2	0	0	0	0	7829
10:00 AM	12	4755	1631	11	177	103	53	41	616	20	4	0	0	0	0	7423
11:00 AM	25	4833	1682	11	198	93	58	40	664	11	4	1	0	0	0	7620
12:00 PM	17	3636	1703	15	196	92	52	44	644	21	4	2	0	0	0	6426
1:00 PM	21	5625	1710	9	222	91	60	24	545	23	5	1	0	0	0	8336
2:00 PM	33	4972	1869	14	233	79	40	36	585	10	1	0	0	0	0	7872
3:00 PM	22	5432	2143	9	206	54	46	20	485	8	0	1	0	0	0	8426
4:00 PM	22	5444	2179	9	136	48	27	17	358	10	2	2	0	0	0	8254
5:00 PM	26	7240	2411	10	89	40	4	31	406	1	3	1	0	0	0	10262
6:00 PM	29	6286	2156	3	81	17	5	27	439	4	5	1	0	0	0	9053
7:00 PM	26	4097	1563	12	58	13	5	16	487	7	9	1	0	0	0	6294
8:00 PM	25	4021	1083	11	66	16	5	8	478	5	10	5	0	0	0	5733
9:00 PM	19	2986	834	6	48	18	0	11	387	3	14	5	0	0	0	4331
10:00 PM	12	2078	443	8	30	14	0	14	481	1	25	11	0	0	0	3117
11:00 PM	6	1246	227	4	22	11	1	19	501	1	25	11	0	0	0	2074
TOTAL	416	92005	31112	184	2640	1076	503	501	11355	157	373	98	0	0	0	140420

MANUAL COUNT DESIGN DATA - FHWA FORMAT

Station Number HP-878 **Direction** ______ **Year** 2016

Optional Misc. Info. (loc., etc.) IH 35, 0.9 Mi. S of RM 620; AUS Dist., Williamson Co.

Type of Truck		Number of Trucks	Single Axles Mult.		Tandem Axle Sets Mult.	
Single Units						
Buses	4	184	2	368	0	0
2-D	5	2640	2	5280	0	0
3-Axle	6	1076	1	1076	1	1076
4-Axle	7	503	1	503	1	503
Single Trailer						
3-4-Axle	8	501	2.5	1252.5	0.5	250.5
5-Axle	9	11355	1	11355	2	22710
6-Axle	10	157	1	157	2	314
Multi-Trailers						
5-Axle	11	373	5	1865	0	0
6-Axle	12	98	4	392	1	98
7-Axle	13	0	3	0	2	0
Total		16887		22248.5		24951.5

(Singles + Tandems) / Total Trucks = Axle Factor	2.80
(Singles Axles / (Singles + Tandems))	0.47

Light Duty Vehicles	Motorcycles	416
	Passenger Cars	92005
	Pickup or Van	31112
Single Units	Buses	184
	Other 2 Axle	2640
	3 Axles	1076
	4 Axles or more	503
Single Trailer	3-4 Axles	501
	5 Axles	11355
	6 Axles or more	157
Multi-Trailers	5 Axles or less	373
	6 Axles	98
	7 Axles or more	0

Light	123533
Medium	3074
Heavy	13813
Trucks	16887
Total Vehicles	140420
%T of Tot. Veh.	12.0
Num. of Trucks	16887
Axle Factor	2.80
% Single Axles	0.47

Texas Department of Transportation

MS2 Traffic Count Database System (TCDS)

Classification Report

Location ID	MS190	**Located On**	IH0035	**County**	Travis
Counted By	TCDS_Combined		1.5 Miles South of FM 1825	**Community**	Austin
Start Date	Thu 9/22/2016	**Loc On Alias**	IH0035-KG	**Station**	
Start Time	12:00:00 AM	**Direction**	2-WAY	**Agency**	Texas DOT
Source	Syst_Combine	**Sensor Type**		**Owner**	Bertha.Arellano
Axle Factor	0.881	**Count Status**	Accepted		
Filename					

FHWA-Scheme F Classification

Start Time	Motor cycle	Car	Pick up	Bus	2A SU	3A SU	>3A SU	<5A 2U	5A 2U	>5A 2U	<6A >2U	6A >2U	>6A >2U	14	15	TOTAL
12:00 AM	6	768	292	10	41	7	0	16	336	0	20	29	0	0	0	1525
1:00 AM	1	534	178	7	39	12	0	18	367	1	20	16	0	0	0	1193
2:00 AM	4	449	180	5	52	8	0	14	362	3	16	11	0	0	0	1104
3:00 AM	5	440	143	9	54	10	0	11	394	1	8	12	0	0	0	1087
4:00 AM	9	1090	400	4	86	19	1	23	633	5	16	18	0	0	0	2304
5:00 AM	17	2294	1195	2	177	36	1	18	474	6	7	8	0	0	0	4235
6:00 AM	32	4881	2496	4	259	49	6	14	369	5	8	4	0	0	0	8127
7:00 AM	17	5188	2247	7	274	28	1	19	294	4	3	2	0	0	0	8084
8:00 AM	18	4061	1900	8	289	18	1	23	378	1	2	1	0	0	0	6700
9:00 AM	10	3925	1761	4	295	50	7	23	515	10	4	2	0	0	0	6606
10:00 AM	22	3816	1856	9	312	61	6	32	519	20	1	0	0	0	0	6654
11:00 AM	22	3620	1908	10	333	64	6	30	481	10	1	0	0	0	0	6485
12:00 PM	25	3767	1960	13	362	45	8	26	561	19	5	1	0	0	0	6792
1:00 PM	15	3719	2054	8	367	63	8	27	581	14	2	2	0	0	0	6860
2:00 PM	20	4081	2144	7	313	58	9	24	469	12	3	1	0	0	0	7141
3:00 PM	28	4519	2343	10	260	47	13	19	434	16	1	0	0	0	0	7690
4:00 PM	38	5008	2558	14	270	38	6	14	366	6	0	1	0	0	0	8319
5:00 PM	42	5505	2692	8	236	16	0	18	277	4	0	4	0	0	0	8802
6:00 PM	28	4860	2376	9	191	13	3	15	425	3	3	1	0	0	0	7927
7:00 PM	29	3767	1889	7	145	26	4	12	454	5	8	1	0	0	0	6347
8:00 PM	15	2710	1189	9	125	15	0	16	403	6	6	5	0	0	0	4499
9:00 PM	14	2371	994	7	104	14	0	10	365	4	8	5	0	0	0	3896
10:00 PM	13	1778	791	14	85	11	0	13	448	2	24	14	0	0	0	3193
11:00 PM	9	1184	428	14	52	12	1	17	385	0	26	22	0	0	0	2150
TOTAL	439	74335	35974	199	4721	720	81	452	10290	157	192	160	0	0	0	127720

MANUAL COUNT DESIGN DATA - FHWA FORMAT

Station Number MS-190 **Direction**

Optional Misc. Info. (loc., etc.) IH 35, 1.5 Mi. S. of FM 1825; AUS Dist., Travis Co.

Year 2016

Type of Truck		Number of Trucks	Single Axles Mult.		Tandem Axle Sets Mult.	
Single Units						
Buses	4	199	2	398	0	0
2-D	5	4721	2	9442	0	0
3-Axle	6	720	1	720	1	720
4-Axle	7	81	1	81	1	81
Single Trailer						
3-4-Axle	8	452	2.5	1130.0	0.5	226.0
5-Axle	9	10290	1	10290	2	20580
6-Axle	10	157	1	157	2	314
Multi-Trailers						
5-Axle	11	192	5	960	0	0
6-Axle	12	160	4	640	1	160
7-Axle	13	0	3	0	2	0
Total		16972		23818.0		22081.0

(Singles + Tandems) / Total Trucks = Axle Factor	2.70
(Singles Axles / (Singles + Tandems))	0.52

Light Duty Vehicles	Motorcycles	439
	Passenger Cars	74335
	Pickup or Van	35974
Single Units	Buses	199
	Other 2 Axle	4721
	3 Axles	720
	4 Axles or more	81
Single Trailer	3-4 Axles	452
	5 Axles	10290
	6 Axles or more	157
Multi-Trailers	5 Axles or less	192
	6 Axles	160
	7 Axles or more	0

Light	110748
Medium	5146
Heavy	11826
Trucks	16972
Total Vehicles	127720
%T of Tot. Veh.	13.3
Num. of Trucks	16972
Axle Factor	2.70
% Single Axles	0.52

Texas Department of Transportation

MS2

Traffic Count Database System (TCDS)

Classification Report

Location ID	MS190FR	**Located On**	IH 35 Frontage Road	**County**	Travis
Counted By	TCDS_Combined			**Community**	Austin
Start Date	Thu 9/22/2016	**Loc On Alias**		**Station**	
Start Time	12:00:00 AM	**Direction**	2-WAY	**Agency**	Texas DOT
Source	Syst_Combine	**Sensor Type**		**Owner**	Bertha.Arellano
Axle Factor	0.981	**Count Status**	Accepted		
Filename					

FHWA-Scheme F Classification

Start Time	Motor cycle	Car	Pick up	Bus	2A SU	3A SU	>3A SU	<5A 2U	5A 2U	>5A 2U	<6A >2U	6A >2U	>6A >2U	14	15	TOTAL
12:00 AM	2	232	100	0	13	0	0	0	7	0	0	0	0	0	0	354
1:00 AM	2	145	63	0	9	0	0	0	4	0	0	0	0	0	0	223
2:00 AM	0	103	60	0	13	1	0	0	10	0	2	0	0	0	0	189
3:00 AM	2	124	68	0	10	1	0	3	9	0	1	0	0	0	0	218
4:00 AM	2	213	135	0	16	3	0	4	8	0	0	0	0	0	0	381
5:00 AM	3	604	370	6	38	5	0	3	34	0	0	0	0	0	0	1063
6:00 AM	3	1741	962	6	84	12	2	7	35	0	0	0	0	0	0	2852
7:00 AM	4	2596	1225	9	81	4	1	7	28	0	1	0	0	0	0	3956
8:00 AM	4	2370	1206	8	93	2	5	9	36	0	0	0	0	0	0	3733
9:00 AM	7	1929	1078	3	118	20	7	10	36	2	0	0	0	0	0	3210
10:00 AM	3	1584	822	4	130	12	2	7	34	2	0	0	0	0	0	2600
11:00 AM	5	1740	1092	5	157	9	7	6	28	1	0	0	0	0	0	3050
12:00 PM	10	2040	1227	2	162	13	3	5	39	1	0	0	0	0	0	3502
1:00 PM	5	2033	984	1	151	19	4	4	26	1	0	0	0	0	0	3228
2:00 PM	2	1896	985	3	99	14	5	8	33	1	0	0	0	0	0	3046
3:00 PM	5	2197	1192	7	110	13	4	6	32	1	0	0	0	0	0	3567
4:00 PM	7	2386	1550	4	113	9	6	11	29	1	0	0	0	0	0	4116
5:00 PM	6	2627	1633	4	103	3	3	5	22	0	0	0	0	0	0	4406
6:00 PM	6	2513	1462	7	75	1	5	5	17	1	0	0	0	0	0	4092
7:00 PM	8	1765	748	2	76	2	2	2	16	0	0	0	0	0	0	2621
8:00 PM	1	1464	633	2	54	3	0	1	11	1	6	0	0	0	0	2176
9:00 PM	4	1125	532	1	44	0	0	1	6	0	7	1	0	0	0	1721
10:00 PM	3	746	346	0	21	0	0	1	10	0	0	1	0	0	0	1128
11:00 PM	3	411	263	1	23	1	0	0	7	0	0	0	0	0	0	709
TOTAL	97	34584	18736	75	1793	147	56	105	517	12	17	2	0	0	0	56141

MANUAL COUNT DESIGN DATA - FHWA FORMAT

Station Number MS-190FR **Direction** ______ **Year** 2016

Optional Misc. Info. (loc., etc.) IH 35 FRs, 1.5 Mi. S. of FM 1825; AUS Dist., Travis Co.

Type of Truck		Number of Trucks	Single Axles Mult.		Tandem Axle Sets Mult.	
Single Units						
Buses	4	75	2	150	0	0
2-D	5	1793	2	3586	0	0
3-Axle	6	147	1	147	1	147
4-Axle	7	56	1	56	1	56
Single Trailer						
3-4-Axle	8	105	2.5	262.5	0.5	52.5
5-Axle	9	517	1	517	2	1034
6-Axle	10	12	1	12	2	24
Multi-Trailers						
5-Axle	11	17	5	85	0	0
6-Axle	12	2	4	8	1	2
7-Axle	13	0	3	0	2	0
Total		2724		4823.5		1315.5

(Singles + Tandems) / Total Trucks = Axle Factor	2.25
(Singles Axles / (Singles + Tandems))	0.79

Light Duty Vehicles	Motorcycles	97
	Passenger Cars	34584
	Pickup or Van	18736
Single Units	Buses	75
	Other 2 Axle	1793
	3 Axles	147
	4 Axles or more	56
Single Trailer	3-4 Axles	105
	5 Axles	517
	6 Axles or more	12
Multi-Trailers	5 Axles or less	17
	6 Axles	2
	7 Axles or more	0

Light	53417
Medium	1920
Heavy	804
Trucks	2724
Total Vehicles	56141
%T of Tot. Veh.	4.9
Num. of Trucks	2724
Axle Factor	2.25
% Single Axles	0.79

MANUAL COUNT DESIGN DATA - FHWA FORMAT

Station Number MS-190 (MLs & FRs) **Direction** ______ **Year** 2016

Optional Misc. Info. (loc., etc.) IH 35, 1.5 Mi. S. of FM 1825; AUS Dist., Travis Co.

Type of Truck		Number of Trucks	Single Axles Mult.	Single Axles	Tandem Axle Sets Mult.	Tandem Axle Sets
Single Units						
Buses	4	274	2	548	0	0
2-D	5	6514	2	13028	0	0
3-Axle	6	867	1	867	1	867
4-Axle	7	137	1	137	1	137
Single Trailer						
3-4-Axle	8	557	2.5	1392.5	0.5	278.5
5-Axle	9	10807	1	10807	2	21614
6-Axle	10	169	1	169	2	338
Multi-Trailers						
5-Axle	11	209	5	1045	0	0
6-Axle	12	162	4	648	1	162
7-Axle	13	0	3	0	2	0
Total		19696		28641.5		23396.5

(Singles + Tandems) / Total Trucks = Axle Factor	2.64
(Singles Axles / (Singles + Tandems))	0.55

Light Duty Vehicles	Motorcycles	536
	Passenger Cars	108919
	Pickup or Van	54710
Single Units	Buses	274
	Other 2 Axle	6514
	3 Axles	867
	4 Axles or more	137
Single Trailer	3-4 Axles	557
	5 Axles	10807
	6 Axles or more	169
Multi-Trailers	5 Axles or less	209
	6 Axles	162
	7 Axles or more	0

Light	164165
Medium	7066
Heavy	12630
Trucks	19696
Total Vehicles	183861
%T of Tot. Veh.	10.7
Num. of Trucks	19696
Axle Factor	2.64
% Single Axles	0.55

Texas Department of Transportation

MS2

Traffic Count Database System (TCDS)

Classification Report

Location ID	MS132	**Located On**	IH0035	**County**	Travis
Counted By	TCDS_Combined			**Community**	Austin
Start Date	Wed 10/19/2016	**Loc On Alias**	At Lady Bird Lake Bridge	**Station**	
Start Time	12:00:00 AM	**Direction**	2-WAY	**Agency**	Texas DOT
Source	Syst_Combine	**Sensor Type**		**Owner**	Bertha.Arellano
Axle Factor	0.907	**Count Status**	Accepted		
Filename					

FHWA-Scheme F Classification

Start Time	Motor cycle	Car	Pick up	Bus	2A SU	3A SU	>3A SU	<5A 2U	5A 2U	>5A 2U	<6A >2U	6A >2U	>6A >2U	14	15	TOTAL
12:00 AM	12	1398	496	7	74	5	0	3	352	5	34	24	0	0	0	2410
1:00 AM	10	1047	378	7	59	12	0	10	345	6	29	26	0	0	0	1929
2:00 AM	13	994	350	5	59	17	0	10	372	5	23	19	0	0	0	1867
3:00 AM	9	655	273	2	71	20	3	10	370	1	18	21	0	0	0	1453
4:00 AM	7	817	371	3	81	36	2	20	421	2	11	15	0	0	0	1786
5:00 AM	13	2288	1128	17	196	39	4	24	465	4	11	14	0	0	0	4203
6:00 AM	29	4238	2193	20	270	74	8	19	305	8	7	3	0	0	0	7174
7:00 AM	10	4571	2369	44	370	22	4	17	252	2	5	0	0	0	0	7666
8:00 AM	23	4284	2256	34	595	34	0	17	298	2	6	1	0	0	0	7550
9:00 AM	24	4503	2408	39	910	56	3	30	572	2	7	1	0	0	0	8555
10:00 AM	17	4982	2564	22	824	54	5	33	506	7	5	3	0	0	0	9022
11:00 AM	23	5640	2684	44	749	53	8	23	489	11	2	3	0	0	0	9729
12:00 PM	24	5153	2681	30	479	70	8	23	539	8	5	1	0	0	0	9021
1:00 PM	33	5254	2717	35	404	76	6	19	538	6	7	1	0	0	0	9096
2:00 PM	34	5248	2825	31	402	54	6	20	436	8	3	0	0	0	0	9067
3:00 PM	28	5164	2740	20	377	49	4	11	446	7	4	1	0	0	0	8851
4:00 PM	25	5296	2703	33	320	13	2	9	326	5	3	1	0	0	0	8736
5:00 PM	25	5123	2431	24	262	17	4	7	315	5	1	1	0	0	0	8215
6:00 PM	30	5333	2390	15	250	5	2	7	425	5	6	1	0	0	0	8469
7:00 PM	30	5379	2603	22	230	14	2	8	480	7	3	2	0	0	0	8780
8:00 PM	33	5504	2327	15	149	11	1	11	443	7	9	7	0	0	0	8517
9:00 PM	31	5164	1764	13	121	11	2	13	340	4	7	5	0	0	0	7475
10:00 PM	24	3896	1498	29	137	11	1	8	395	3	15	9	0	0	0	6026
11:00 PM	29	2958	1042	17	84	10	0	14	397	2	21	11	0	0	0	4585
TOTAL	536	94889	45191	528	7473	763	75	366	9827	122	242	170	0	0	0	160182

MANUAL COUNT DESIGN DATA - FHWA FORMAT

Station Number MS-132 **Direction** ______ **Year** 2016

Optional Misc. Info. (loc., etc.) IH 35, at Lady Bird Lake Bridge; AUS Dist., Travis Co.

Type of Truck		Number of Trucks	Single Axles Mult.		Tandem Axle Sets Mult.	
Single Units						
Buses	4	528	2	1056	0	0
2-D	5	7473	2	14946	0	0
3-Axle	6	763	1	763	1	763
4-Axle	7	75	1	75	1	75
Single Trailer						
3-4-Axle	8	366	2.5	915.0	0.5	183.0
5-Axle	9	9827	1	9827	2	19654
6-Axle	10	122	1	122	2	244
Multi-Trailers						
5-Axle	11	242	5	1210	0	0
6-Axle	12	170	4	680	1	170
7-Axle	13	0	3	0	2	0
Total		19566		29594.0		21089.0

(Singles + Tandems) / Total Trucks = Axle Factor	2.59
(Singles Axles / (Singles + Tandems))	0.58

Light Duty Vehicles	Motorcycles	536
	Passenger Cars	94889
	Pickup or Van	45191
Single Units	Buses	528
	Other 2 Axle	7473
	3 Axles	763
	4 Axles or more	75
Single Trailer	3-4 Axles	366
	5 Axles	9827
	6 Axles or more	122
Multi-Trailers	5 Axles or less	242
	6 Axles	170
	7 Axles or more	0

Light	140616
Medium	8184
Heavy	11382
Trucks	19566
Total Vehicles	160182
%T of Tot. Veh.	12.2
Num. of Trucks	19566
Axle Factor	2.59
% Single Axles	0.58

Texas Department of Transportation

MS2

Traffic Count Database System (TCDS)

Classification Report

Location ID	MS132FR	**Located On**	IH 35 Frontage Road	**County**	Travis
Counted By	TCDS_Combined			**Community**	Austin
Start Date	Wed 10/19/2016	**Loc On Alias**		**Station**	
Start Time	12:00:00 AM	**Direction**	2-WAY	**Agency**	Texas DOT
Source	Syst_Combine	**Sensor Type**		**Owner**	Bertha.Arellano
Axle Factor	0.996	**Count Status**	Accepted		
Filename					

FHWA-Scheme F Classification

Start Time	Motor cycle	Car	Pick up	Bus	2A SU	3A SU	>3A SU	<5A 2U	5A 2U	>5A 2U	<6A >2U	6A >2U	>6A >2U	14	15	TOTAL
12:00 AM	5	419	132	1	4	0	0	0	3	0	0	0	0	0	0	564
1:00 AM	5	309	96	0	9	1	0	0	0	0	0	0	0	0	0	420
2:00 AM	1	218	58	0	2	3	0	0	2	0	0	0	0	0	0	284
3:00 AM	2	123	44	0	8	3	0	0	1	0	0	0	0	0	0	181
4:00 AM	1	123	51	0	9	1	0	0	1	0	0	0	0	0	0	186
5:00 AM	1	274	120	0	16	5	0	1	0	0	0	0	0	0	0	417
6:00 AM	6	763	434	12	29	2	0	1	4	0	0	0	0	0	0	1251
7:00 AM	10	1584	756	34	38	4	0	0	1	0	0	0	0	0	0	2427
8:00 AM	9	1849	761	38	55	3	0	1	8	0	0	0	0	0	0	2724
9:00 AM	11	1392	648	44	73	8	1	0	2	1	0	0	0	0	0	2180
10:00 AM	11	1257	631	26	38	7	0	2	6	1	0	0	0	0	0	1979
11:00 AM	11	1534	680	31	62	5	0	1	3	0	0	0	0	0	0	2327
12:00 PM	14	1706	790	24	63	2	0	1	5	0	0	0	0	0	0	2605
1:00 PM	15	1602	740	31	76	11	0	1	3	0	0	0	0	0	0	2479
2:00 PM	14	1765	802	38	68	2	0	0	4	0	0	0	0	0	0	2693
3:00 PM	15	2005	819	33	57	5	1	0	9	0	0	0	0	0	0	2944
4:00 PM	13	2093	938	32	77	2	0	2	8	0	0	0	0	0	0	3165
5:00 PM	21	2526	1032	29	61	3	0	2	5	0	0	0	0	0	0	3679
6:00 PM	13	2313	841	19	50	0	0	1	5	0	0	0	0	0	0	3242
7:00 PM	18	1829	753	8	41	1	0	0	3	0	0	0	0	0	0	2653
8:00 PM	9	1378	428	7	26	0	0	0	0	0	0	0	0	0	0	1848
9:00 PM	10	1118	339	10	20	0	0	0	0	0	0	0	0	0	0	1497
10:00 PM	7	998	286	4	11	0	0	0	1	0	0	0	0	0	0	1307
11:00 PM	12	794	183	3	9	1	0	1	2	0	0	0	0	0	0	1005
TOTAL	234	29972	12362	424	902	69	2	14	76	2	0	0	0	0	0	44057

MANUAL COUNT DESIGN DATA - FHWA FORMAT

Station Number MS-132FR **Direction** ______ **Year** 2016

Optional Misc. Info. (loc., etc.) IH 35 FRs, at Lady Bird Lake Bridge; AUS Dist., Travis Co.

Type of Truck		Number of Trucks	Single Axles Mult.		Tandem Axle Sets Mult.	
Single Units						
Buses	4	424	2	848	0	0
2-D	5	902	2	1804	0	0
3-Axle	6	69	1	69	1	69
4-Axle	7	2	1	2	1	2
Single Trailer						
3-4-Axle	8	14	2.5	35.0	0.5	7.0
5-Axle	9	76	1	76	2	152
6-Axle	10	2	1	2	2	4
Multi-Trailers						
5-Axle	11	0	5	0	0	0
6-Axle	12	0	4	0	1	0
7-Axle	13	0	3	0	2	0
Total		1489		2836.0		234.0

(Singles + Tandems) / Total Trucks = Axle Factor	2.06
(Singles Axles / (Singles + Tandems))	0.92

Light Duty Vehicles	Motorcycles	234
	Passenger Cars	29972
	Pickup or Van	12362
Single Units	Buses	424
	Other 2 Axle	902
	3 Axles	69
	4 Axles or more	2
Single Trailer	3-4 Axles	14
	5 Axles	76
	6 Axles or more	2
Multi-Trailers	5 Axles or less	0
	6 Axles	0
	7 Axles or more	0

Light	42568
Medium	1333
Heavy	156
Trucks	1489
Total Vehicles	44057
%T of Tot. Veh.	3.4
Num. of Trucks	1489
Axle Factor	2.06
% Single Axles	0.92

MANUAL COUNT DESIGN DATA - FHWA FORMAT

Station Number MS-132 (MLs & FRs) **Direction** ______ **Year** 2016

Optional Misc. Info. (loc., etc.) IH 35, at Lady Bird Lake Bridge; AUS Dist., Travis Co.

Type of Truck		Number of Trucks	Single Axles Mult.	Single Axles	Tandem Axle Sets Mult.	Tandem Axle Sets
Single Units						
Buses	4	952	2	1904	0	0
2-D	5	8375	2	16750	0	0
3-Axle	6	832	1	832	1	832
4-Axle	7	77	1	77	1	77
Single Trailer						
3-4-Axle	8	380	2.5	950.0	0.5	190.0
5-Axle	9	9903	1	9903	2	19806
6-Axle	10	124	1	124	2	248
Multi-Trailers						
5-Axle	11	242	5	1210	0	0
6-Axle	12	170	4	680	1	170
7-Axle	13	0	3	0	2	0
Total		21055		32430.0		21323.0

(Singles + Tandems) / Total Trucks = Axle Factor	2.55
(Singles Axles / (Singles + Tandems))	0.60

Light Duty Vehicles	Motorcycles	770
	Passenger Cars	124861
	Pickup or Van	57553
Single Units	Buses	952
	Other 2 Axle	8375
	3 Axles	832
	4 Axles or more	77
Single Trailer	3-4 Axles	380
	5 Axles	9903
	6 Axles or more	124
Multi-Trailers	5 Axles or less	242
	6 Axles	170
	7 Axles or more	0

Light	183184
Medium	9517
Heavy	11538
Trucks	21055
Total Vehicles	204239
%T of Tot. Veh.	10.3
Num. of Trucks	21055
Axle Factor	2.55
% Single Axles	0.60

Texas Department of Transportation

MS2

Traffic Count Database System (TCDS)

Classification Report

Location ID	HP871	**Located On**	IH 35	**County**	Travis
Counted By	TCDS_Combined			**Community**	Austin
Start Date	Tue 10/28/2014 ✓	**Loc On Alias**	0.3 Miles North of SH 71	**Station**	
Start Time	12:00:00 AM	**Direction**	2-WAY	**Agency**	Texas DOT
Source	Syst_Combine	**Sensor Type**		**Owner**	Bertha.Arellano
Axle Factor	0.899	**Count Status**	Accepted		
Filename					

FHWA-Scheme F Classification

Start Time	Motor cycle	Car	Pick up	Bus	2A SU	3A SU	>3A SU	<5A 2U	5A 2U	>5A 2U	<6A >2U	6A >2U	>6A >2U	14	15	TOTAL
12:00 AM	18	1525	219	19	42	13	0	17	321	4	50	5	0	0	0	2233
1:00 AM	8	846	101	3	33	14	0	24	339	0	41	14	0	0	0	1423
2:00 AM	5	789	190	2	48	14	0	28	331	1	40	4	0	0	0	1452
3:00 AM	6	664	145	9	42	18	0	31	345	0	37	6	0	0	0	1303
4:00 AM	5	982	227	20	99	33	0	35	335	1	45	9	0	0	0	1791
5:00 AM	18	3088	458	34	164	41	0	44	380	1	32	7	0	0	0	4267
6:00 AM	32	6012	1921	78	194	60	0	49	281	1	15	5	0	0	0	8648
7:00 AM	25	5846	1827	31	164	41	1	22	245	0	8	6	0	0	0	8216
8:00 AM	20	5303	1826	39	177	30	1	19	352	1	5	2	0	0	0	7775
9:00 AM	31	5659	2352	44	239	47	1	30	516	2	13	2	0	0	0	8936
10:00 AM	25	6442	1730	21	248	70	2	12	557	11	9	2	0	0	0	9129
11:00 AM	27	5787	2171	29	257	73	2	27	601	12	10	2	0	0	0	8998
12:00 PM	33	5935	2145	10	245	59	1	19	546	9	9	1	0	0	0	9012
1:00 PM	33	6269	1807	20	223	52	1	19	563	3	5	2	0	0	0	8997
2:00 PM	35	6144	1678	70	195	52	1	19	518	4	3	1	0	0	0	8720
3:00 PM	19	4445	1633	24	154	25	1	13	476	2	1	2	0	0	0	6795
4:00 PM	25	5142	1684	28	115	20	0	10	452	2	7	3	0	0	0	7488
5:00 PM	30	5447	1704	26	94	18	0	11	320	1	0	1	0	0	0	7652
6:00 PM	28	5929	1446	17	116	18	0	10	446	0	7	1	0	0	0	8018
7:00 PM	48	6328	1427	16	121	19	1	24	544	5	4	1	0	0	0	8538
8:00 PM	28	5455	1352	19	109	18	0	28	439	1	16	3	0	0	0	7468
9:00 PM	29	4890	1021	18	87	14	0	34	424	1	21	5	0	0	0	6544
10:00 PM	18	3580	788	18	68	14	0	24	372	0	22	4	0	0	0	4908
11:00 PM	26	2786	545	18	48	7	0	22	369	1	32	5	0	0	0	3859
TOTAL	572	105293	30397	613	3282	770	12	571	10072	63	432	93	0	0	0	152170

$\frac{15908}{152170}$ = 10.5% ✓

Trucks

Texas Department of Transportation

MS2
Traffic Count Database System (TCDS)

Classification Report

Location ID	HP871	**Located On**	IH 35	**County**	Travis
Counted By	TCDS_Combined preliminary			**Community**	Austin
Start Date	Wed 12/6/2017 DRAFT	**Loc On Alias**	0.3 Miles North of SH 71	**Station**	
Start Time	12:00:00 AM	**Direction**	2-WAY	**Agency**	Texas DOT
Source	TCDS_BIN_IMPORT_COMBINE	**Sensor Type**		**Owner**	Bertha.Arellano
Axle Factor	0.9	**Count Status**	Accepted		
Filename					

FHWA-Scheme F Classification

Start Time	Motor cycle	Car	Pick up	Bus	2A SU	3A SU	>3A SU	<5A 2U	5A 2U	>5A 2U	<6A >2U	6A >2U	>6A >2U	14	15	TOTAL
12:00 AM	0	2061	490	7	63	13	0	10	417	0	36	10	0	0	0	3107
1:00 AM	1	1091	230	8	58	15	0	5	482	0	32	5	0	0	0	1927
2:00 AM	0	907	166	4	45	11	0	9	480	0	37	2	0	0	0	1661
3:00 AM	1	672	143	6	73	15	0	12	432	1	35	4	0	0	0	1394
4:00 AM	0	1220	241	15	95	16	0	21	498	3	43	4	0	0	0	2156
5:00 AM	1	3667	839	18	129	19	0	26	447	2	26	1	0	0	0	5175
6:00 AM	3	5565	1262	48	144	15	0	11	305	1	5	1	0	0	0	7360
7:00 AM	2	5930	1311	32	113	8	2	17	183	0	3	1	0	0	0	7602
8:00 AM	1	5135	964	31	166	16	1	17	293	0	0	0	0	0	0	6624
9:00 AM	2	5515	1456	16	273	27	0	31	439	2	3	4	0	0	0	7768
10:00 AM	2	5727	1619	9	258	34	0	36	471	2	6	0	0	0	0	8164
11:00 AM	3	5476	1591	17	223	39	0	39	482	4	5	1	0	0	0	7880
12:00 PM	11	5347	1435	13	217	26	1	44	437	8	2	0	0	0	0	7541
1:00 PM	3	5576	1433	22	226	26	0	35	554	5	2	0	0	0	0	7882
2:00 PM	3	5840	1498	37	290	25	1	34	370	1	3	0	0	0	0	8102
3:00 PM	0	6142	1574	32	251	25	1	20	445	3	2	0	0	0	0	8495
4:00 PM	1	7006	1320	27	143	15	0	15	283	2	1	0	0	0	0	8813
5:00 PM	4	7305	1209	25	125	7	0	8	277	0	1	0	0	0	0	8961
6:00 PM	0	6902	1037	26	130	3	0	11	387	1	1	0	0	0	0	8498
7:00 PM	0	6651	867	17	109	10	0	8	519	1	3	0	0	0	0	8185
8:00 PM	0	4673	1064	14	87	18	0	13	445	0	7	3	0	0	0	6324
9:00 PM	0	4303	955	13	85	15	0	24	483	0	11	3	0	0	0	5892
10:00 PM	1	3138	674	12	69	11	0	35	442	0	10	5	0	0	0	4397
11:00 PM	0	2248	540	14	39	12	0	36	445	0	12	5	0	0	0	3351
TOTAL	39	108097	23918	463	3411	421	6	517	10016	36	286	49	0	0	0	147259

$\frac{15205}{147259}$ = 10.3% Trucks

MANUAL COUNT DESIGN DATA - FHWA FORMAT

Station Number HP-871 **Direction** ____ **Year** 2014

Optional Misc. Info. (loc., etc.) IH 35, 0.3 Mi. N. of SH 71; AUS Dist., Travis Co.

Type of Truck		Number of Trucks	Single Axles Mult.		Tandem Axle Sets Mult.	
Single Units						
Buses	4	613	2	1226	0	0
2-D	5	3282	2	6564	0	0
3-Axle	6	770	1	770	1	770
4-Axle	7	12	1	12	1	12
Single Trailer						
3-4-Axle	8	571	2.5	1427.5	0.5	285.5
5-Axle	9	10072	1	10072	2	20144
6-Axle	10	63	1	63	2	126
Multi-Trailers						
5-Axle	11	432	5	2160	0	0
6-Axle	12	93	4	372	1	93
7-Axle	13	0	3	0	2	0
Total		15908		22666.5		21430.5

(Singles + Tandems) / Total Trucks = Axle Factor	2.77
(Singles Axles / (Singles + Tandems))	0.51

Light Duty Vehicles	Motorcycles	572
	Passenger Cars	105293
	Pickup or Van	30397
Single Units	Buses	613
	Other 2 Axle	3282
	3 Axles	770
	4 Axles or more	12
Single Trailer	3-4 Axles	571
	5 Axles	10072
	6 Axles or more	63
Multi-Trailers	5 Axles or less	432
	6 Axles	93
	7 Axles or more	0

Light	136262
Medium	4180
Heavy	11728
Trucks	15908
Total Vehicles	152170
%T of Tot. Veh.	10.5
Num. of Trucks	15908
Axle Factor	2.77
% Single Axles	0.51

Texas Department of Transportation

MS2

Traffic Count Database System (TCDS)

Classification Report

Location ID	MS4	**Located On**	IH 35	**County**	Travis
Counted By	TCDS_Combined			**Community**	Austin
Start Date	Thu 9/29/2016	**Loc On Alias**	0.3 Miles South of FM 1626	**Station**	
Start Time	12:00:00 AM	**Direction**	2-WAY	**Agency**	Texas DOT
Source	Syst_Combine	**Sensor Type**		**Owner**	Bertha.Arellano
Axle Factor	0.883	**Count Status**	Accepted		
Filename					

FHWA-Scheme F Classification

Start Time	Motor cycle	Car	Pick up	Bus	2A SU	3A SU	>3A SU	<5A 2U	5A 2U	>5A 2U	<6A >2U	6A >2U	>6A >2U	14	15	TOTAL
12:00 AM	4	917	208	3	27	18	2	3	570	3	24	4	0	0	0	1783
1:00 AM	2	491	212	6	25	21	1	4	506	0	29	9	0	0	0	1306
2:00 AM	0	377	169	6	35	28	4	4	448	1	45	5	0	0	0	1122
3:00 AM	0	353	181	6	44	27	4	13	425	0	35	8	0	0	0	1096
4:00 AM	4	790	368	9	64	24	3	16	497	1	49	13	0	0	0	1838
5:00 AM	12	2746	1507	7	114	58	5	30	526	1	22	5	0	0	0	5033
6:00 AM	25	4497	1955	8	172	54	9	28	335	1	5	3	0	0	0	7092
7:00 AM	10	4430	1525	6	153	52	2	24	234	1	1	2	0	0	0	6440
8:00 AM	18	4293	1601	4	179	47	5	34	325	6	3	0	0	0	0	6515
9:00 AM	18	4262	1553	10	213	67	3	46	538	7	7	4	0	0	0	6728
10:00 AM	29	4259	1634	8	243	82	4	44	475	7	3	1	0	0	0	6789
11:00 AM	11	4417	1623	6	205	79	7	50	426	12	2	0	0	0	0	6838
12:00 PM	11	3228	1188	3	169	70	9	34	354	6	5	0	0	0	0	5077
1:00 PM	24	4931	1833	18	246	111	4	44	577	22	3	1	0	0	0	7814
2:00 PM	20	5348	1874	6	236	95	2	41	545	11	1	0	0	0	0	8179
3:00 PM	34	5429	1900	13	215	75	5	34	461	11	2	0	0	0	0	8179
4:00 PM	34	6139	2113	10	149	52	4	25	396	6	0	0	0	0	0	8928
5:00 PM	27	5995	2086	11	121	35	2	17	320	2	0	0	0	0	0	8616
6:00 PM	42	5410	1956	5	97	29	3	28	374	8	0	2	0	0	0	7954
7:00 PM	24	5053	1592	6	101	14	1	13	466	5	5	1	0	0	0	7281
8:00 PM	18	4220	1372	7	73	28	0	14	516	2	13	0	0	0	0	6263
9:00 PM	23	2939	954	9	49	14	0	14	268	0	9	1	0	0	0	4280
10:00 PM	10	2378	656	10	39	12	5	6	297	0	21	4	0	0	0	3438
11:00 PM	2	1731	450	5	37	14	4	8	380	0	13	2	0	0	0	2646
TOTAL	402	84633	30510	182	3006	1106	88	574	10259	113	297	65	0	0	0	131235

MANUAL COUNT DESIGN DATA - FHWA FORMAT

Station Number MS-4 **Direction** ______ **Year** 2016

Optional Misc. Info. (loc., etc.) IH 35, 0.3 Mi. S. of FM 1626; AUS Dist., Travis Co.

Type of Truck		Number of Trucks	Single Axles		Tandem Axle Sets	
Single Units			Mult.		Mult.	
Buses	4	182	2	364	0	0
2-D	5	3006	2	6012	0	0
3-Axle	6	1106	1	1106	1	1106
4-Axle	7	88	1	88	1	88
Single Trailer						
3-4-Axle	8	574	2.5	1435.0	0.5	287.0
5-Axle	9	10259	1	10259	2	20518
6-Axle	10	113	1	113	2	226
Multi-Trailers						
5-Axle	11	297	5	1485	0	0
6-Axle	12	65	4	260	1	65
7-Axle	13	0	3	0	2	0
Total		15690		21122.0		22290.0

(Singles + Tandems) / Total Trucks = Axle Factor	2.77
(Singles Axles / (Singles + Tandems))	0.49

Light Duty Vehicles	Motorcycles	402
	Passenger Cars	84633
	Pickup or Van	30510
Single Units	Buses	182
	Other 2 Axle	3006
	3 Axles	1106
	4 Axles or more	88
Single Trailer	3-4 Axles	574
	5 Axles	10259
	6 Axles or more	113
Multi-Trailers	5 Axles or less	297
	6 Axles	65
	7 Axles or more	0

Light	115545
Medium	3475
Heavy	12215
Trucks	15690
Total Vehicles	131235
%T of Tot. Veh.	12.0
Num. of Trucks	15690
Axle Factor	2.77
% Single Axles	0.49

Transportation Planning and Programming Division's
Statewide Traffic Analysis and Reporting System II

High Hourly Volumes for Year for 1/1/2016 - 12/31/2016

District : Austin
County : Travis
Community : Round Rock
Route: 1.9 miles south of FM1825
On Road: IH0035
Location ID : S190
Collection Type : PERM
AADT: 133,194
Roadbed : ML

Ordinal High Hour	Date	Day of Week	Hour	Volume	K Factor	Peak Direction	Directional Distribution
1	1/17/2016	Sunday	1pm-2pm	10604	8	NB	63
2	1/28/2016	Thursday	12pm-1pm	10549	7.9	NB	66
3	1/19/2016	Tuesday	3pm-4pm	10533	7.9	NB	66
4	2/8/2016	Monday	11am-12pm	10304	7.7	NB	66
5	2/2/2016	Tuesday	1pm-2pm	10042	7.5	NB	67
6	2/11/2016	Thursday	12pm-1pm	9897	7.4	NB	64
7	1/17/2016	Sunday	2pm-3pm	9777	7.3	NB	60
8	2/11/2016	Thursday	2pm-3pm	9716	7.3	NB	64
9	2/2/2016	Tuesday	2pm-3pm	9675	7.3	NB	65
10	2/15/2016	Monday	2pm-3pm	9648	7.2	NB	61
20	1/11/2016	Monday	4pm-5pm	9287	7	NB	62
25	6/22/2016	Wednesday	7am-8am	9200	6.9	SB	59
30	1/8/2016	Friday	6pm-7pm	9164	6.9	NB	58
35	4/13/2016	Wednesday	7am-8am	9144	6.9	SB	59
40	1/27/2016	Wednesday	5pm-6pm	9128	6.9	NB	57
45	4/14/2016	Thursday	7am-8am	9099	6.8	SB	58
50	1/30/2016	Saturday	12pm-1pm	9088	6.8	NB	58
75	4/29/2016	Friday	3pm-4pm	9014	6.8	NB	56
100	11/17/2016	Thursday	6am-7am	8967	6.7	SB	61
125	1/8/2016	Friday	10am-11am	8917	6.7	NB	62
150	10/25/2016	Tuesday	6am-7am	8881	6.7	SB	63
175	7/5/2016	Tuesday	7am-8am	8846	6.6	SB	60
200	8/23/2016	Tuesday	7am-8am	8806	6.6	SB	60

Generated 5/10/2018

This information has been prepared for internal use within the
Texas Department of Transportation.
Accuracy is limited to the validity of available data as of date shown.

Transportation Planning and Programming Division's
Statewide Traffic Analysis and Reporting System II

High Hourly Volumes for Year for 1/1/2016 - 12/31/2016

District : Austin
County : Travis
Community : Austin
Route: North of Town Lake Bridge
On Road: IH0035
Location ID : S132
Collection Type : PERM
AADT: 202,393
Roadbed : ML

Ordinal High Hour	Date	Day of Week	Hour	Volume	K Factor	Peak Direction	Directional Distribution
1	8/5/2016	Friday	7pm-8pm	12721	6.3	NB	53
2	10/18/2016	Tuesday	7am-8am	12719	6.3	NB	53
3	2/13/2016	Saturday	10am-11am	12711	6.3	NB	51
4	3/5/2016	Saturday	9am-10am	12710	6.3	NB	51
5	3/5/2016	Saturday	10am-11am	12560	6.2	SB	50
6	10/16/2016	Sunday	11am-12pm	12544	6.2	NB	51
7	10/9/2016	Sunday	11am-12pm	12525	6.2	NB	51
8	2/25/2016	Thursday	7am-8am	12512	6.2	NB	59
9	10/2/2016	Sunday	11am-12pm	12498	6.2	NB	51
10	2/17/2016	Wednesday	7am-8am	12471	6.2	NB	58
20	8/27/2016	Saturday	6pm-7pm	12390	6.1	SB	52
25	1/30/2016	Saturday	12pm-1pm	12353	6.1	SB	51
30	4/15/2016	Friday	7am-8am	12341	6.1	NB	58
35	4/19/2016	Tuesday	7am-8am	12317	6.1	NB	58
40	2/20/2016	Saturday	12pm-1pm	12299	6.1	NB	50
45	2/2/2016	Tuesday	7am-8am	12277	6.1	NB	59
50	2/6/2016	Saturday	11am-12pm	12253	6.1	SB	51
75	1/26/2016	Tuesday	12pm-1pm	12198	6	SB	51
100	2/16/2016	Tuesday	12pm-1pm	12134	6	SB	52
125	3/25/2016	Friday	11am-12pm	12083	6	SB	51
150	2/6/2016	Saturday	12pm-1pm	12041	5.9	SB	51
175	2/11/2016	Thursday	8am-9am	12005	5.9	NB	60
200	4/12/2016	Tuesday	7am-8am	11976	5.9	NB	58

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Texas Department of Transportation.
Accuracy is limited to the validity of available data as of date shown.

Transportation Planning and Programming Division's
Statewide Traffic Analysis and Reporting System II

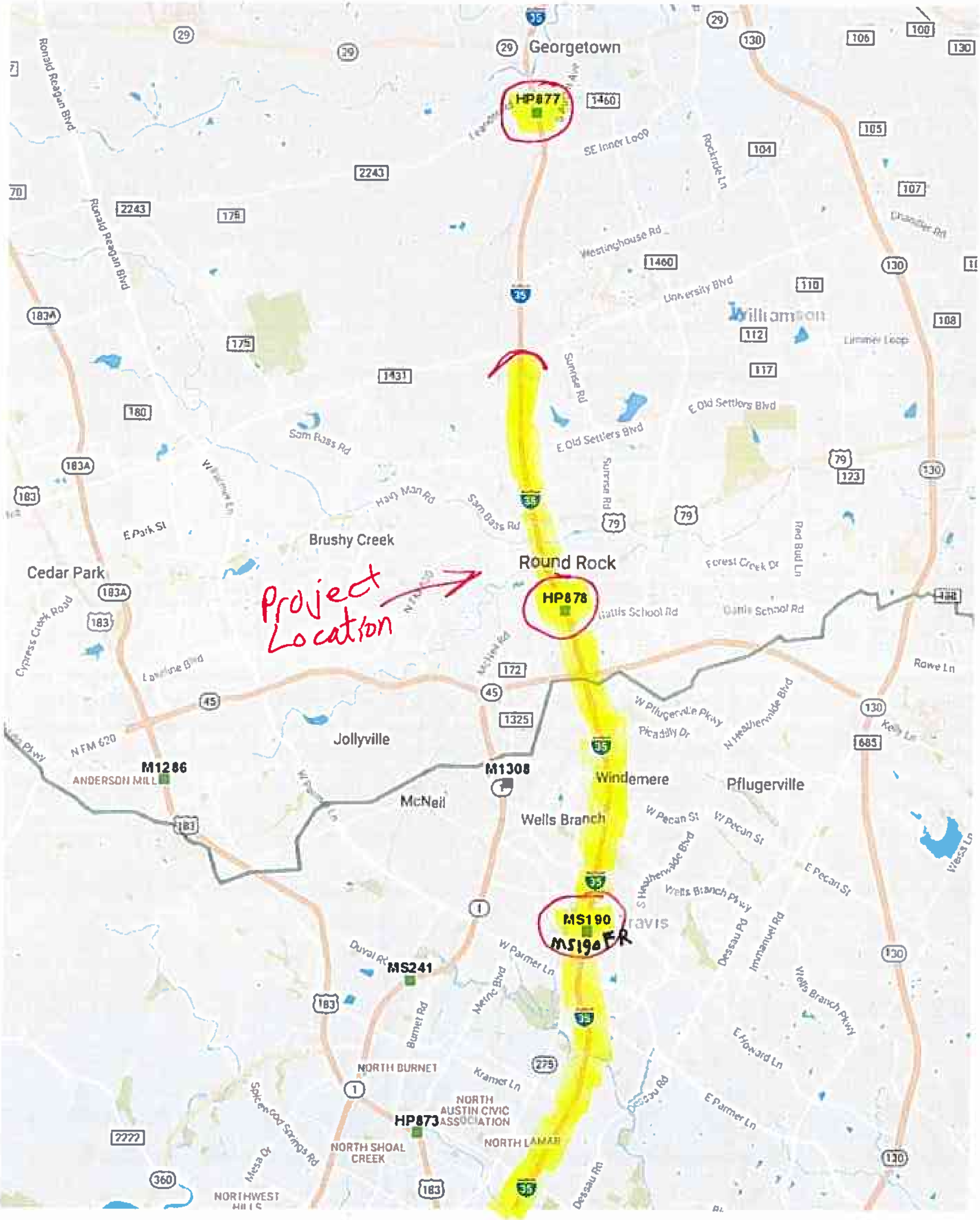
High Hourly Volumes for Year for 1/1/2016 - 12/31/2016

District : Austin
County : Travis
Community : Austin
Route: 0.3 miles south of FM1626, S. Austin
On Road: IH0035
Location ID : S4
Collection Type : PERM
AADT: 131,764
Roadbed : ML

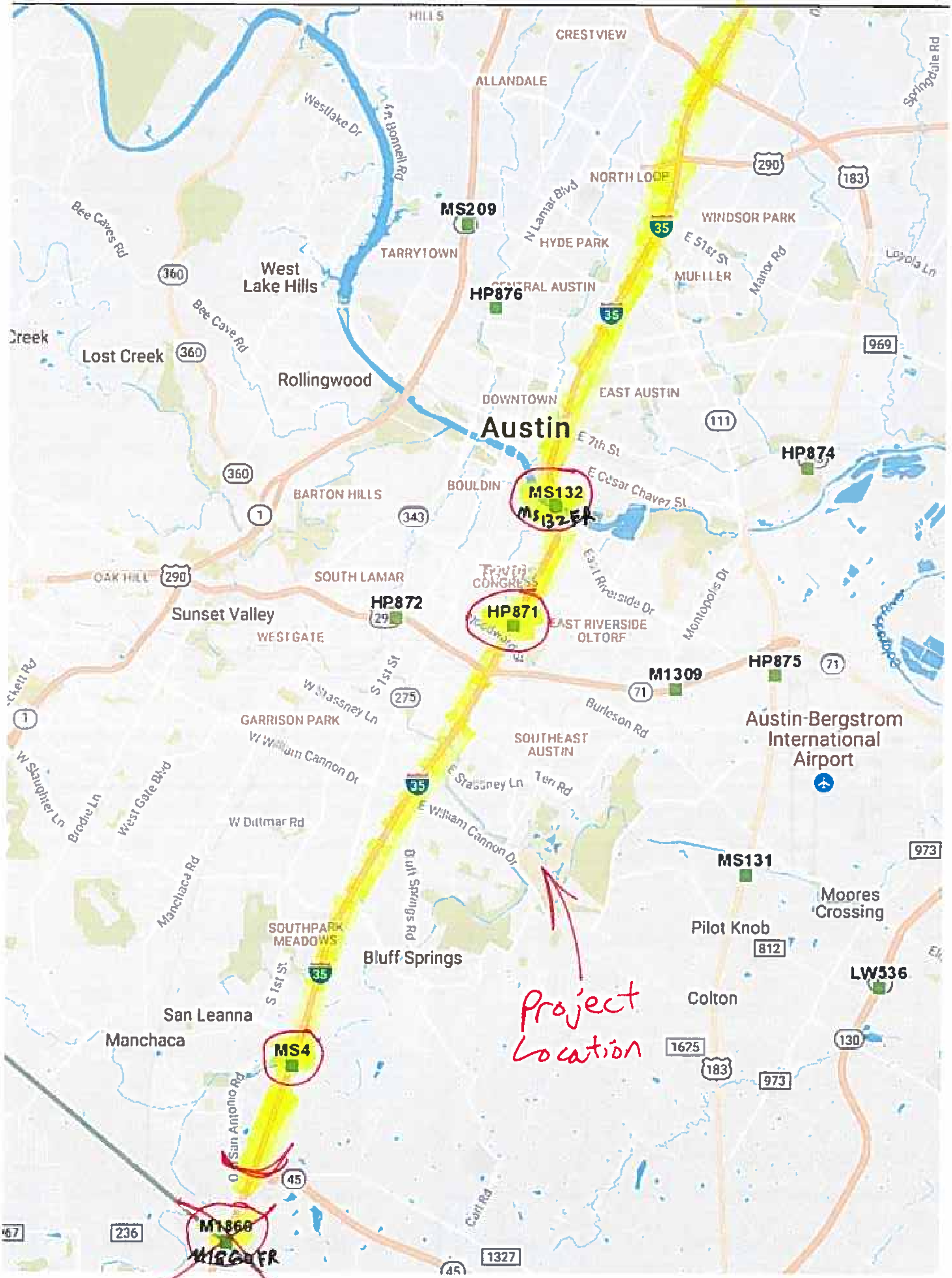
Ordinal High Hour	Date	Day of Week	Hour	Volume	K Factor	Peak Direction	Directional Distribution
1	11/24/2016	Thursday	11am-12pm	9854	7.5	SB	55
2	11/5/2016	Saturday	4pm-5pm	9777	7.4	SB	52
3	10/15/2016	Saturday	3pm-4pm	9553	7.3	NB	51
4	4/7/2016	Thursday	5pm-6pm	9515	7.2	SB	53
5	2/20/2016	Saturday	2pm-3pm	9500	7.2	NB	50
6	4/23/2016	Saturday	3pm-4pm	9485	7.2	SB	50
7	6/19/2016	Sunday	11am-12pm	9443	7.2	NB	50
8	6/19/2016	Sunday	12pm-1pm	9436	7.2	NB	50
9	4/24/2016	Sunday	12pm-1pm	9432	7.2	NB	52
10	11/12/2016	Saturday	3pm-4pm	9402	7.1	SB	55
20	11/19/2016	Saturday	4pm-5pm	9334	7.1	SB	52
25	8/13/2016	Saturday	12pm-1pm	9318	7.1	SB	52
30	3/27/2016	Sunday	12pm-1pm	9308	7.1	SB	53
35	3/5/2016	Saturday	3pm-4pm	9287	7	SB	50
40	10/15/2016	Saturday	12pm-1pm	9272	7	NB	51
45	4/30/2016	Saturday	4pm-5pm	9247	7	SB	50
50	12/30/2016	Friday	2pm-3pm	9219	7	SB	53
75	11/19/2016	Saturday	3pm-4pm	9163	7	SB	51
100	4/23/2016	Saturday	4pm-5pm	9115	6.9	SB	51
125	5/13/2016	Friday	4pm-5pm	9080	6.9	SB	53
150	12/10/2016	Saturday	12pm-1pm	9041	6.9	SB	51
175	3/27/2016	Sunday	2pm-3pm	9008	6.8	SB	55
200	5/30/2016	Monday	1pm-2pm	8976	6.8	NB	51

Generated 5/25/2018

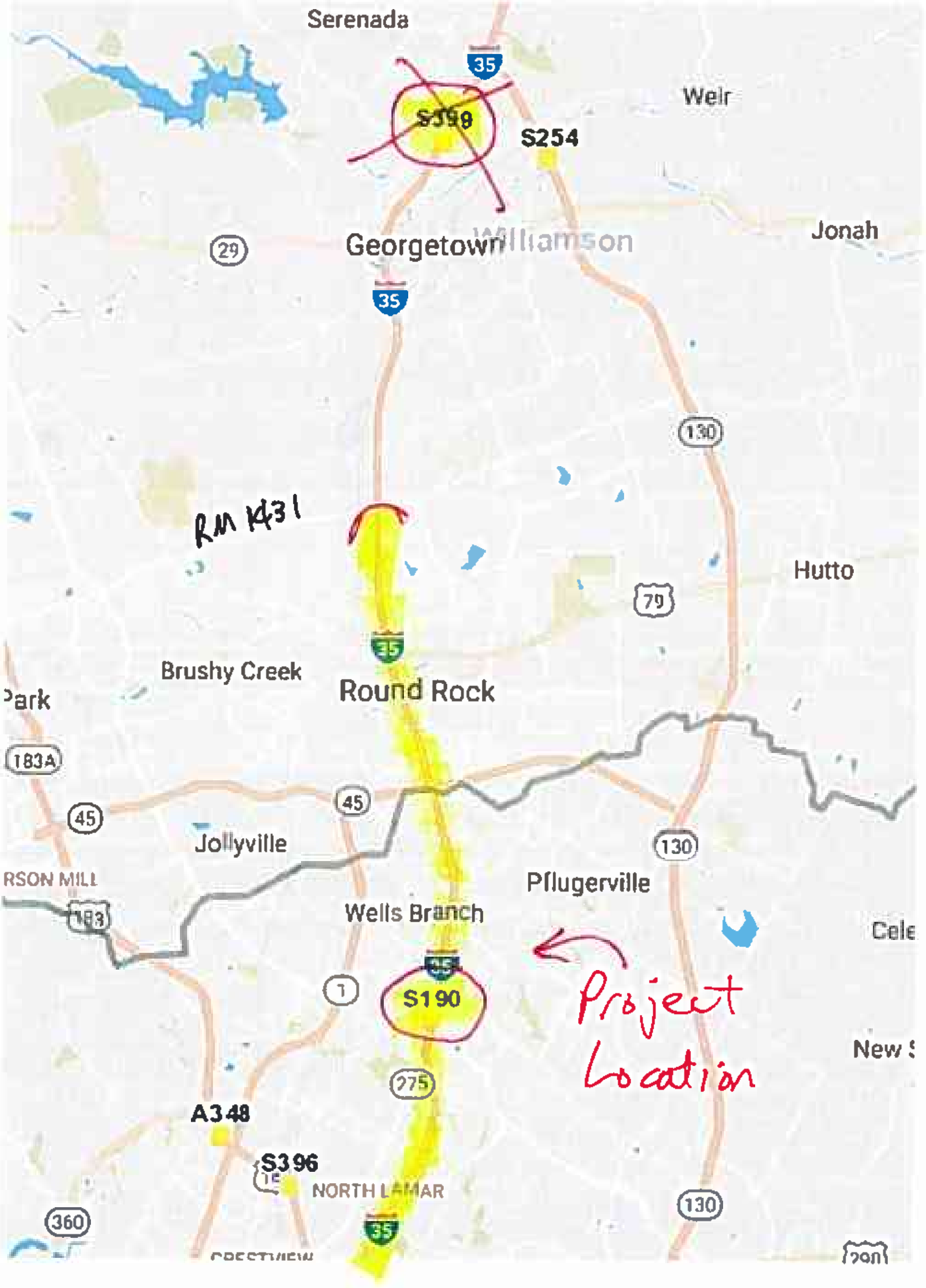
This information has been prepared for internal use within the
Texas Department of Transportation.
Accuracy is limited to the validity of available data as of date shown.



MC Location Map sheet 1of 2

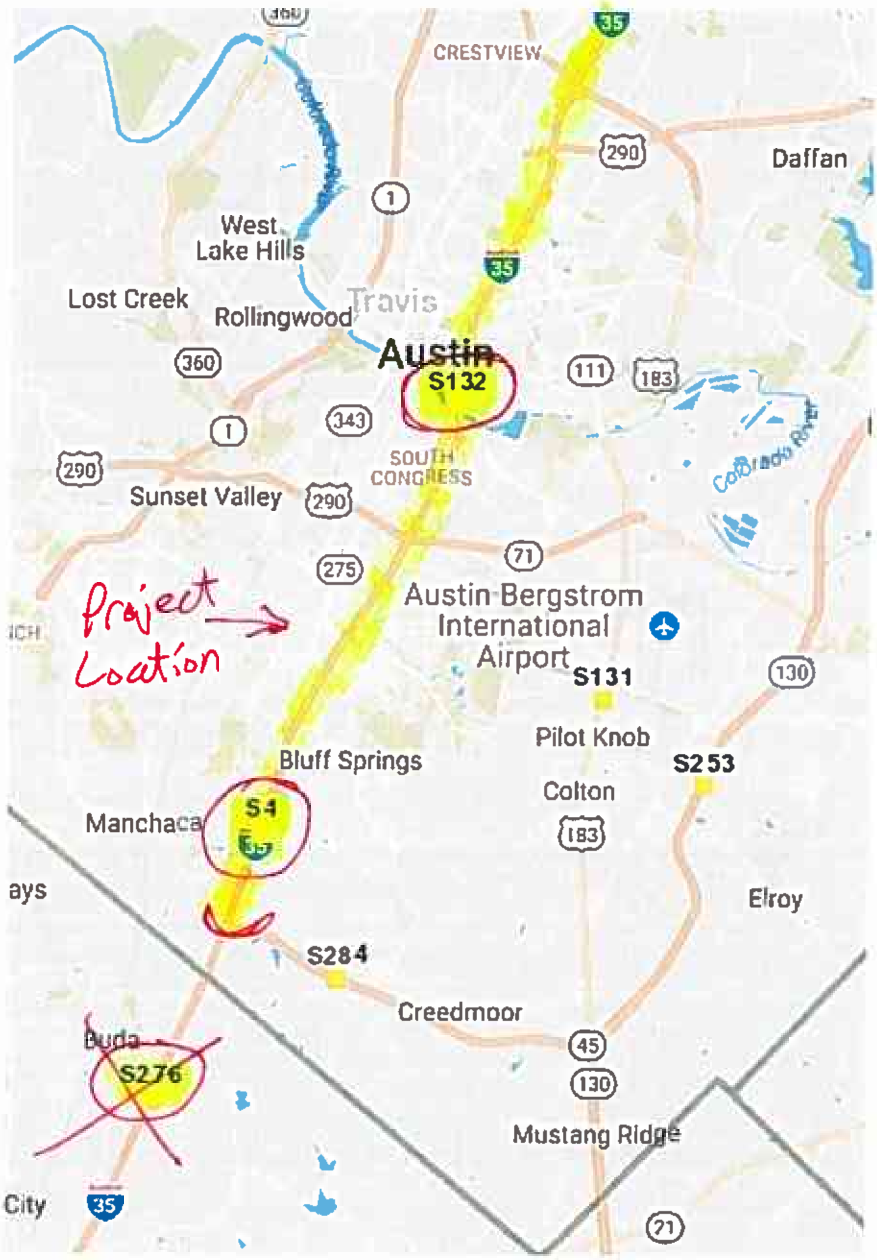


Mc Location Map   sheet 2 of 2



SP Location Map

Sheet 1 of 2



SP Location Map

Sheet 2 of 2

Texas
Department
of Transportation

File

Past Projects

MEMO

October 7, 2016

To: Terry McCoy, P.E., District Engineer
Attention: Lorena Eche~~verria~~ De Misi, P.E., Director of TPD

Through: William E. Knowles, P.E,
Traffic Analysis Section Director, TPP

From: Lee Theobald
Transportation Analyst, TPP

Subject: Traffic Data
CSJ: 0015-10-062
I-35 (Mainlanes and Frontage Roads separate)
From FM 1431
To US 183
Travis and Williamson Counties

Attached are diagrams provided by Consultants depicting 2020, 2040 and 2050 average daily traffic volumes and turning movements from ramps to main lanes on I 35 from FM 1431 to US 183 for existing, no-build and build conditions. Also attached are tabulations showing traffic analysis for highway design for the 2020 to 2040 twenty year period and 2020 to 2050 thirty year period for the described limits of the route. Also included are tabulations showing data for use in air and noise analysis.

Due to differences in traffic volumes the project was separated into two sections.
Section 1: From FM 1431 to SH 45
Section 2: From SH 45 to US 183

Please refer to your Memo dated July 8, 2016.

If you have any questions or need additional information, please contact Lee Theobald at (512) 486-5143.

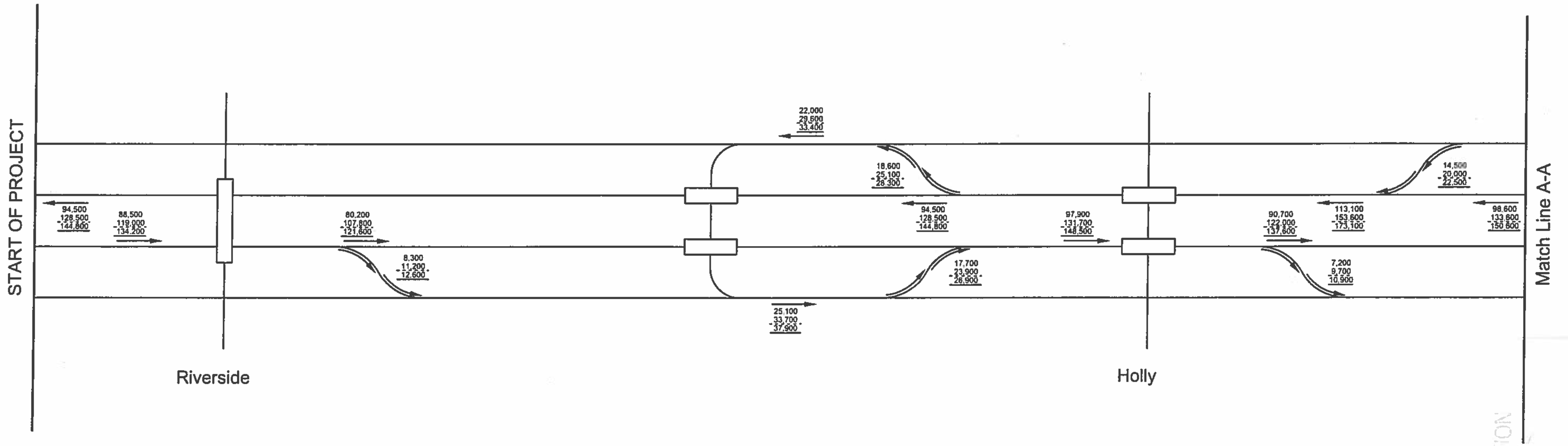
Attachments

Lot

CC: Carmen Ramos, Planner, Austin District
Design Division

EXISTING

NOT TO SCALE



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

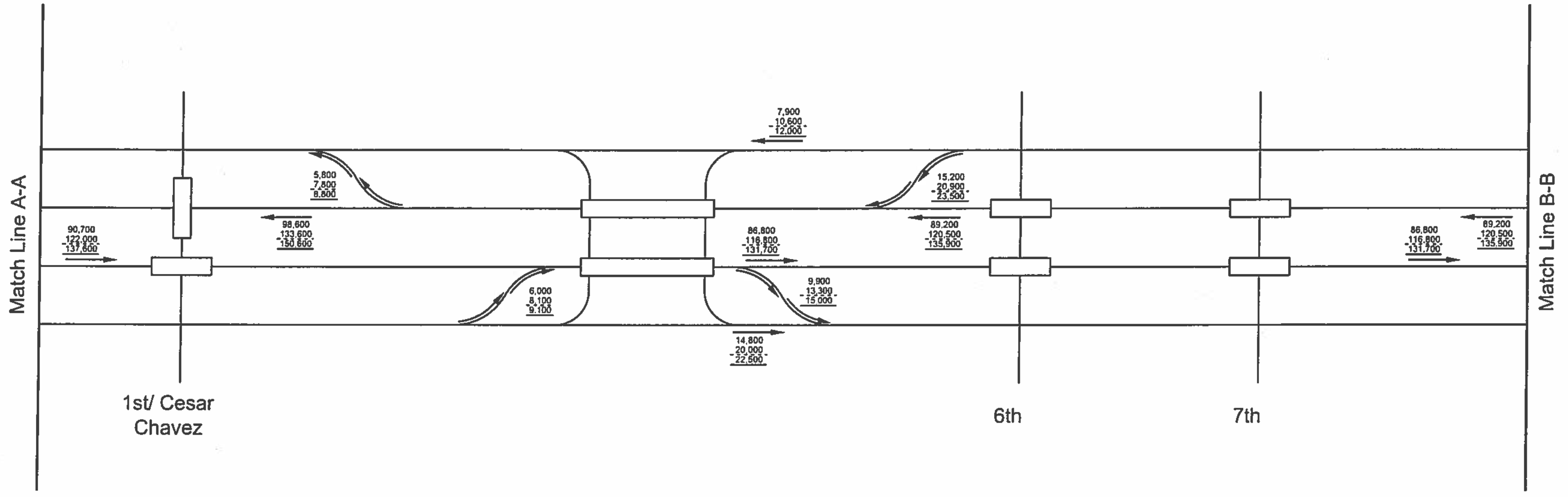
2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS ALONG I-35 FROM RIVERSIDE TO US 183

SHEET 1 OF 8

ALLIANCE TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

EXISTING

NOT TO SCALE



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM RIVERSIDE TO US 183

SHEET 2 OF 8

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

EXISTING

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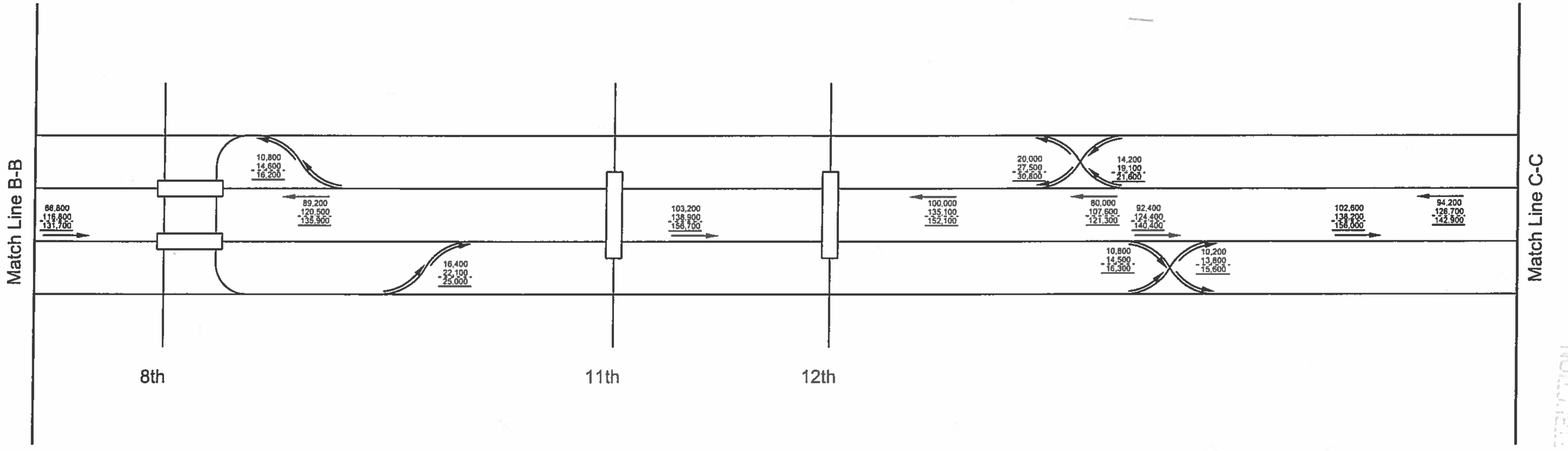

LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM RIVERSIDE TO US 183

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
[illegible] P.E.
Serial Number [illegible]

SHEET 3 OF 8

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
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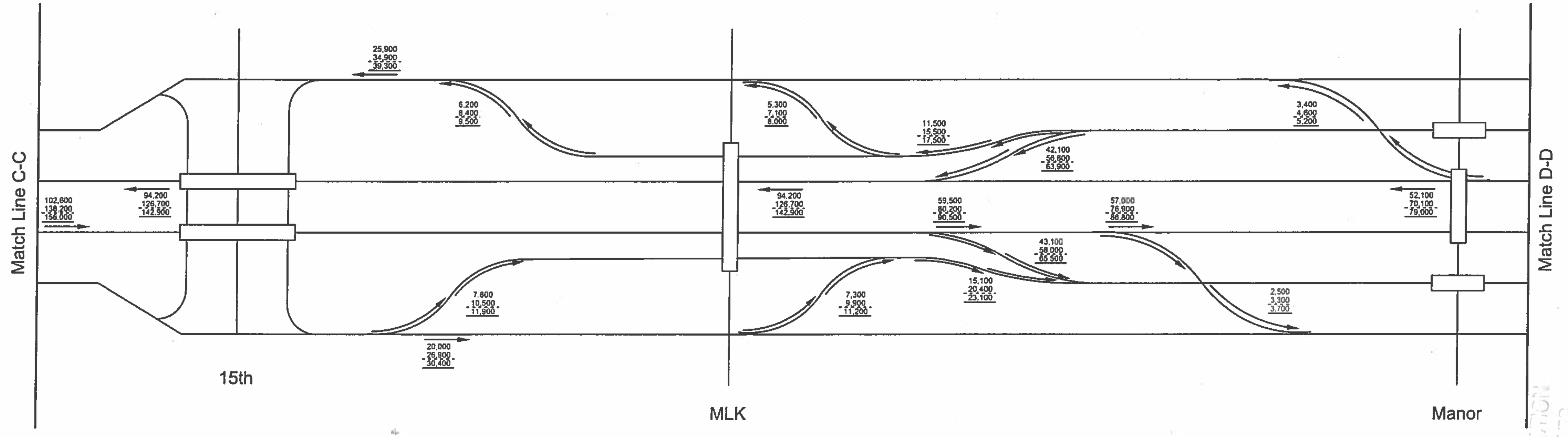

LEGEND

1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM RIVERSIDE TO US 183

Serial Number 84704

SHEET 4 OF 8

ALLIANCE
TRANSPORTATION GROUP
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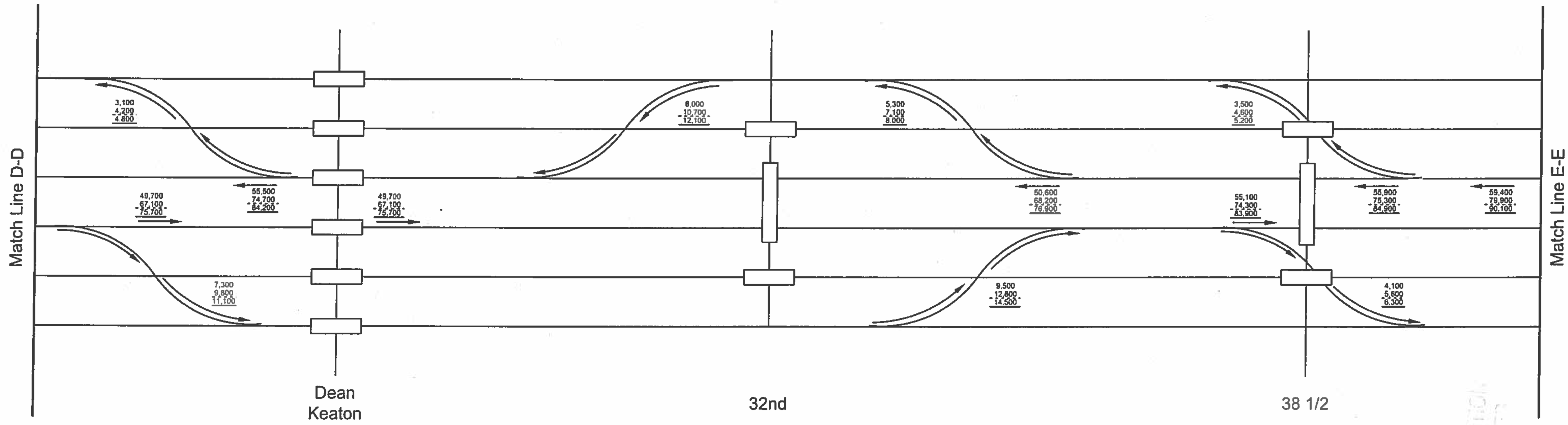

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM RIVERSIDE TO US 183

LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

SHEET 5 OF 8

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

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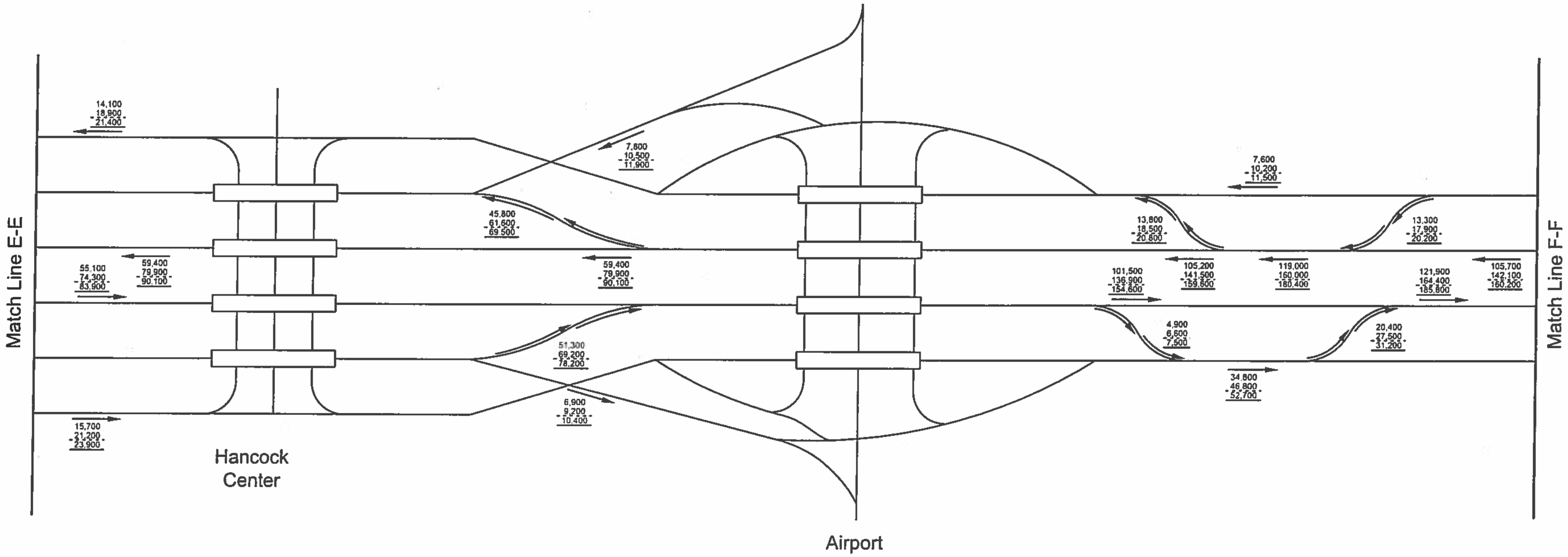

LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM RIVERSIDE TO US 183

SHEET 6 OF 8

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
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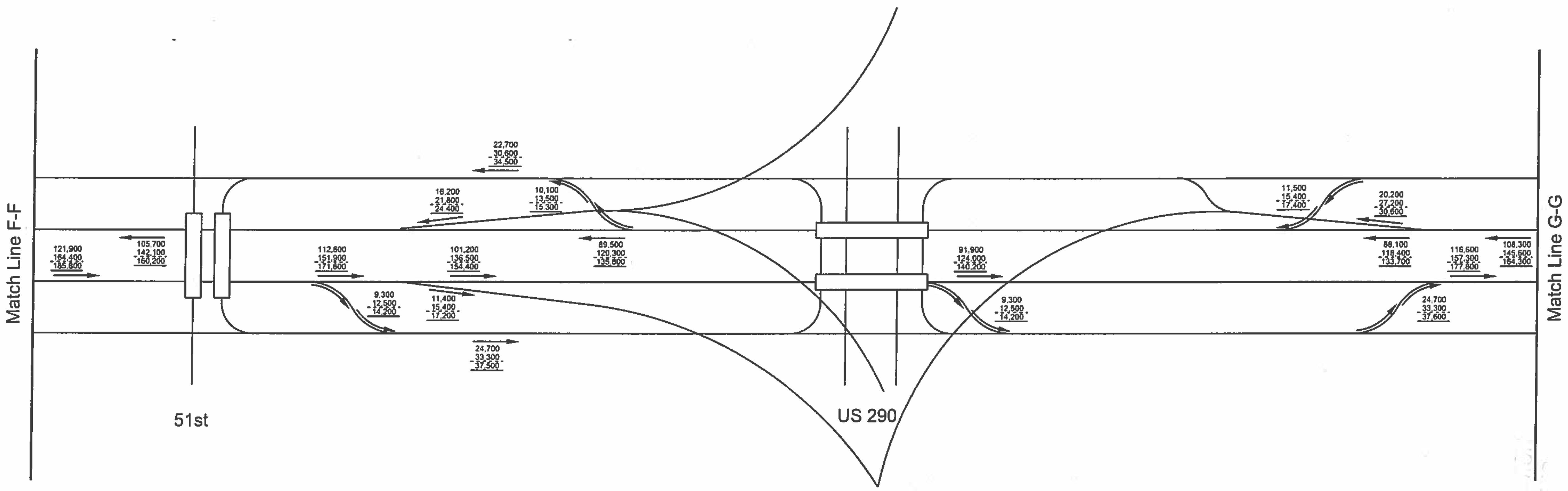


LEGEND

1000 - 2020 ADT

1000 - 2040 ADT

1000 - 2050 ADT

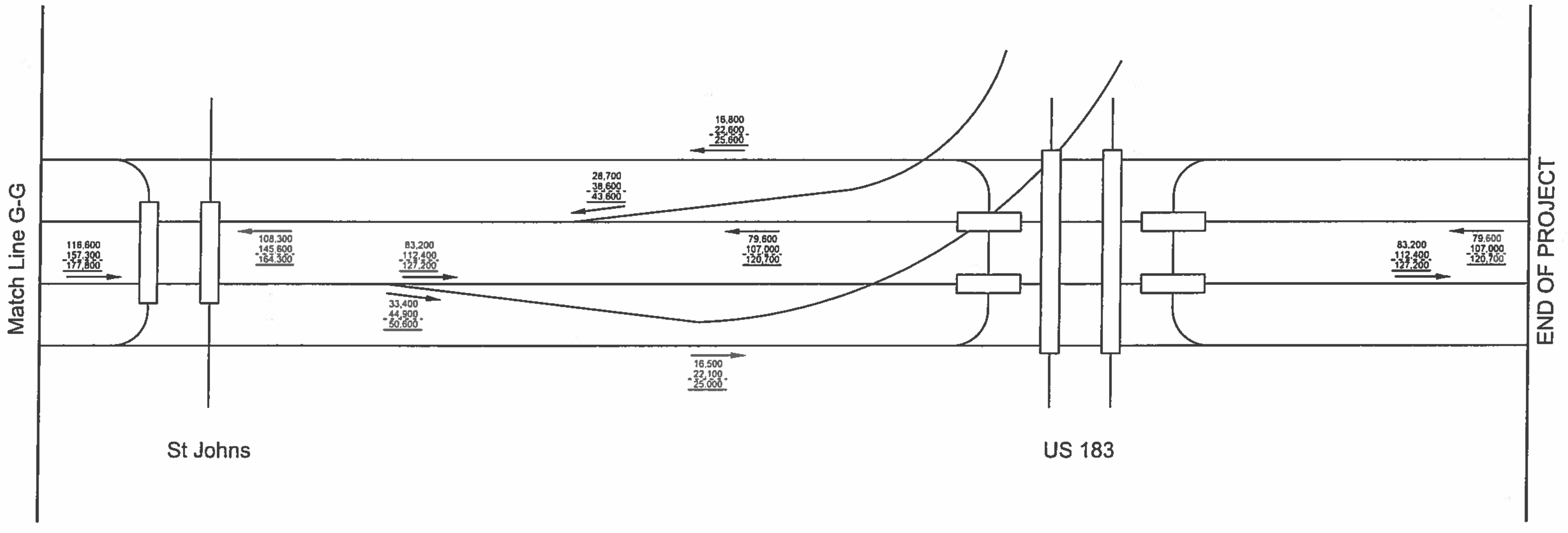
2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM RIVERSIDE TO US 183

SHEET 7 OF 8

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

EXISTING

NOT TO SCALE



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

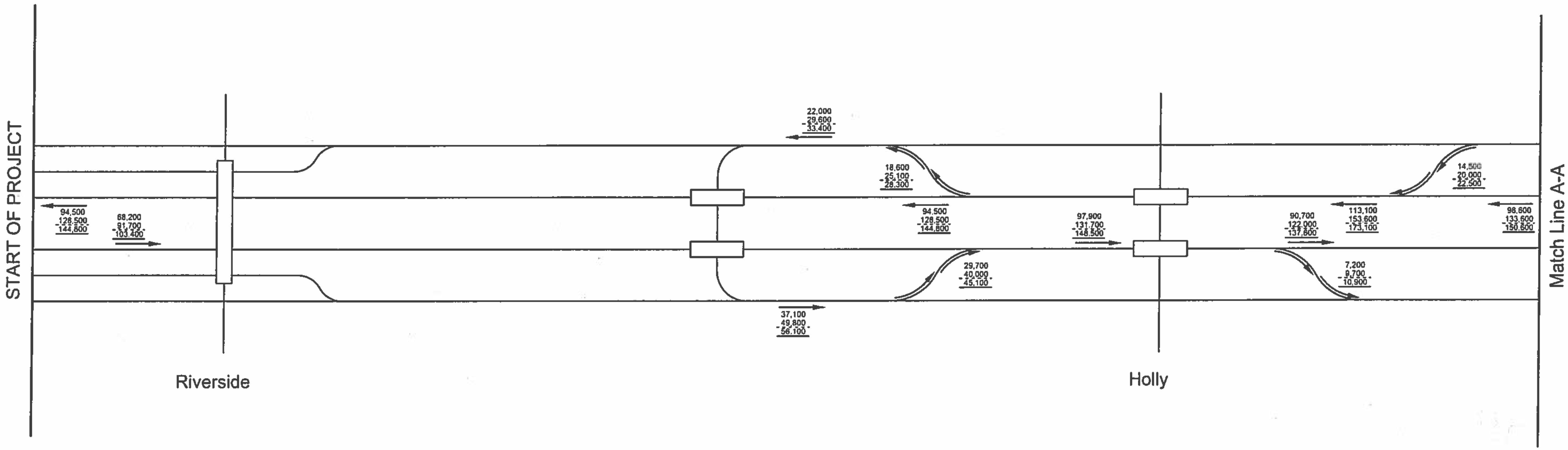
2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM RIVERSIDE TO US 183

SHEET 8 OF 8

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 612

NO-BUILD

NOT TO SCALE



LEGEND

1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

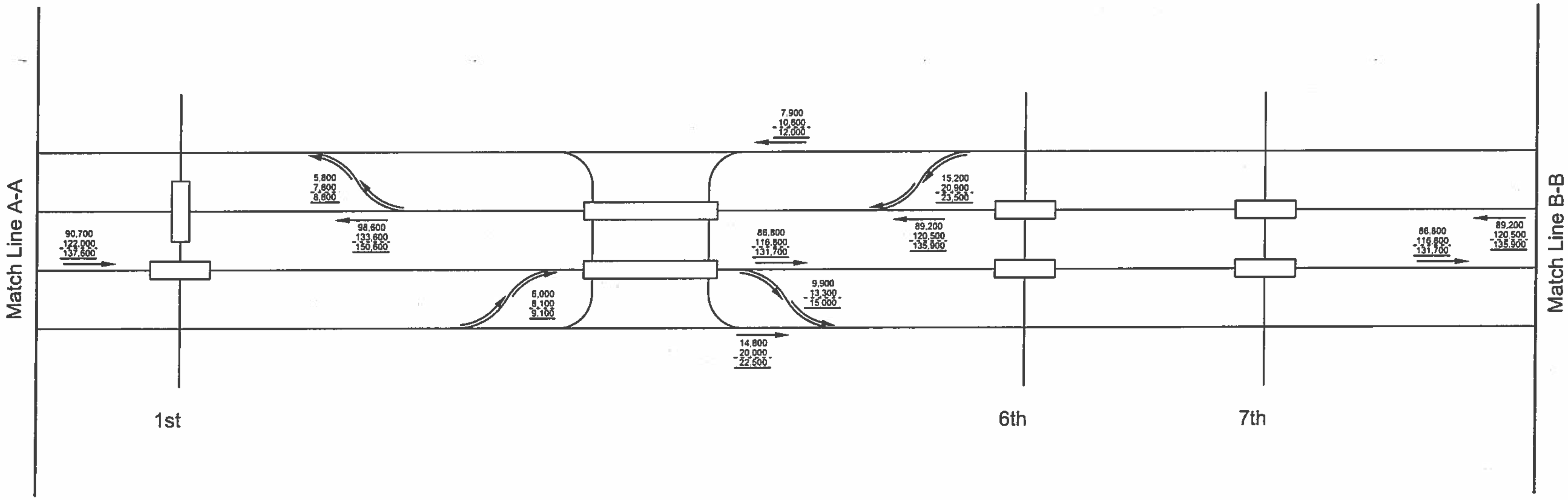
2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM RIVERSIDE TO US 183

SHEET 1 OF 8

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

NO-BUILD

NOT TO SCALE



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS ALONG I-35 FROM RIVERSIDE TO US 183

SHEET 2 OF 8

ALLIANCE
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NO-BUILD

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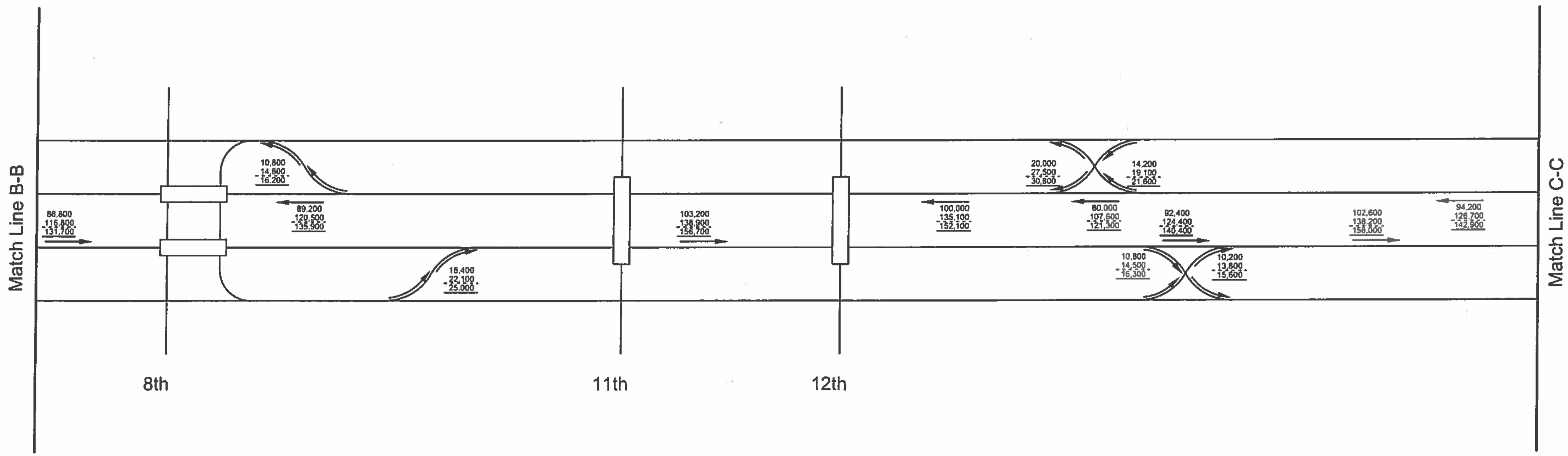

LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM RIVERSIDE TO US 183

SHEET 3 OF 8

ALLIANCE
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NO-BUILD

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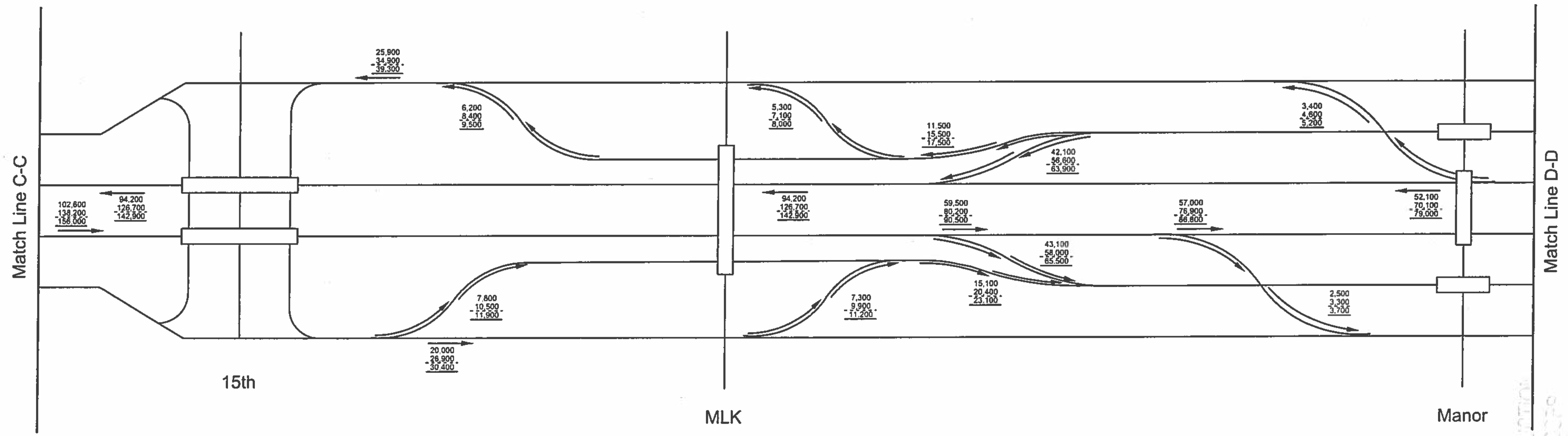

LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM RIVERSIDE TO US 183

SHEET 4 OF 8

ALLIANCE
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11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

NO-BUILD

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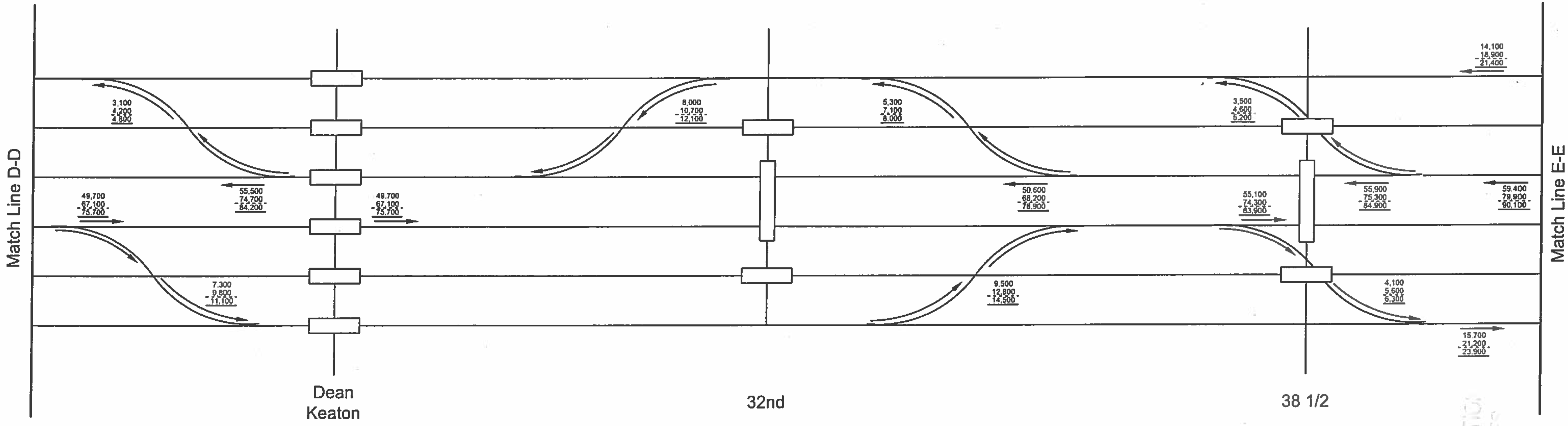

LEGEND

1000 - 2020 ADT

1000 - 2040 ADT

1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM RIVERSIDE TO US 183

SHEET 5 OF 8

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

NO-BUILD

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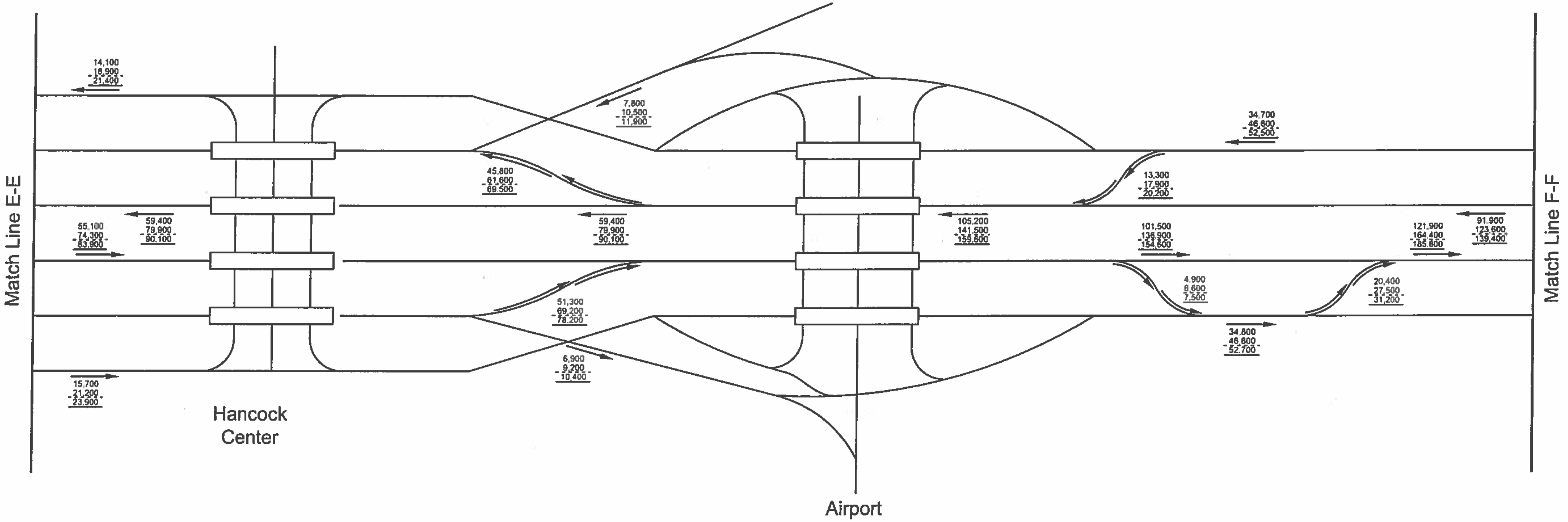

LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
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2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM RIVERSIDE TO US 183

SHEET 6 OF 8

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NO-BUILD

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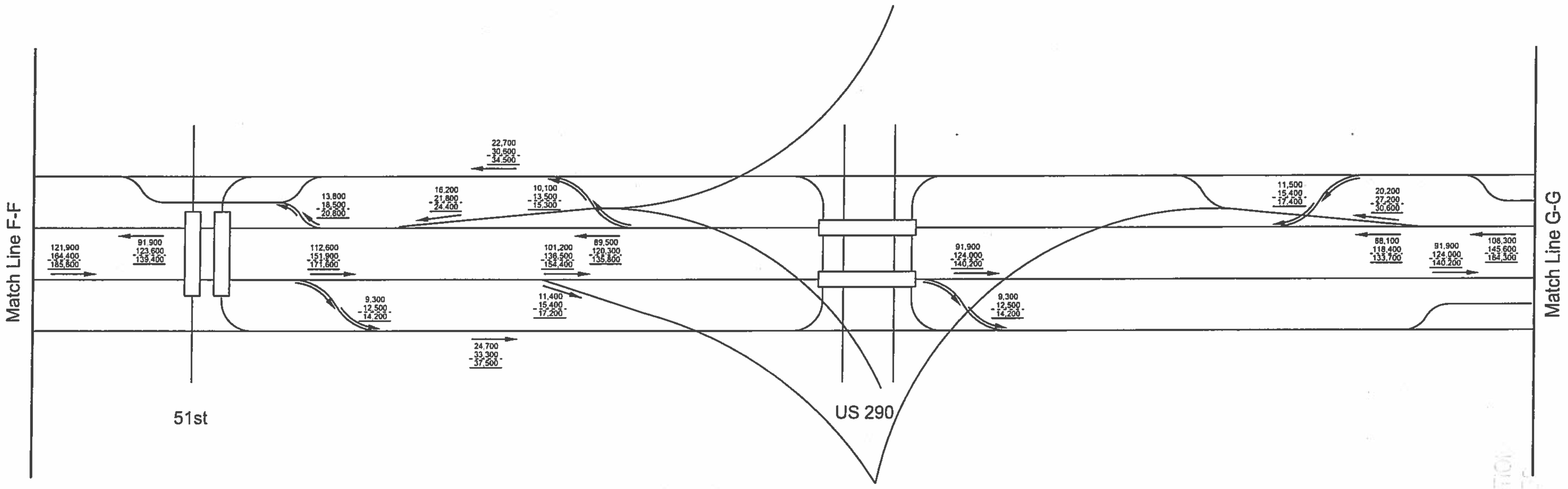

LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM RIVERSIDE TO US 183

SHEET 7 OF 8

ALLIANCE
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11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
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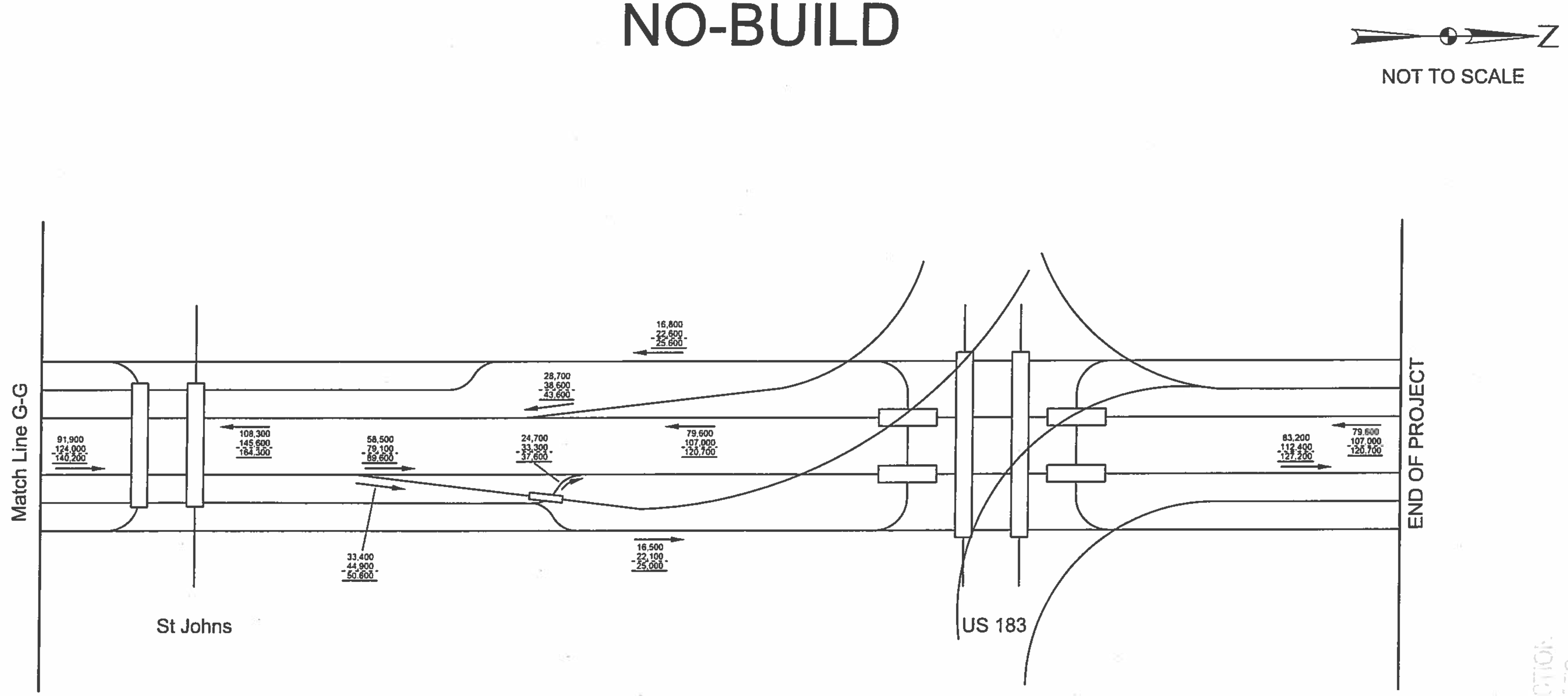
NO-BUILD



LEGEND
1000 - 2020 ADT
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2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM RIVERSIDE TO US 183

SHEET 8 OF 8

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TBPE Firm Registration No. F - 812

BUILD

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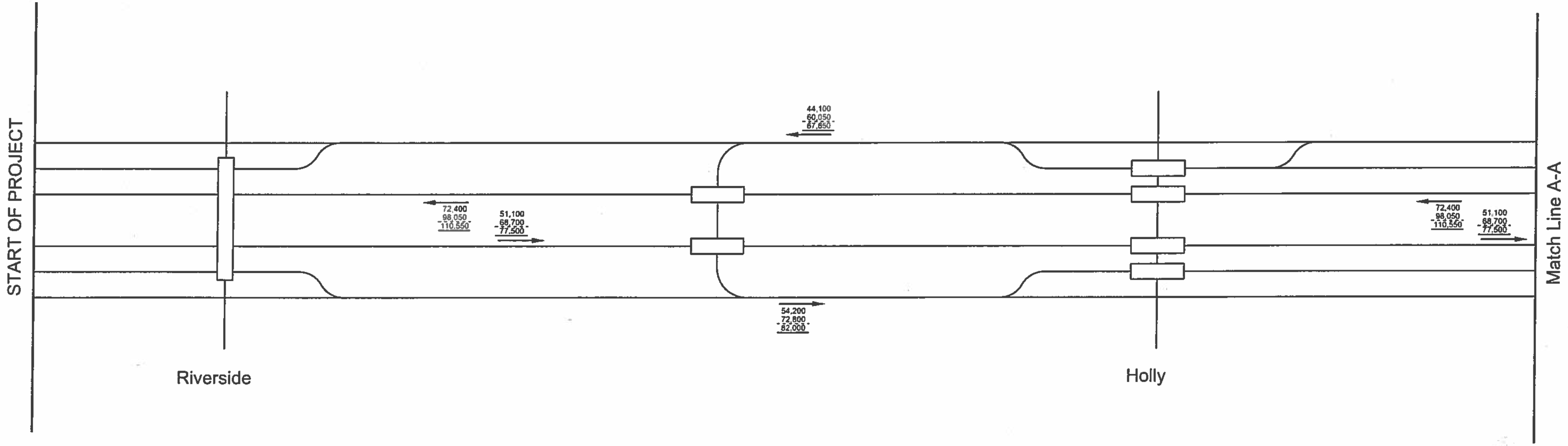

LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
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2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS ALONG I-35 FROM RIVERSIDE TO US 183

SHEET 1 OF 8

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
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TBPE Firm Registration No. F - 812

BUILD

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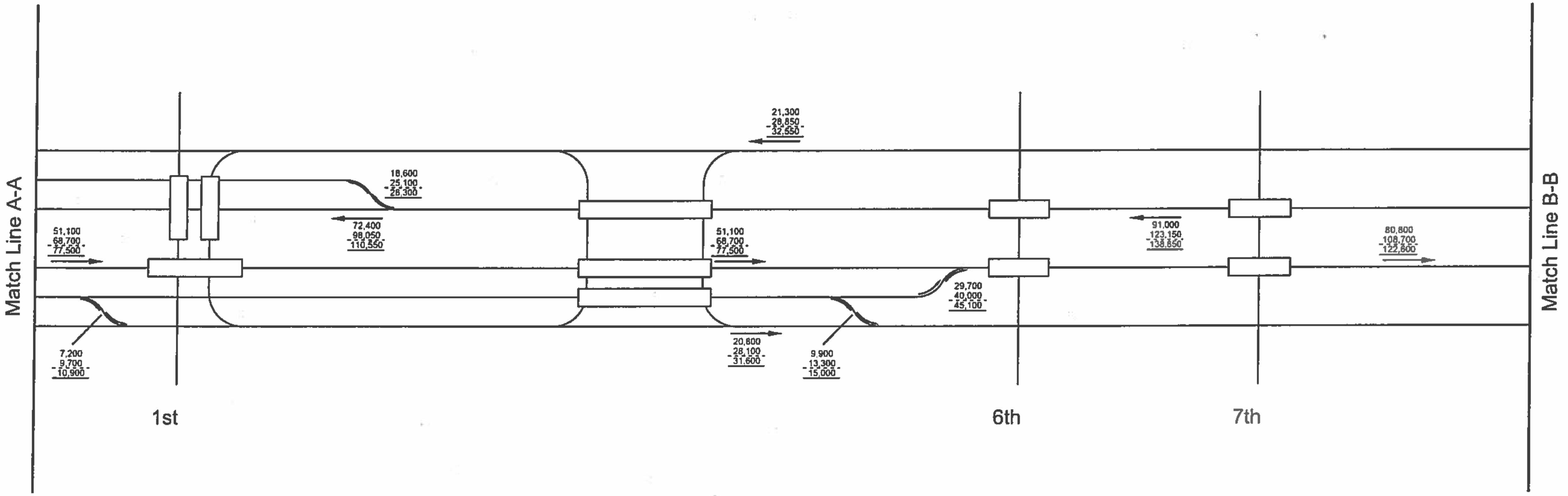

LEGEND
1000 - 2020 ADT
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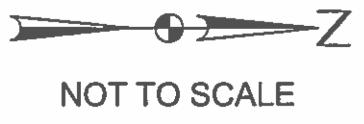
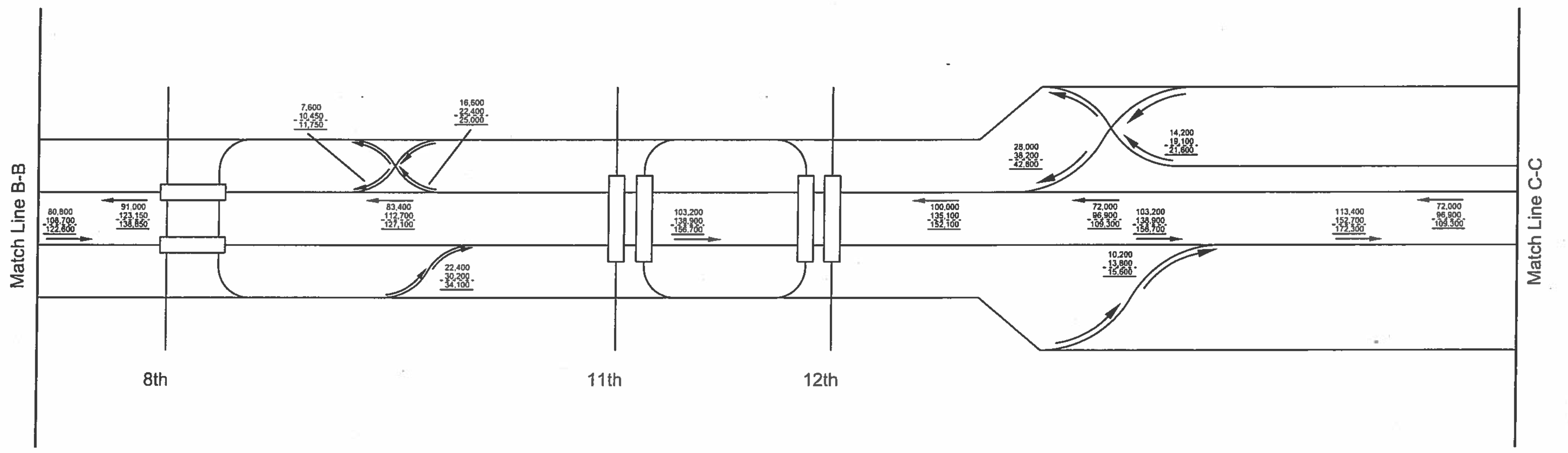
2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM RIVERSIDE TO US 183

SHEET 2 OF 8

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

BUILD





LEGEND
1000 - 2020 ADT
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2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM RIVERSIDE TO US 183

SHEET 3 OF 8

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Phone: 512-821-2081 • Fax: 512-821-2085
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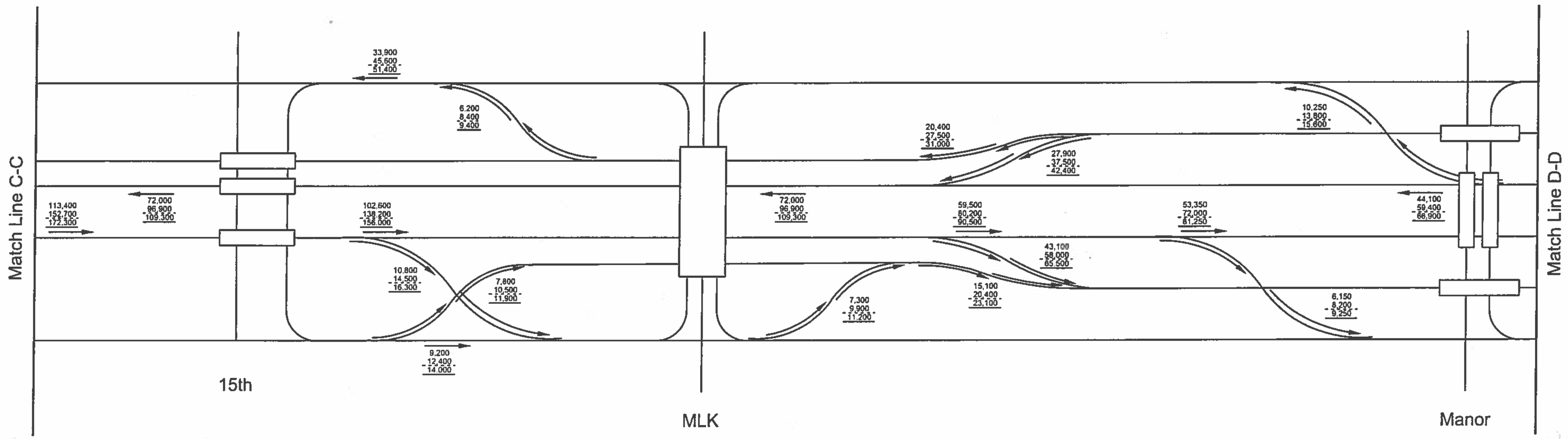

LEGEND
1000 - 2020 ADT
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1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS ALONG I-35 FROM RIVERSIDE TO US 183

SHEET 4 OF 8

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BUILD

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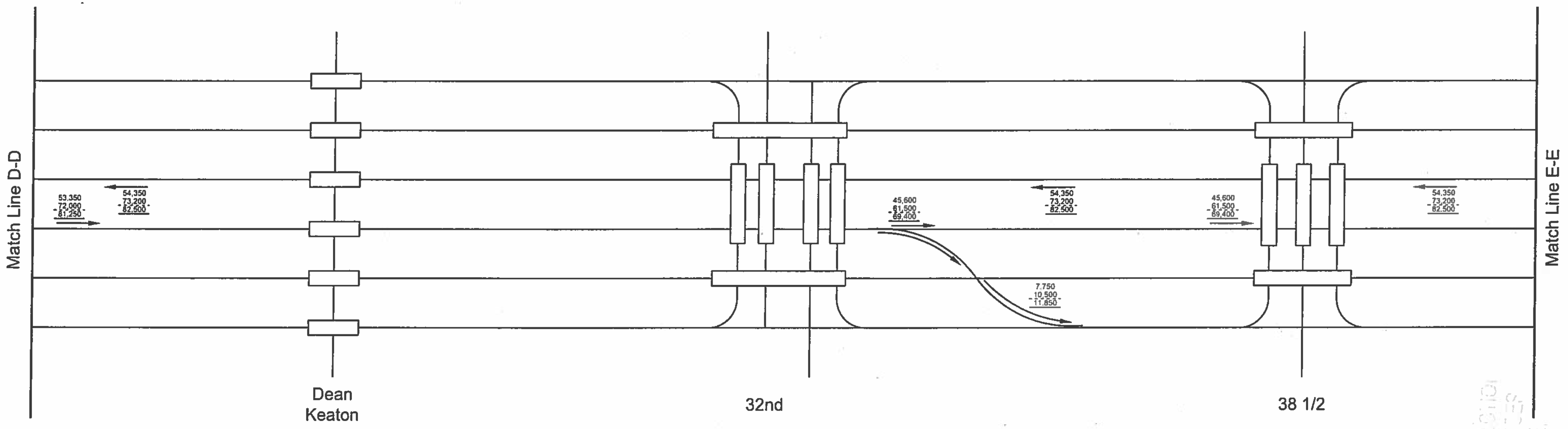

LEGEND
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2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
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SHEET 5 OF 8

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BUILD

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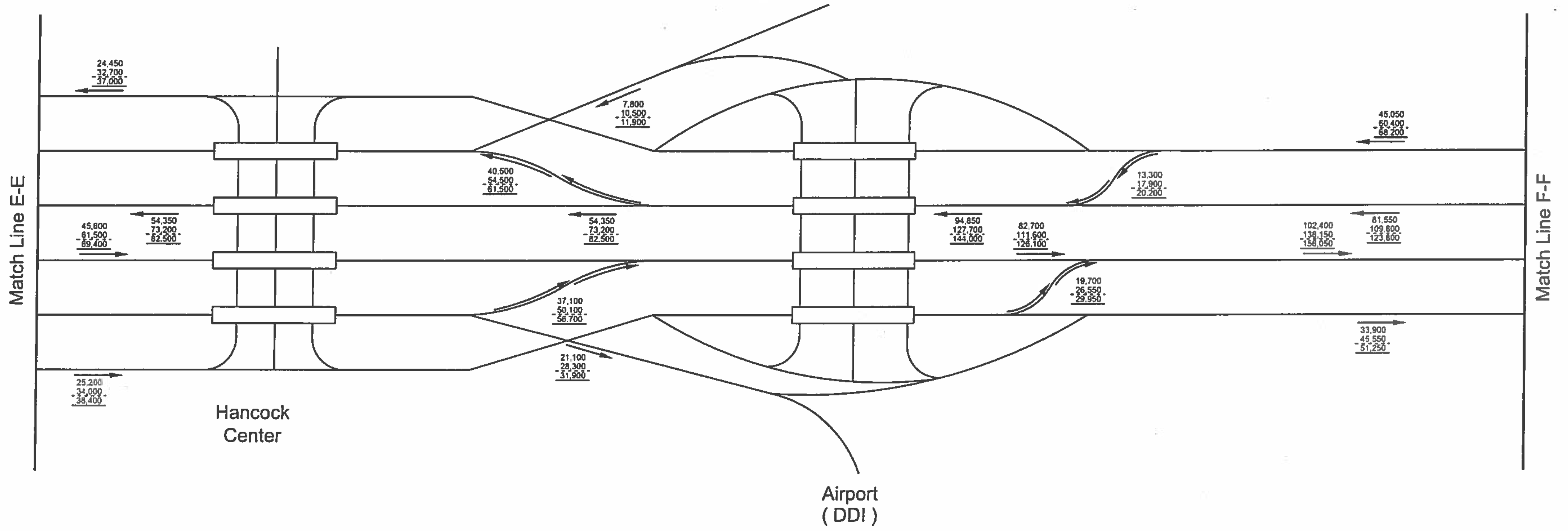

LEGEND
1000 - 2020 ADT
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SHEET 6 OF 8

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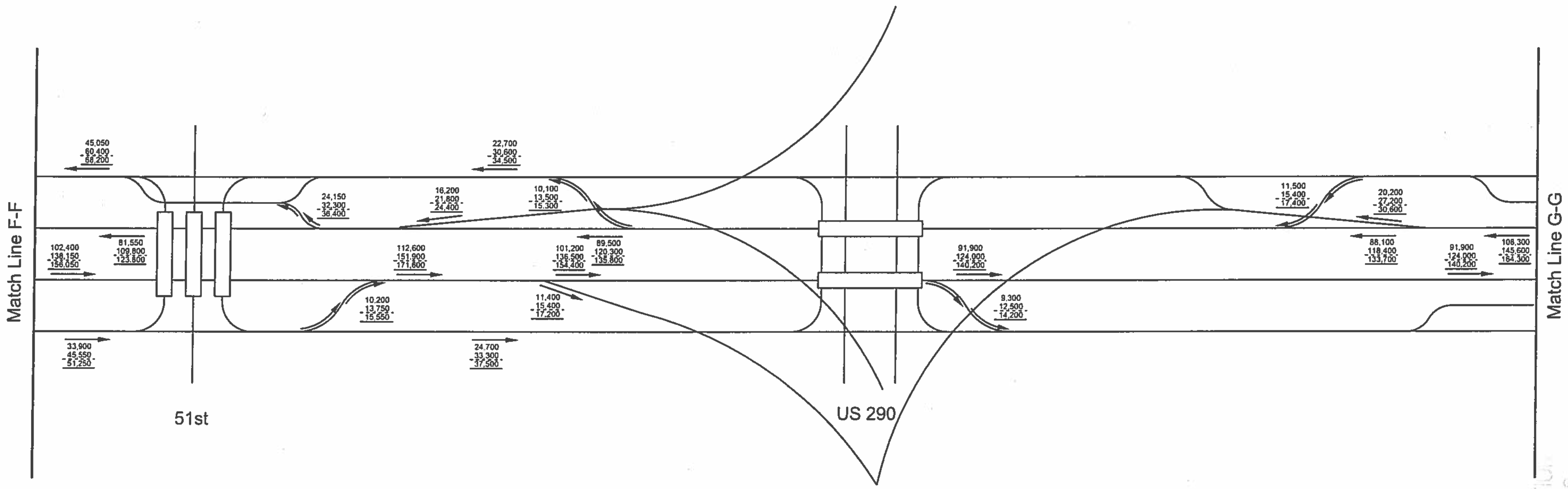

LEGEND

1000 - 2020 ADT
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2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM RIVERSIDE TO US 183

SHEET 7 OF 8

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BUILD

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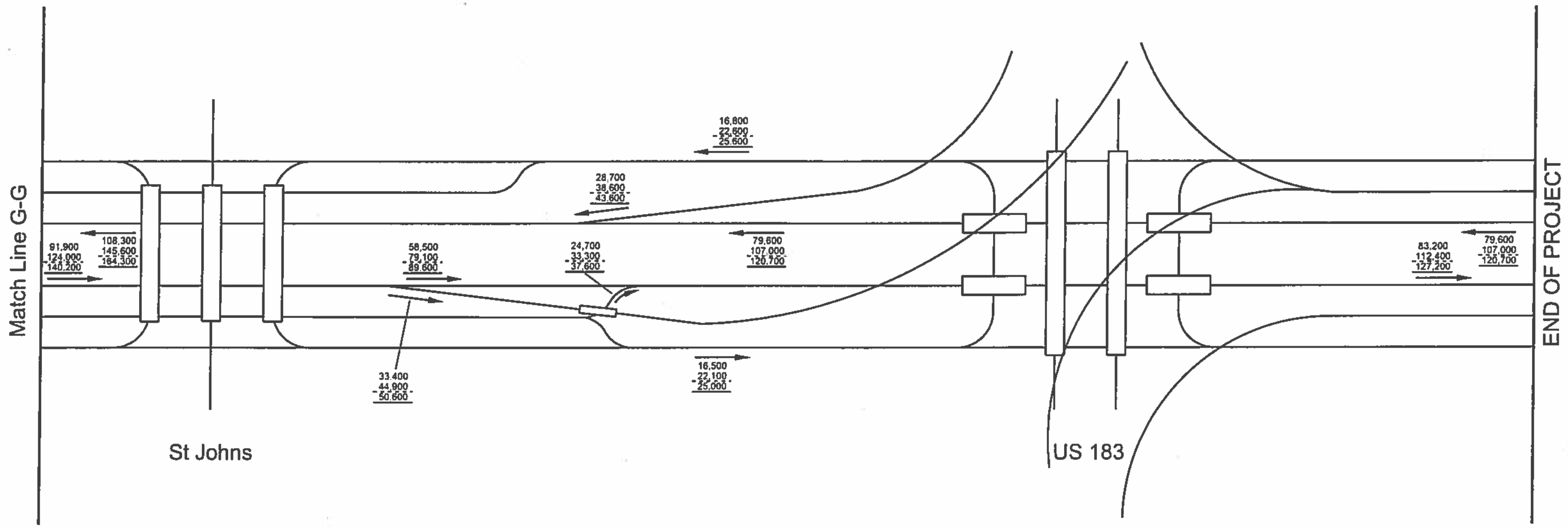

LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
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2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS ALONG I-35 FROM RIVERSIDE TO US 183

SHEET 8 OF 8

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TBPE Firm Registration No. F - 812

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

September 29, 2016

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
			Dir Dist %	K Factor	Percent Trucks							
	2020	2040			ADT	DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
I-35 (Mainlanes) Existing, No-Build and Build From US 183 To Riverside Travis County	218,300	294,000	51 - 49	5.3	3.3	3.7	13,500	30	79,419,000	3	112,526,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year	
	% of ADT	% of DHV
Light Duty	91.7	96.3
Medium Duty	1.5	0.7
Heavy Duty	6.8	3.0

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
			Dir Dist %	K Factor	Percent Trucks							
	2020	2050			ADT	DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
I-35 (Mainlanes) Existing, No-Build and Build From US 183 To Riverside Travis County	218,300	331,800	51 - 49	5.3	3.3	3.7	13,600	20	127,916,000	3	181,239,000	8"

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

September 29, 2016

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
			Dir Dist %	K Factor	Percent Trucks							
	2020	2040			ADT	DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
I-35 (Frontage Roads) Existing, No-Build and Build From US 183 To Riverside Travis County	47,400	63,900	51 - 49	6.3	3.2	2.4	11,700	20	3,993,000	3	4,599,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year	
	% of ADT	% of DHV
Light Duty	96.8	97.6
Medium Duty	2.3	1.7
Heavy Duty	0.9	0.7

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
			Dir Dist %	K Factor	Percent Trucks							
	2020	2050			ADT	DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
I-35 (Frontage Roads) Existing, No-Build and Build From US 183 To Riverside Travis County	47,400	72,000	51 - 49	6.3	3.2	2.4	11,700	20	6,425,000	3	7,400,000	8"

Texas
Department
of Transportation

MEMO

July 8, 2016

RECEIVED
JUL 14 2016
BY TPP

To: Bill Knowles, P.E.
Director, Transportation Analysis

From: Carmen Ramos
Austin District

Subject: Traffic Request

County: Travis
CSJ: 0015-10-062, 0015-13-388, 0015-13-077
Highway: IH 35 (Mainlanes and Frontage Roads Separate
Limits: From FM 1431 to US 183, US 183 to Riverside Drive, and Riverside Drive to Hays County Line

---

On February 24, 2016, the Austin District submitted a request for traffic data for the IH 35 from FM 1431 to US 183, US 183 to Riverside Drive, and Riverside Drive to Hays County Line. In late April, Janie Temple requested that the District proceed with developing TPP-type traffic numbers for TPP's review to satisfy the request. The District is now submitting the traffic forecast and is requesting TPP concurrence with the District traffic figures.

Attached is a memo from Keri Johnson (Alliance Transportation Group, Inc.), outlining project details. A second memo, from Mike Chaney (Alliance Transportation Group, Inc.) details the methodology used in completing the analysis. Also attached are the Existing, Build, and No Build line diagrams for the North, Central, and South projects.

Feel free to contact me at (512) 832-7075 if you should have any questions or need additional information.

ATTACHMENTS

CC: Advanced Transportation Planning

Texas
Department
of Transportation

MEMO

February 22, 2016

To: Bill Knowles, P.E.
Director, Transportation Analysis

From: CR Carmen Ramos
Austin District

Subject: Traffic Request

County: Travis
CSJ: 0015-13-388
Highway: IH 35 (Mainlanes and Frontage Roads Separate)
Limits: US 183 to Riverside Drive

Attached please find our request for traffic data for IH 35 (Mainlanes and Frontage Roads Separate) from US 183 to Riverside Drive. This transmittal includes the following documents:

1. Completed TRAFFIC REQUEST FORM
2. Project Location Map
3. Line Diagram
4. Memo from Dustin Elliott, Deputy PM – Mobility GEC
5. District Priority List

Please feel free to contact Carmen Ramos at (512) 832-7075 if you have any questions.

RECEIVED TPP
0194 FEB 25 16

CC: Janie Temple, TPP
Robert Williams, TPP
Gabe Contreras, TPP
Deena Salas, TPP
Marisabel Ramthum, P.E., Austin District

Form 2124
(6/2004)
Page 1 of 1

REQUEST FOR TRAFFIC DATA

Date: 2/19/2016

District: Austin **County:** Travis **CSJ:** 0015-13-388

Highway: Interstate Highway 35 (Mainlanes & Frontage Roads Separate)
Limits: From US 183 to Riverside Drive

Texas Reference Marker System

From Marker: 233 From Displacement: .340 From DFO: 232.851
To Marker: 240 To Displacement: .132 To DFO: 239.643

Is it in the UTP? ☒ Yes ☐ No District Priority: 9 Est. Letting Date: 2020

Existing Number of Lanes: 6
Proposed Number of Lanes: 8

District Contact Person: Carmen Ramos
Phone Number: 512/832-7075

Please attach an 8-1/2" x 11" location map and make note of any existing or proposed development that will be a traffic generator.

The following to be completed (Please mark information to be provided):

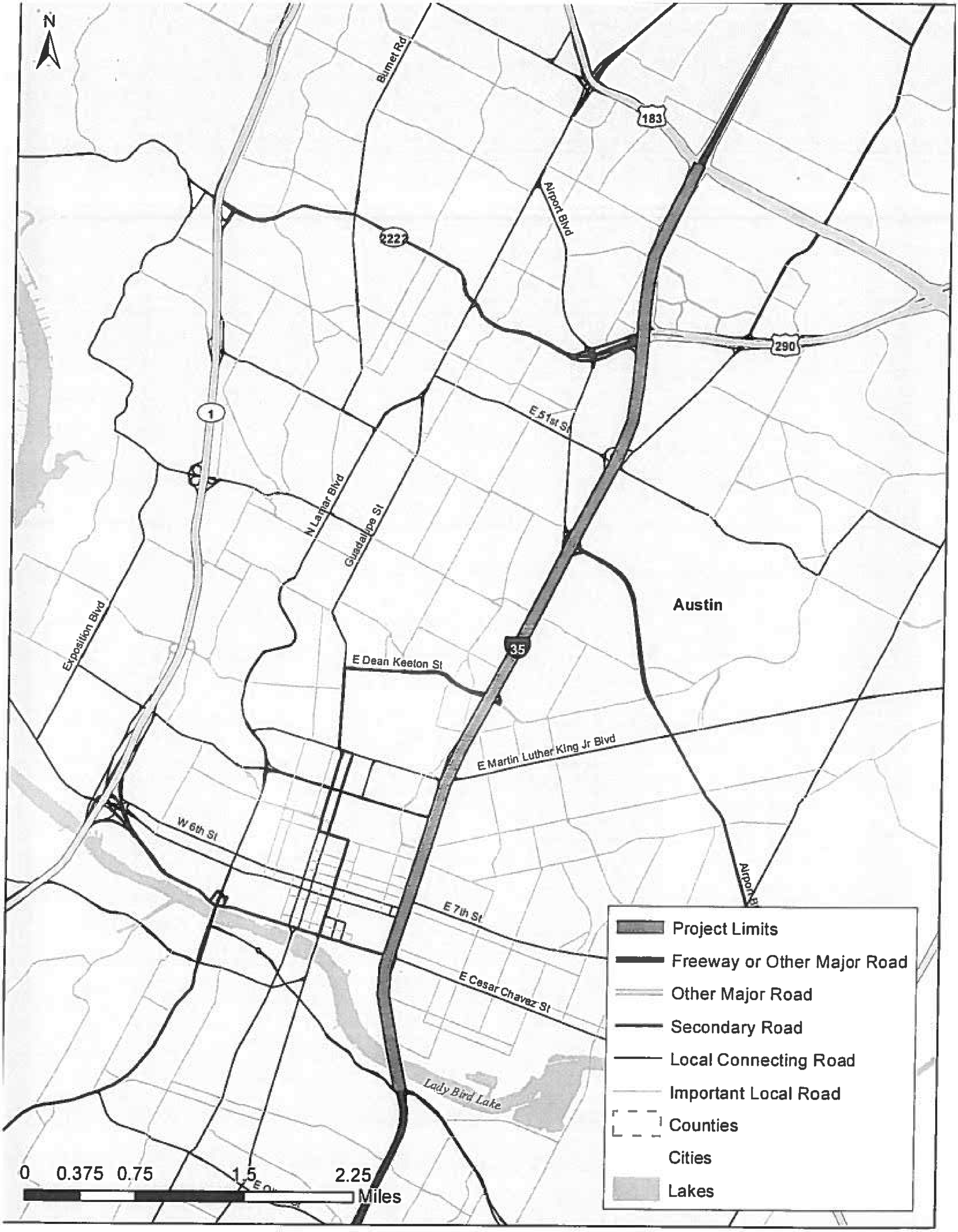
☒ 1. Basic Highway Traffic Data for pavement design
(No line diagram analysis required)
- A. Base year/Beginning year: 2020
- B. Forecasted 20 year: 2040
- C. Forecasted 30 year: 2050
- D. Directional Distribution
- E. K-factor
- F. Percent Trucks ADT/DHV
- G. Average Ten Heaviest Wheel Loads (ATHWLD)
- H. Percent Tandem Axles in the ATHWLD
- I. One Directional cumulative 18 KSA at the end of the 20 years/30years
- J. Slab Thickness (8" unless otherwise specified): ______
- K. Structural Number (3 unless otherwise specified): ______

☒ 2. Vehicle classification for environmental studies (Air and Noise Analysis).

☒ 3. Line diagram analysis (straight line turning movements; please provide line diagram).

☐ 4. Complete Corridor Analysis (includes basic highway traffic data for pavement design, environmental studies and detailed schematic turning movements; *please provide detailed schematic*).

Note: If complete corridor analysis is requested, please attach a traffic schematic diagram.


N
Burnet Rd
183
Airport Blvd
2222
290
E 51st St
1
N Lamar Blvd
Guadalupe St
Exposition Blvd
35
Austin
E Dean Keeton St
E Martin Luther King Jr Blvd
W 6th St
E 7th St
E Cesar Chavez St
Airport Blvd
Lady Bird Lake
Project Limits
Freeway or Other Major Road
Other Major Road
Secondary Road
Local Connecting Road
Important Local Road
Counties
Cities
Lakes
0
0.375
0.75
1.5
2.25
Miles

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 (Mainlanes)	Date for Memorandum	10/5/2016
Rd Type	IH	District	Austin
	Exsiting, No-Build and Build	County	Travis
Project	From US 183	CSJ	0015-13-388
Limits	To Riverside	Analyst	LRT

Date	Request	7/8/2016	Received	7/14/2016	Started	7/16/2016	Completed 9/28/2016
	District Contact	Carmen Ramos			Phone #	512/832-7075	

	Year	ADT's
Count		
Base	2020	218300
Forecast	2040	294000
Forecast	2050	331800

	% Trks ADT	% Trks DHV
	8.3	3.7
# Trks	18119	

SPR Station	S-132	MC Stn	MS-132	% Trks	10.3
Year	2015	Dir	N&S	Num Trks	13695
Peak Hour	6.5	Year	2015	Axle Factor	2.83
DD	51	ADT	133533	% Single Axles	0.47
100-DD	49				
K-Factor	6.3				

Main Road Growth Rate	
Growth Rate after 20 Years	
20 Year Growth Factor	1.734
30 Year Growth Factor	1.733
Design Period 1	20
Design Period 2	30

TDM Assignment: None

LOD: 99999

Structural Number (SN)	3		
Slab Thickness (ST)	8		

	# Lanes
Existing	6
Proposed	8

Past Projects

Project	
From	
To	
Date	
County	
CSJ	

T. Log

ADT			
% Growth Rate			
K-Factor			
DD			
% Trucks ADT			
% Trucks DHV			
MC Station			
SPR Station			

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

● FHWA Format			○ Texas 6 Format		
Light Duty Vehicles	Motorcycles	270	**Light Duty Vehicles**	Passenger	
	Passenger	91996		Panel & Pickup	
	Pickup or Van	27572	**Single Units**	Buses	
Single Units	Buses	425		Other 2 Axle	
	Other 2 Axle	1932		3 Axle	
	3 Axles	723		4 Axle or More	
	4 Axles or more	15	**Truck Combs.**	3 Axle	
Truck Combs.	3-4 Axles	381		4 Axle	
	5 Axles	9768		5 Axle	
	6 Axles or more	81		6 Axle or more	
Semi-Trailer-Trailer	5 Axles or less	284	**Semi-Trailer-Trailer**	5 Axle	
	6 Axles	82		6 Axle	
	7 Axles or more	4		7 Axle or more	

FHWA Format Data

	Number	%
Light	**119838**	**89.7**
Medium	**2547**	**1.9**
Heavy	**11148**	**8.3**
Trucks	**13695**	**10.3**

Section 1

IH

	ADT	DHV
Light	**91.7**	**96.3**
Medium	**1.5**	**0.7**
Heavy	**6.8**	**3.0**

Total Vehicles	**133533**
Total Trucks	**13695**
Total Singles	**18013.5**
Total Tandems	**20716.5**
AXLE FACTOR	**2.83**
SINGLE AX FACT	**0.47**

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	**20**	**20**				
Year 2	**40**	**50**				
ADT	**218300**	**218300**				
% Trks	**8.3**	**8.3**				
Growth Rate	**1.734**	**1.733**				
Years	**20**	**30**				
Facil Type	**A**	**A**				
S.N.	**3**	**3**				
SLAB	**8**	**8**				
Weight Sta	**99999**	**99999**				
Axle Factor	**2.83**	**2.83**				
Single Axle	**0.47**	**0.47**				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	13500	13600				
% T in ATHWLD	30	20				
FLEXIBLE	79419000	127916000				
RIGID	112526000	181239000				

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project: I-35 (Frontage Roads)
Rd Type: FM
Exsiting, No-Build and Build
Project Limits: From US 183
To Riverside

Date for Memorandum: 10/5/2016
District: Austin
County: Travis
CSJ: 0015-13-388
Analyst: LRT

Date: Request: 7/8/2016
Received: 7/14/2016
Started: 7/16/2016
Completed: 9/28/2016
District Contact: Carmen Ramos
Phone #: 512/832-7075

	Year	ADT's
Count		
Base	2020	**47400**
Forecast	2040	**63900**
Forecast	2050	**72000**

% Trks ADT: **3.2**
# Trks: **1517**
% Trks DHV: **2.4**

SPR Station	S-132
Year	2015
Peak Hour	6.5
DD	51
100-DD	**49**
K-Factor	6.3

MC Stn	MS-132FR
Dir	N&S
Year	2015
ADT	56953

% Trks	2.9
Num Trks	1633
Axle Factor	2.22
% Single Axles	0.79

Main Road Growth Rate	
Growth Rate after 20 Years	
20 Year Growth Factor	**1.741**
30 Year Growth Factor	**1.730**
Design Period 1	20
Design Period 2	30

TDM Assignment: None

LOD: 99999

Structural Number (SN)	3		
Slab Thickness (ST)	8		

	# Lanes
Existing	4
Proposed	4

Past Projects

Project	
From	
To	
Date	
County	
CSJ	

T. Log

ADT			
% Growth Rate			
K-Factor			
DD			
% Trucks ADT			
% Trucks DHV			
MC Station			
SPR Station			

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

● FHWA Format		
Light Duty Vehicles	Motorcycles	233
	Passenger	44995
	Pickup or Van	10092
Single Units	Buses	679
	Other 2 Axle	489
	3 Axles	107
	4 Axles or more	4
Truck Combs.	3-4 Axles	36
	5 Axles	311
	6 Axles or more	3
Semi-Trailer-Trailer	5 Axles or less	2
	6 Axles	2
	7 Axles or more	0

○ Texas 6 Format		
Light Duty Vehicles	Passenger	
	Panel & Pickup	
Single Units	Buses	
	Other 2 Axle	
	3 Axle	
	4 Axle or More	
Truck Combs.	3 Axle	
	4 Axle	
	5 Axle	
	6 Axle or more	
Semi-Trailer-Trailer	5 Axle	
	6 Axle	
	7 Axle or more	

FHWA Format Data	Number	%
Light	55320	97.1
Medium	1186	2.1
Heavy	447	0.8
Trucks	1633	2.9

Section 1

FM

	ADT	DHV
Light	96.8	97.6
Medium	2.3	1.7
Heavy	0.9	0.7

Total Vehicles	56953
Total Trucks	1633
Total Singles	2869.0
Total Tandems	759.0
AXLE FACTOR	2.22
SINGLE AX FACT	0.79

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	20	20				
Year 2	40	50				
ADT	47400	47400				
% Trks	3.2	3.2				
Growth Rate	1.741	1.730				
Years	20	30				
Facil Type	C	C				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.22	2.22				
Single Axle	0.79	0.79				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	11700	11700				
% T in ATHWLD	20	20				
FLEXIBLE	3993000	6425000				
RIGID	4599000	7400000				

Texas
Department
of Transportation

File

MEMO

October 7, 2016

To: Terry McCoy, P.E., District Engineer
Attention: Lorena Echeverria De Misi, P.E., Director of TPD

Through: William E. Knowles, P.E,
Traffic Analysis Section Director, TPP

From: Lee Theobald
Transportation Analyst, TPP

Subject: Traffic Data
CSJ: 0015-13-077
I-35 (Mainlanes and Frontage Roads separate)
From Riverside
To Hays County Line (Includes CSJ 0016-01-113)
Travis County

Attached are diagrams provided by Consultants depicting 2020, 2040 and 2050 average daily traffic volumes and turning movements from ramps to main lanes on I 35 from Riverside to Hays County Line for existing, no-build and build conditions. Also attached are tabulations showing traffic analysis for highway design for the 2020 to 2040 twenty year period and 2020 to 2050 thirty year period for the described limits of the route. Also included are tabulations showing data for use in air and noise analysis.

Due to differences in traffic volumes the project was separated into two sections.
Section 1: From Riverside to SH 71
Section 2: From SH 71 to Hays County Line

Please refer to your Memo dated July 8, 2016.

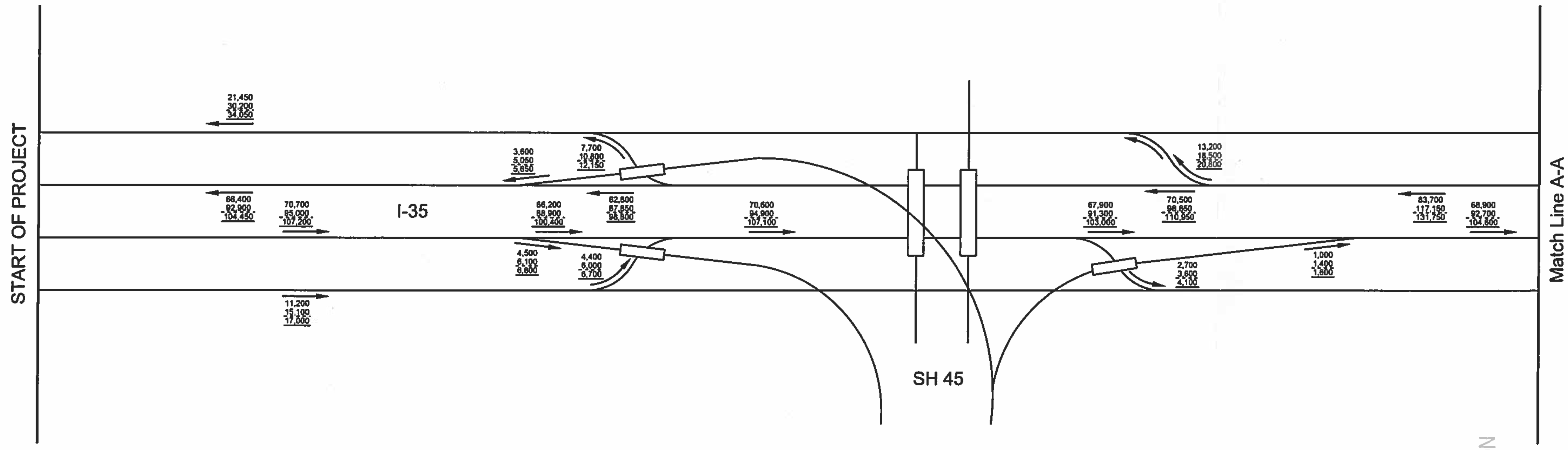
If you have any questions or need additional information, please contact Lee Theobald at (512) 486-5143.

Attachments

CC: Carmen Ramos, Planner, Austin District
Design Division

EXISTING

NOT TO SCALE



LEGEND

1000 - 2020 ADT

1000 - 2040 ADT

1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM SH 45 SE TO RIVERSIDE

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E
Serial Number 84704

SHEET 1 OF 7

ALLIANCE
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Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

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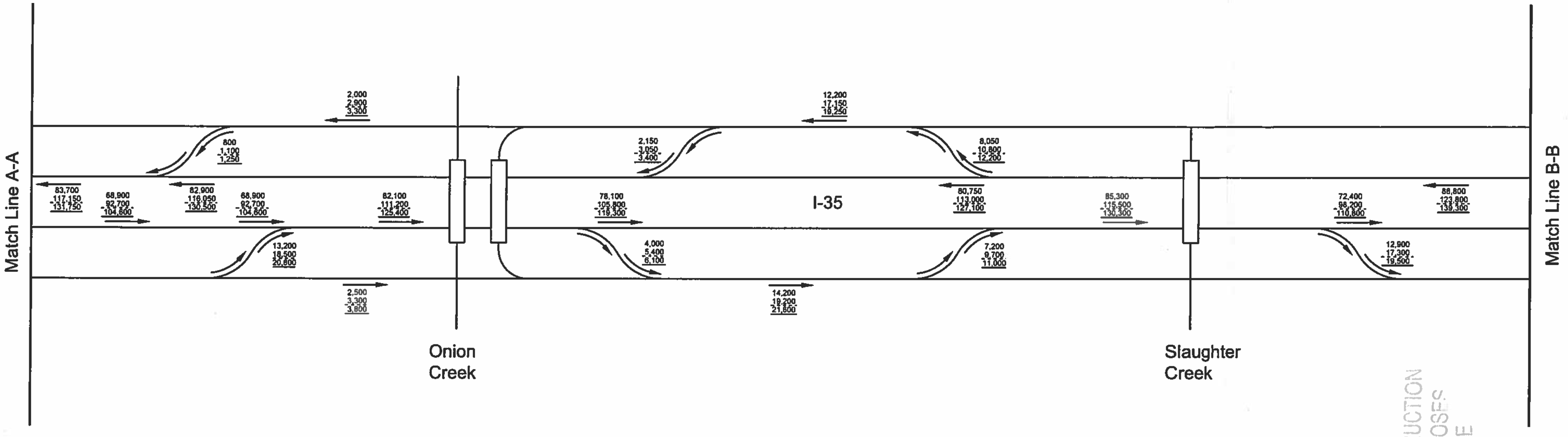

LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

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2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM SH 45 SE TO RIVERSIDE

SHEET 2 OF 7

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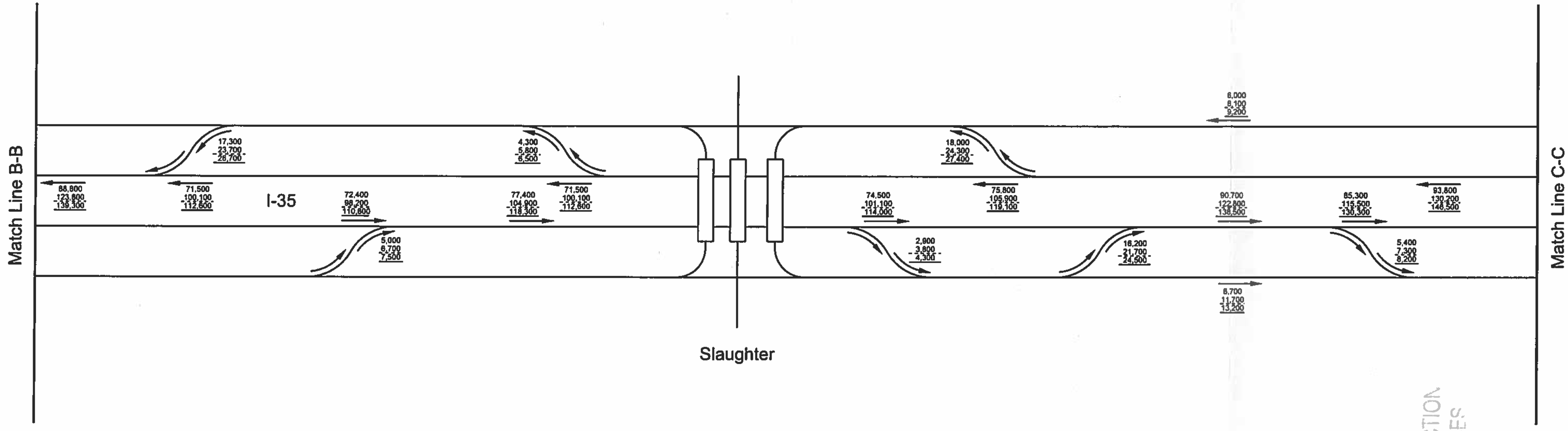

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM SH 45 SE TO RIVERSIDE

LEGEND

1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

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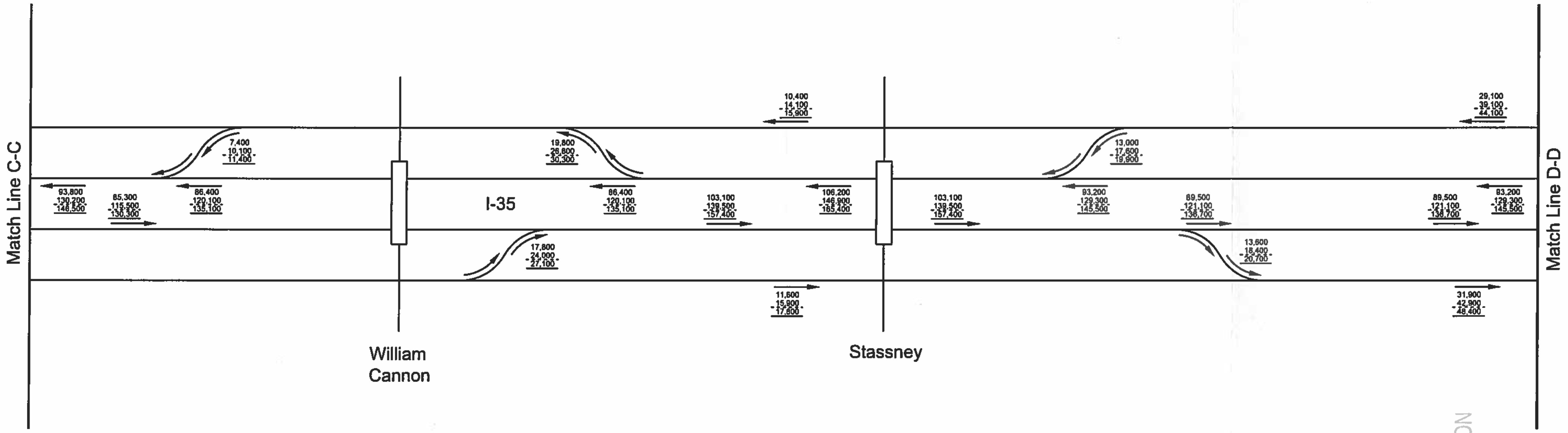

LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

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2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM SH 45 SE TO RIVERSIDE

SHEET 4 OF 7

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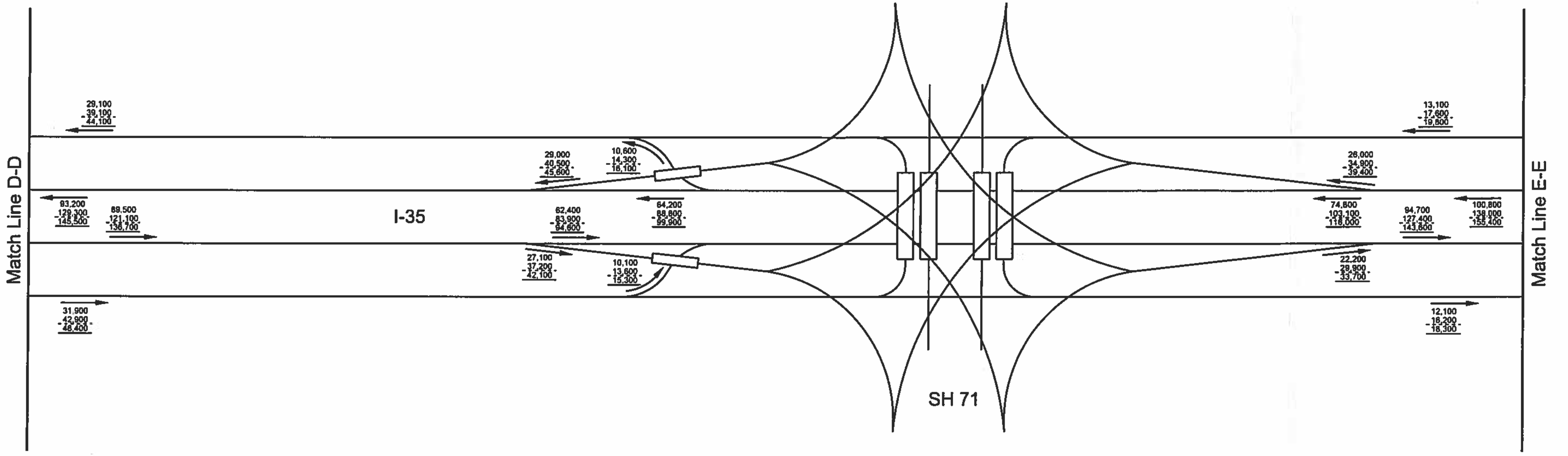

LEGEND
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1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM SH 45 SE TO RIVERSIDE

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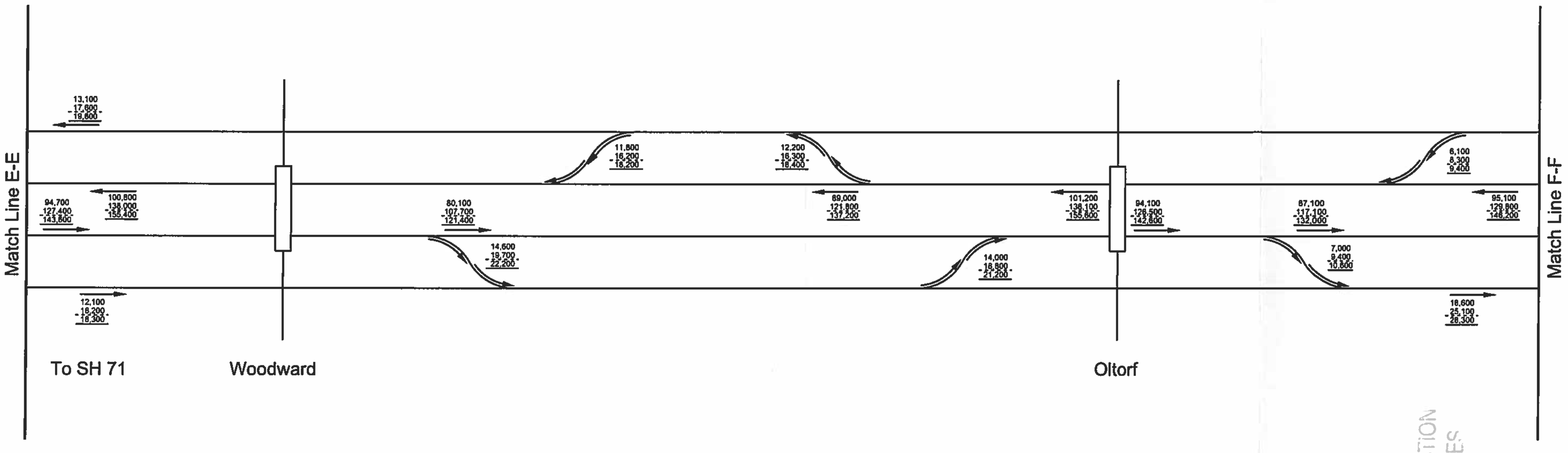

LEGEND
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1000 - 2040 ADT
1000 - 2050 ADT

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2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS ALONG I-35 FROM SH 45 SE TO RIVERSIDE

SHEET 6 OF 7

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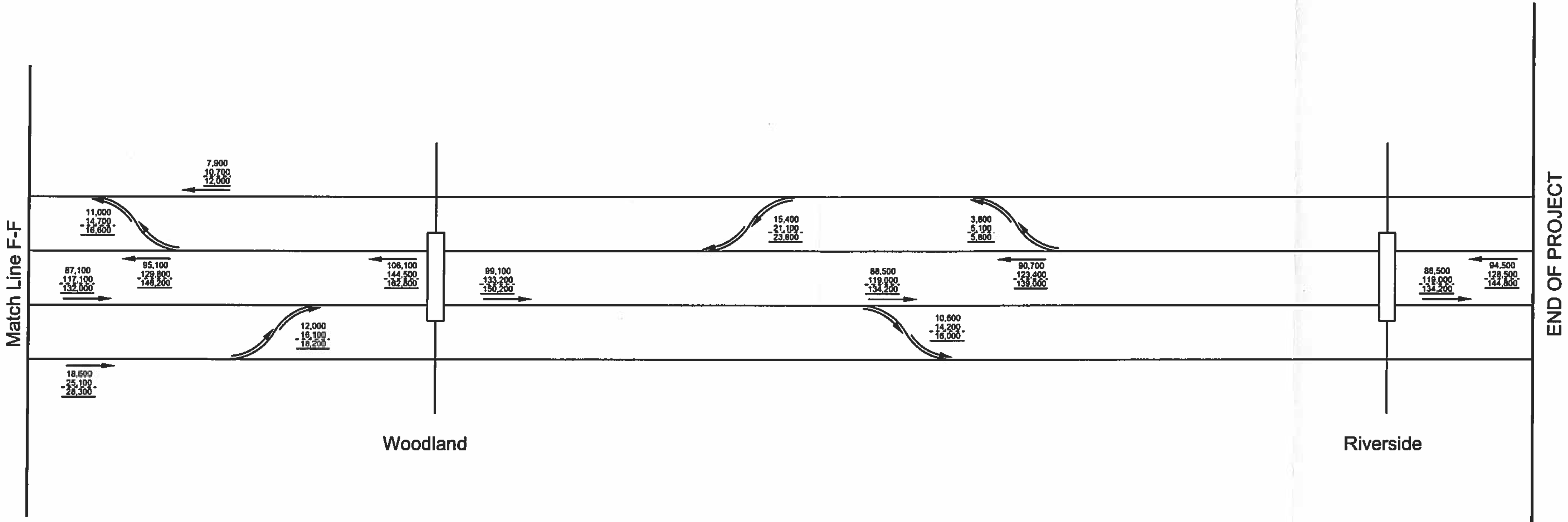

LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
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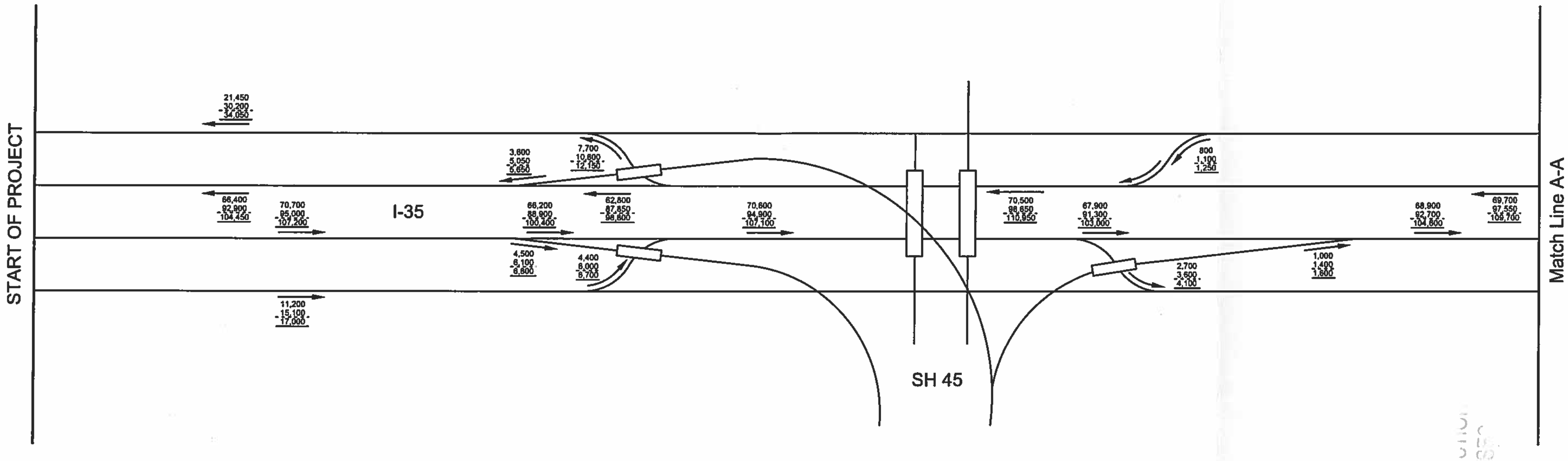

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM SH 45 SE TO RIVERSIDE

LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

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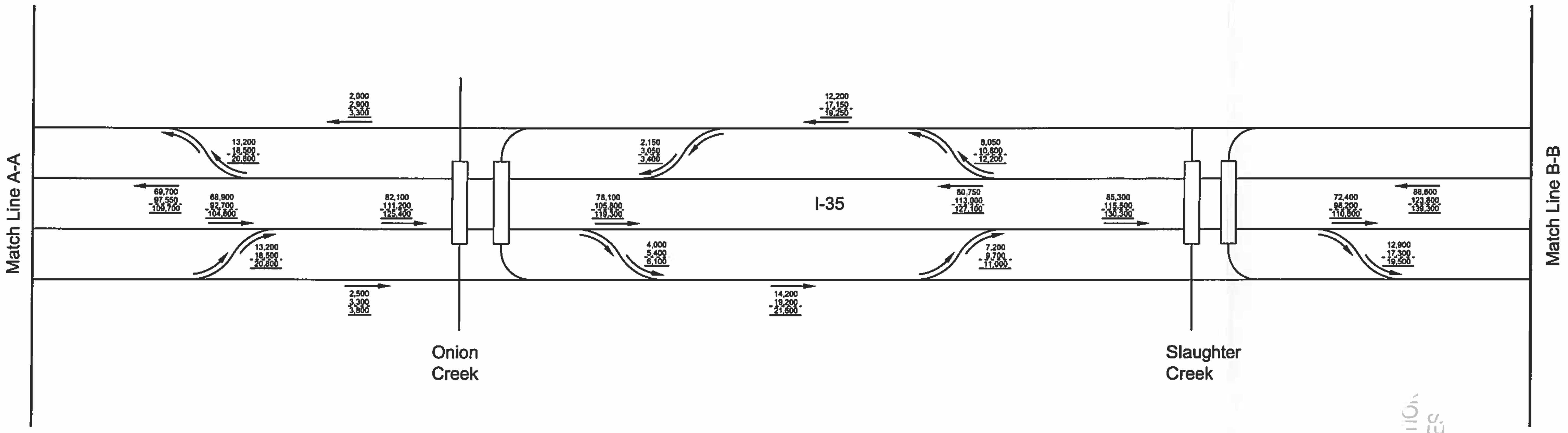

LEGEND

1000 - 2020 ADT

1000 - 2040 ADT

1000 - 2050 ADT

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2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS ALONG I-35 FROM SH 45 SE TO RIVERSIDE

SHEET 2 OF 7

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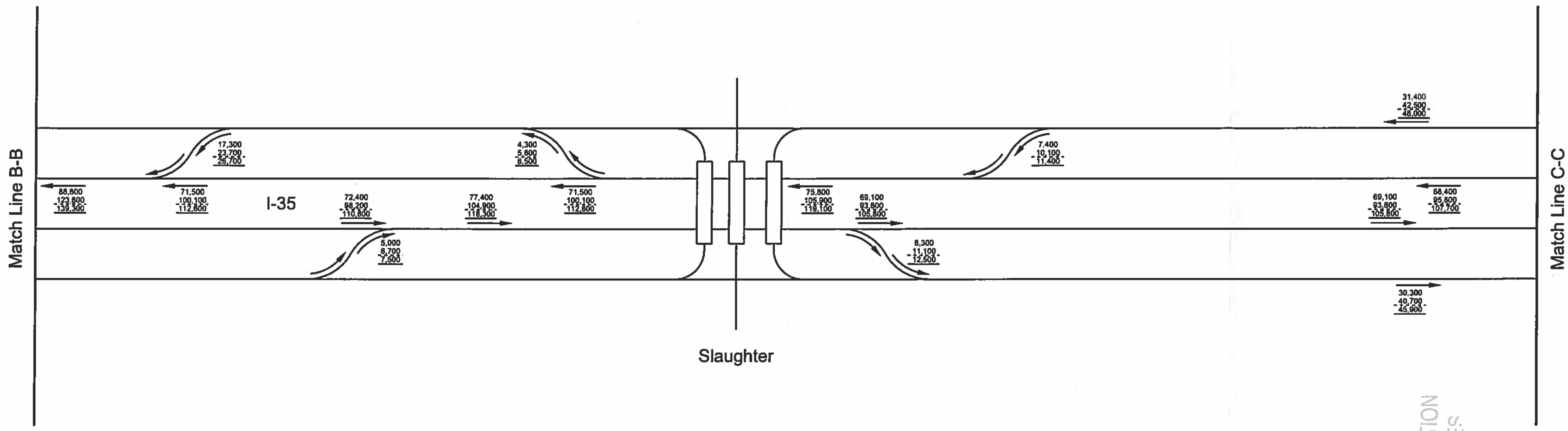

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2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM SH 45 SE TO RIVERSIDE

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William Erich Knowles, P.E.
Serial Number 84704

SHEET 3 OF 7

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TBPE Firm Registration No. F - 812

NO-BUILD

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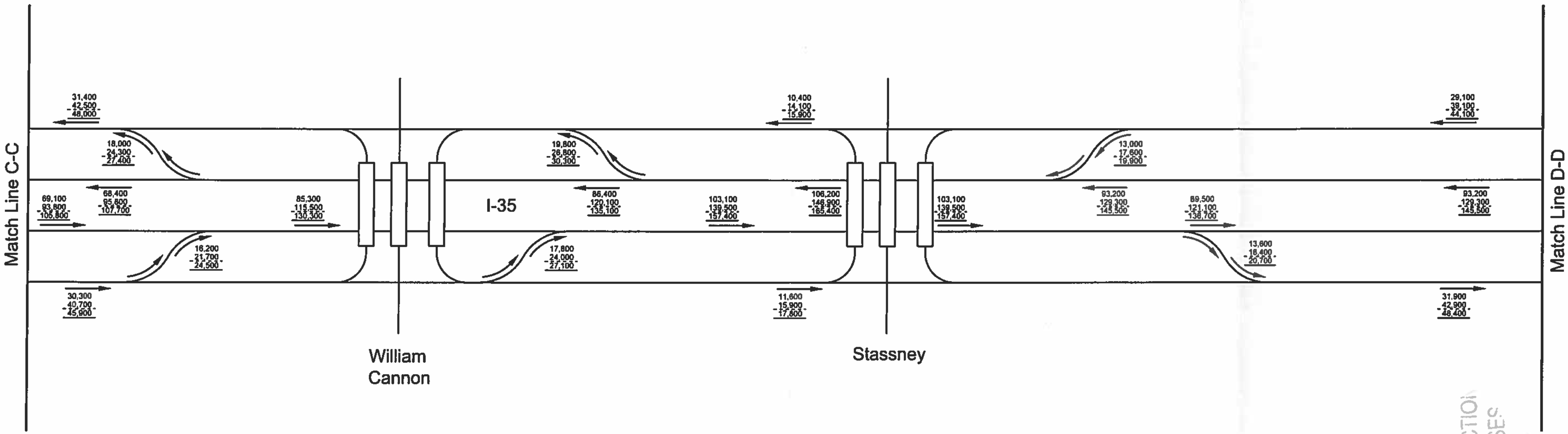

LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

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... OR PERMIT PURPOSES
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Serial Number 84704

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM SH 45 SE TO RIVERSIDE

SHEET 4 OF 7

ALLIANCE
TRANSPORTATION GROUP
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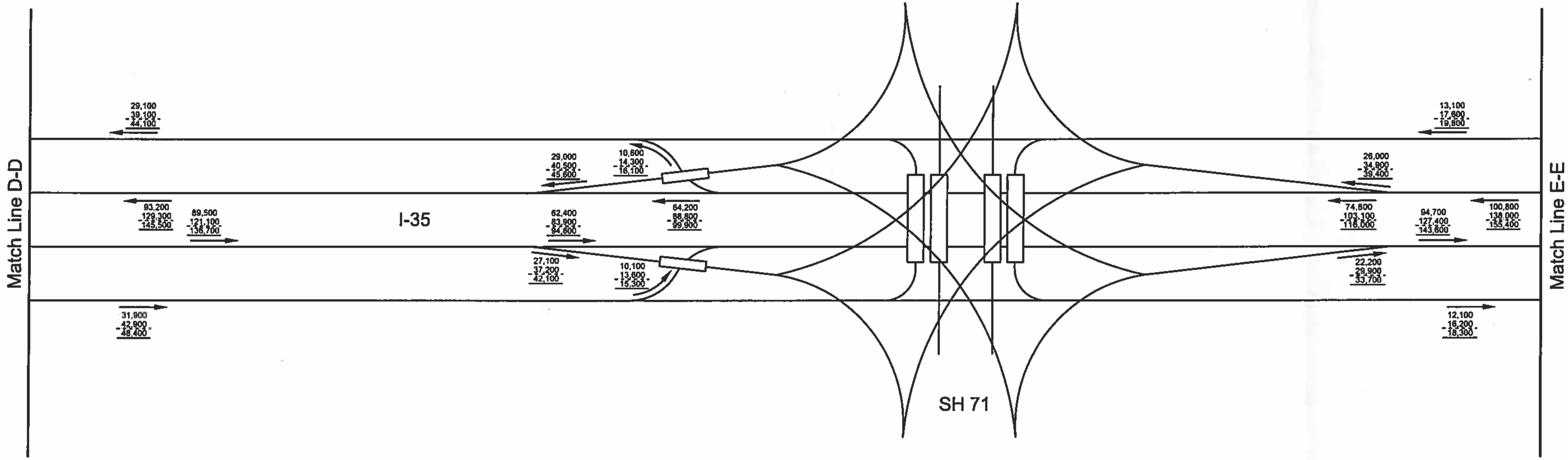
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

NO-BUILD

NOT TO SCALE



LEGEND

1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM SH 45 SE TO RIVERSIDE

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William Erick Knowles, P.E.
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SHEET 5 OF 7

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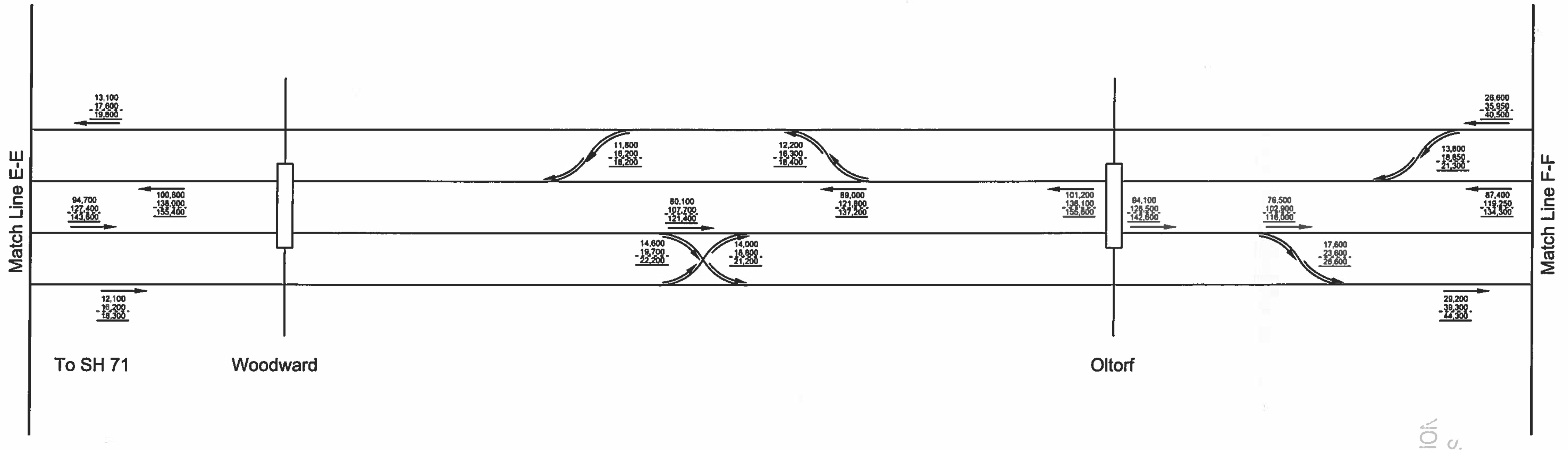
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

NO-BUILD

NOT TO SCALE



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

RELEASED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E
Serial Number 84704

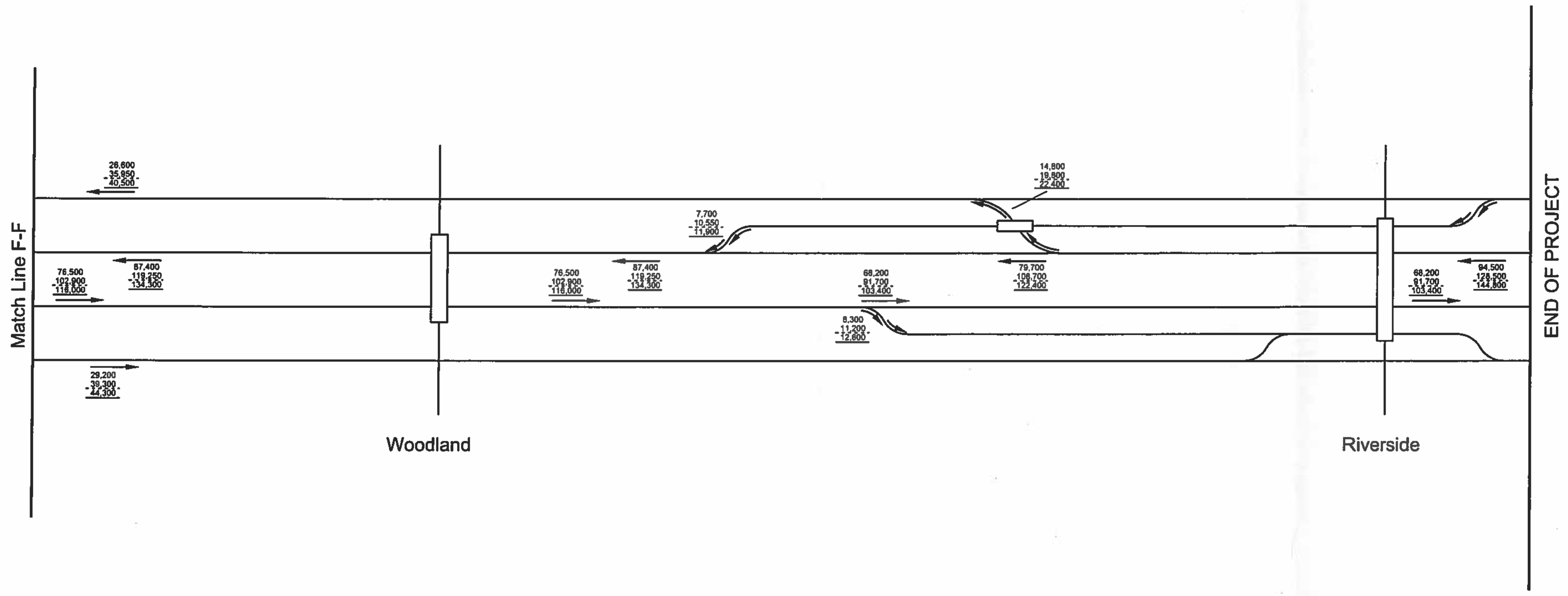
2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM SH 45 SE TO RIVERSIDE

SHEET 6 OF 7

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

NO-BUILD

NOT TO SCALE



LEGEND
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1000 - 2040 ADT
1000 - 2050 ADT

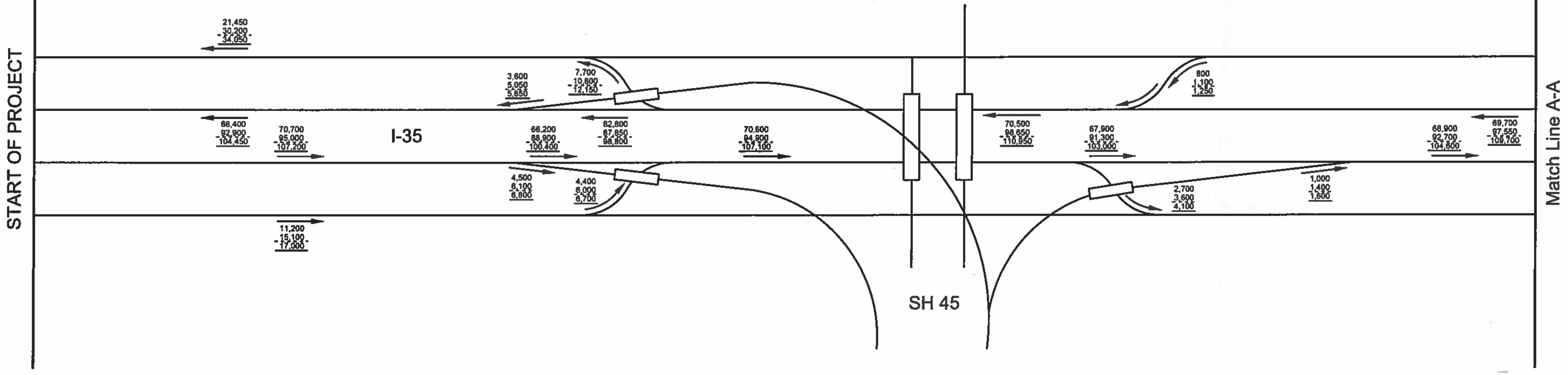
2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM SH 45 SE TO RIVERSIDE

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erich Knowles, P.E
Serial Number 84704

SHEET 7 OF 7

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

BUILD



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM SH 45 SE TO RIVERSIDE

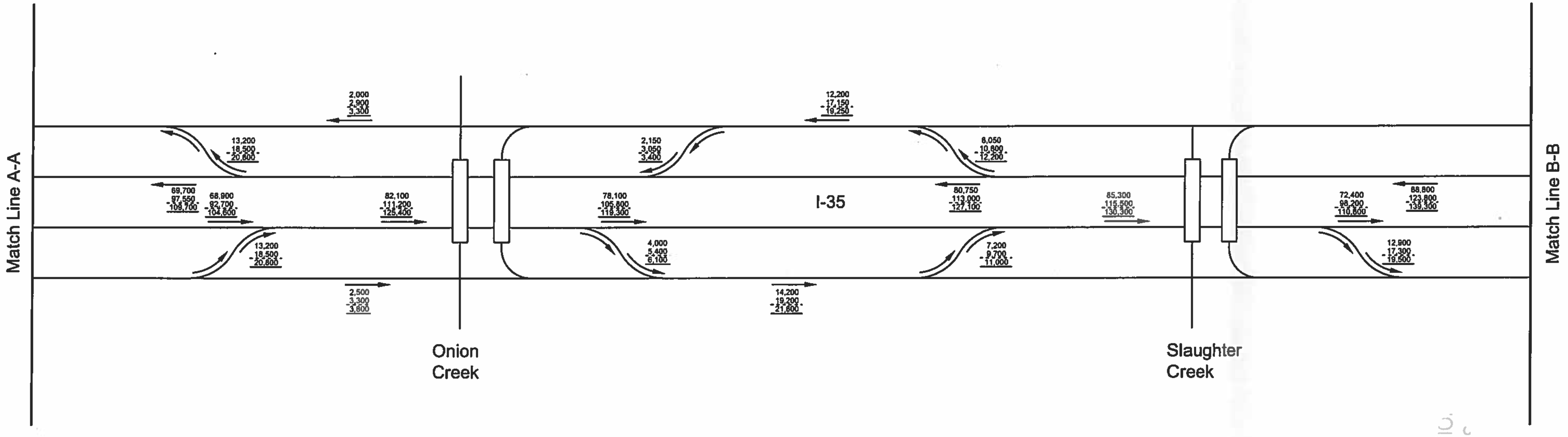
SHEET 1 OF 7

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William E. Knowles, P.E
Serial Number 84704

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

BUILD

NOT TO SCALE



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

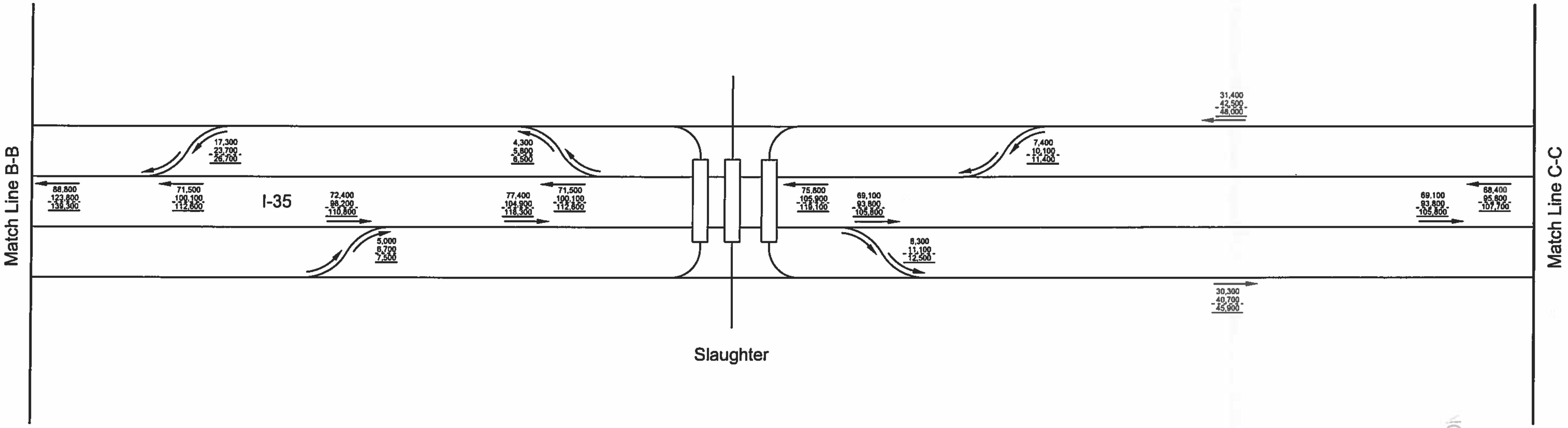
2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM SH 45 SE TO RIVERSIDE

SHEET 2 OF 7

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

BUILD

NOT TO SCALE



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM SH 45 SE TO RIVERSIDE

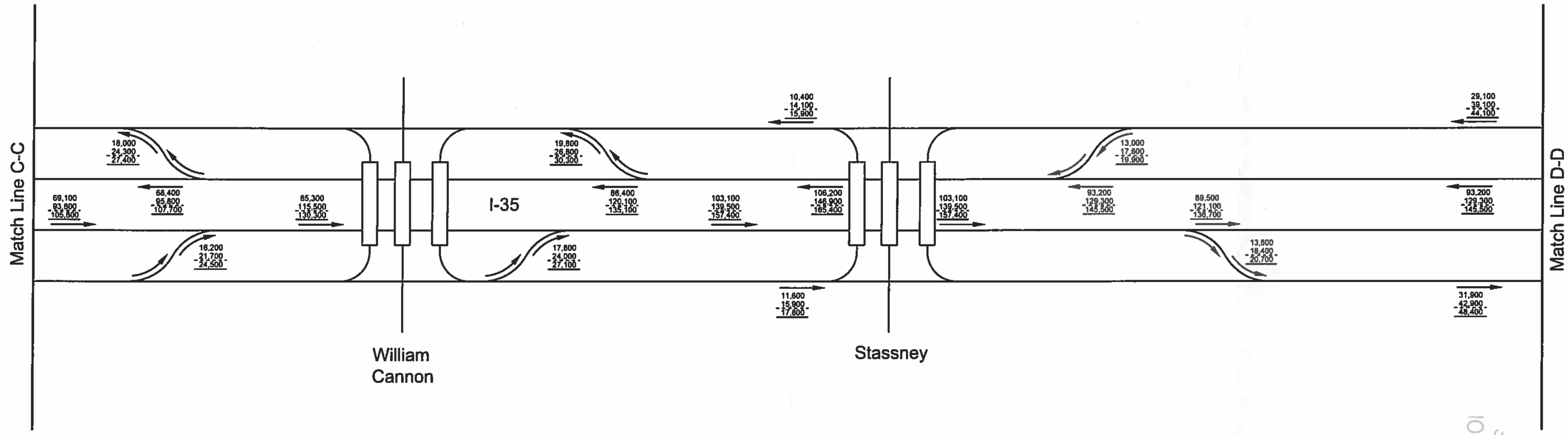
INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
Eric Knowles, P.E
Serial Number 84704

SHEET 3 OF 7

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

BUILD

NOT TO SCALE



LEGEND

1000 - 2020 ADT

1000 - 2040 ADT

1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM SH 45 SE TO RIVERSIDE

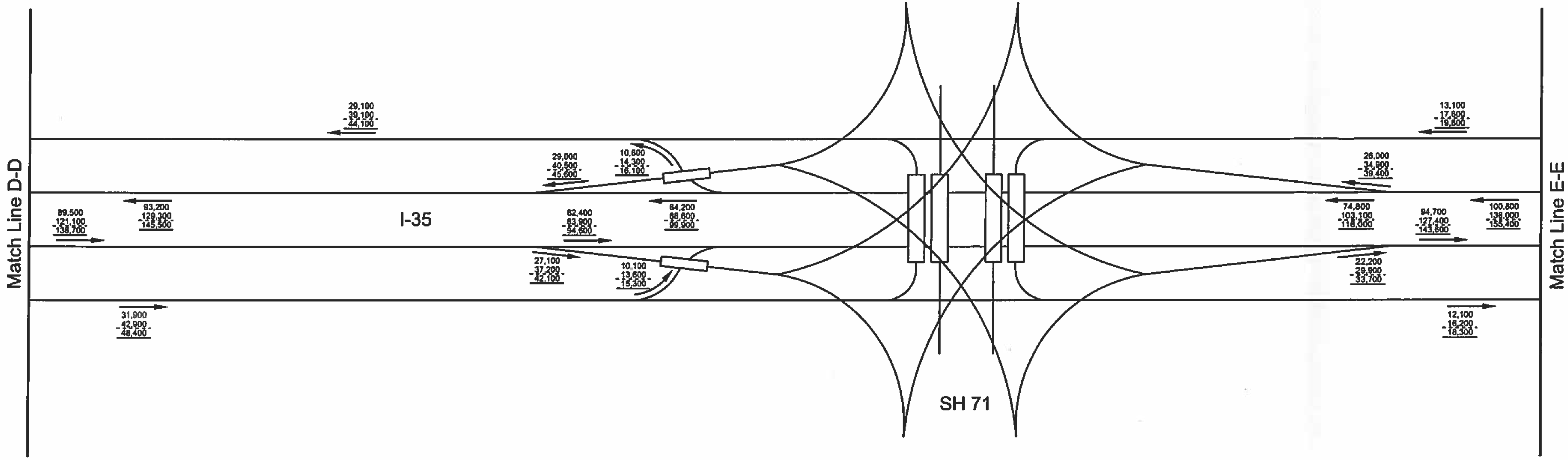
INTENDED FOR CONSTRUCTIO
OR PERMIT PURPOSES
Eric Knowles, P.E
Number 84704

SHEET 4 OF 7

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

BUILD

NOT TO SCALE



LEGEND

1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM SH 45 SE TO RIVERSIDE

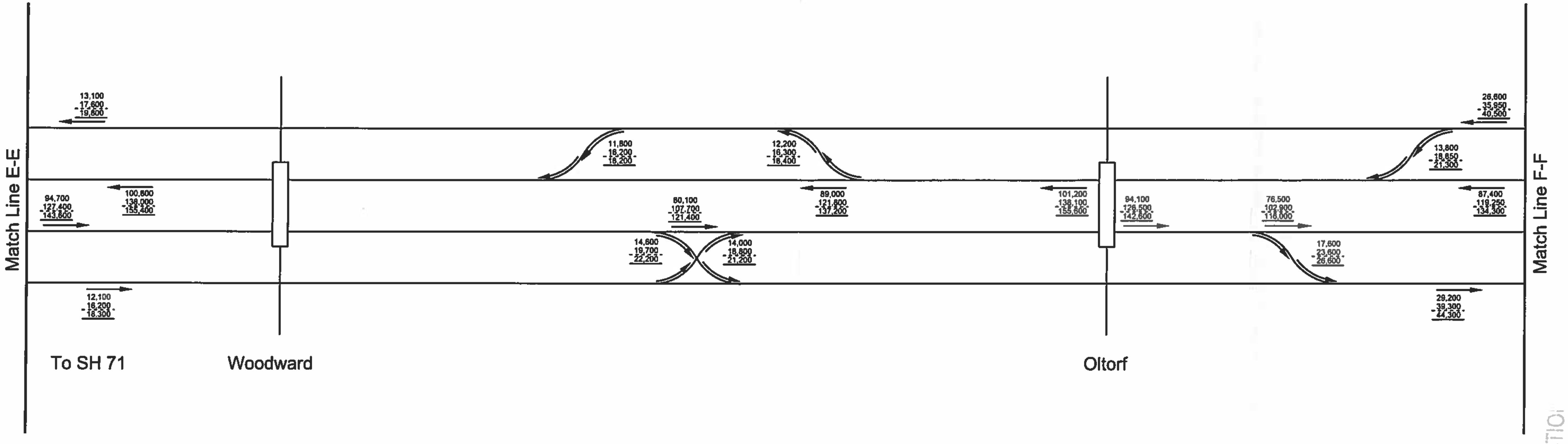
SHEET 5 OF 7

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E
Serial Number 84704

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

BUILD

NOT TO SCALE



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM SH 45 SE TO RIVERSIDE

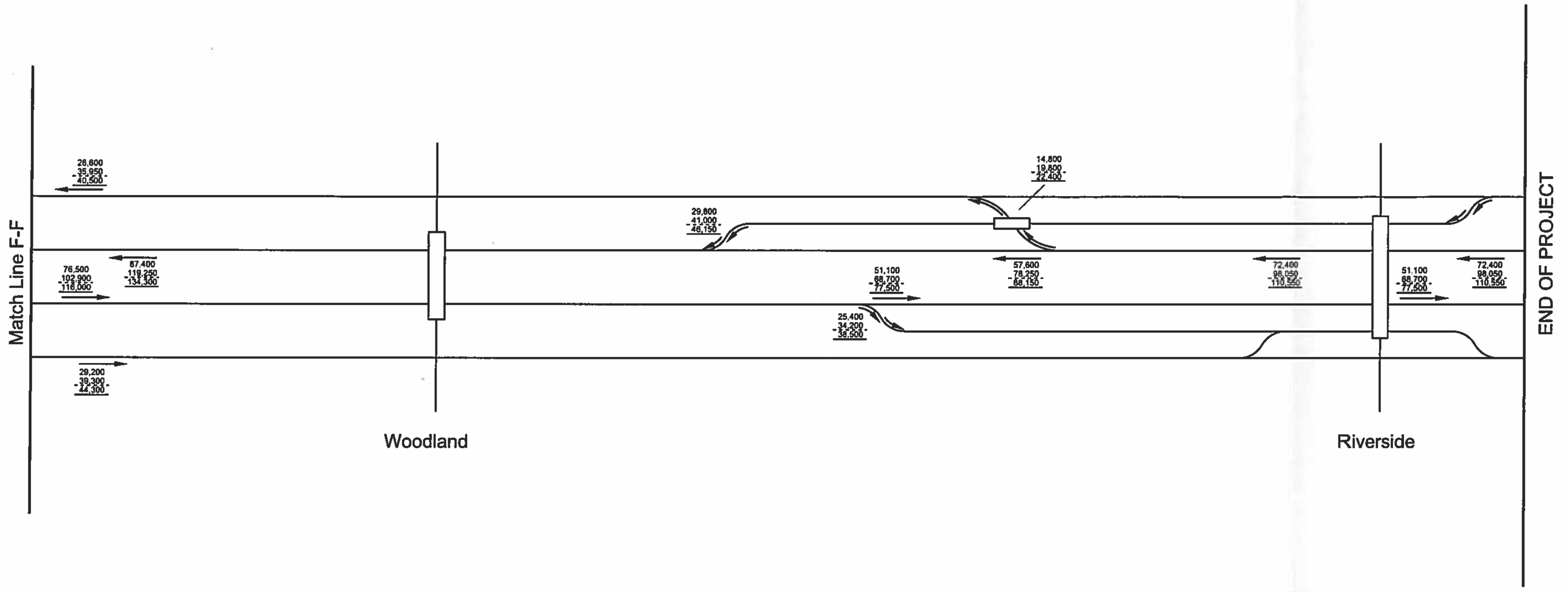
NOT INTENDED FOR CONSTRUCTIO
BIDDING OR PERMIT PURPOSE
William Erick Knowles, P.E
Serial Number 84704

SHEET 6 OF 7

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 612

BUILD

NOT TO SCALE



LEGEND

1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM SH 45 SE TO RIVERSIDE

NOT INTENDED FOR CONSTRUCTIO
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E
Serial Number 84704

SHEET 7 OF 7

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

September 27, 2016

Description of Location	Base Year						ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
	Average Daily Traffic		Dir Dist %	K Factor	Percent Trucks				Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2040			ADT	DHV						
I-35 (Mainlanes) Existing, No-Build and Build Section 1 From Riverside to SH 71 Travis County	195,500	265,400	56 - 44	7.2	9.0	4.1	13,500	20	73,417,000	3	102,243,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year	
	% of ADT	% of DHV
Light Duty	91.0	95.9
Medium Duty	2.3	1.0
Heavy Duty	6.7	3.1

Description of Location	Base Year						ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
	Average Daily Traffic		Dir Dist %	K Factor	Percent Trucks				Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2050			ADT	DHV						
I-35 (Mainlanes) Existing, No-Build and Build Section 1 From Riverside to SH 71 Travis County	195,500	299,000	56 - 44	7.2	9.0	4.1	13,600	20	118,155,000	3	164,547,000	8"

NOT INTENDED FOR CONSTRUCTION,
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number [illegible]

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

September 27, 2016

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
			Dir Dist %	K Factor	Percent Trucks							
	2020	2040			ADT	DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
I-35 (Frontage Roads) Existing, No-Build and Build Section 1 From Riverside to SH 71 Travis County	25,200	33,800	56 - 44	7.2	7.9	5.9	11,900	30	6,473,000	3	8,306,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year	
	% of ADT	% of DHV
Light Duty	92.1	94.1
Medium Duty	2.0	1.5
Heavy Duty	5.9	4.4

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
			Dir Dist %	K Factor	Percent Trucks							
	2020	2050			ADT	DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
I-35 (Frontage Roads) Existing, No-Build and Build Section 1 From Riverside to SH 71 Travis County	25,200	38,100	56 - 44	7.2	7.9	5.9	12,000	30	10,418,000	3	13,366,000	8"

[illegible] CONSTRUCTION
[illegible] PERMIT PURPOSES
[illegible], P.E.
[illegible]

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

September 27, 2016

			Base Year						Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
Description of Location	Average Daily Traffic		Dir Dist %	K Factor	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2040			ADT	DHV						
<u>I-35 (Mainlanes)</u> Existing, No-Build and Build <u>Section 2</u> From SH 71 to Hays County Line Travis County	182,700	250,400	56 - 44	7.2	11.6	5.2	13,700	20	88,211,000	3	123,500,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year	
	% of ADT	% of DHV
Light Duty	88.4	94.8
Medium Duty	3.0	1.4
Heavy Duty	8.6	3.8

			Base Year						Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
Description of Location	Average Daily Traffic		Dir Dist %	K Factor	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2050			ADT	DHV						
<u>I-35 (Mainlanes)</u> Existing, No-Build and Build <u>Section 2</u> From SH 71 to Hays County Line Travis County	182,700	282,200	56 - 44	7.2	11.6	5.2	13,700	20	142,023,000	3	198,839,000	8"

NOT INTENDED FOR CONSTRUCTION,
BIDDING OR PERMIT PURPOSES
William Eric Knowles, P.E.
Serial Number [illegible]

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

September 27, 2016

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
			Dir Dist %	K Factor	Percent Trucks							
	2020	2040			ADT	DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
<u>I-35 (Frontage Roads)</u> Existing, No-Build and Build <u>Section 2</u> From SH 71 to Hays County Line Travis County	61,000	82,000	56 - 44	7.2	4.1	3.1	12,000	30	8,165,000	3	10,492,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year	
	% of ADT	% of DHV
Light Duty	95.9	96.9
Medium Duty	1.0	0.8
Heavy Duty	3.1	2.3

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
			Dir Dist %	K Factor	Percent Trucks							
	2020	2050			ADT	DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
<u>I-35 (Frontage Roads)</u> Existing, No-Build and Build <u>Section 2</u> From SH 71 to Hays County Line Travis County	61,000	92,500	56 - 44	7.2	4.1	3.1	12,100	30	13,146,000	3	16,894,000	8"

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 (Mainlanes)	Date for Memorandum	9/27/2016
Rd Type	IH	District	Austin
	Exsiting, No-Build and Build	County	Travis
Project	Section 1	CSJ	0015-13-388
Limits	From Riverside to SH 71	Analyst	LRT

Date:	Request	7/8/2016	Received	7/14/2016	Started	7/16/2016	Completed	9/27/2016
	District Contact	Carmen Ramos			Phone #	512/832-7075		

	Year	ADT's		% Trks ADT	% Trks DHV
Count				9.0	4.1
Base	2020	195500	# Trks	17642	
Forecast	2040	265400			
Forecast	2050	299000			

SPR Station	S-4	MC Stn	HP-871	% Trks	10.5
Year	2015	Dir	N&S	Num Trks	15908
Peak Hour	10.9	Year	2014	Axle Factor	2.77
DD	56	ADT	152170	% Single Axles	0.51
100-DD	44				
K-Factor	7.2				

Main Road Growth Rate		TDM Assignment	None
Growth Rate after 20 Years			
20 Year Growth Factor	1.788		
30 Year Growth Factor	1.765	LOD	99999
Design Period 1	20		
Design Period 2	30		

					# Lanes
Structural Number (SN)	3			Existing	6
Slab Thickness (ST)	8			Proposed	8

Past Projects

Project	
From	
To	
Date	
County	
CSJ	

T. Log

ADT			
% Growth Rate			
K-Factor			
DD			
% Trucks ADT			
% Trucks DHV			
MC Station			
SPR Station			

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

● FHWA Format			○ Texas 6 Format		
Light Duty Vehicles	Motorcycles	572	Light Duty Vehicles	Passenger	
	Passenger	105293		Panel & Pickup	
	Pickup or Van	30397	Single Units	Buses	
Single Units	Buses	613		Other 2 Axle	
	Other 2 Axle	3282		3 Axle	
	3 Axles	770		4 Axle or More	
	4 Axles or more	12	Truck Combs.	3 Axle	
Truck Combs.	3-4 Axles	571		4 Axle	
	5 Axles	10072		5 Axle	
	6 Axles or more	63		6 Axle or more	
Semi-Trailer-Trailer	5 Axles or less	432	Semi-Trailer-Trailer	5 Axle	
	6 Axles	93		6 Axle	
	7 Axles or more	0		7 Axle or more	

FHWA Format Data		
	Number	%
Light	136262	89.5
Medium	4180	2.7
Heavy	11728	7.7
Trucks	15908	10.5

Section 1

IH

	ADT	DHV
Light	91.0	95.9
Medium	2.3	1.0
Heavy	6.7	3.1

Total Vehicles	152170
Total Trucks	15908
Total Singles	22666.5
Total Tandems	21430.5
AXLE FACTOR	2.77
SINGLE AX FACT	0.51

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	20	20				
Year 2	40	50				
ADT	195500	195500				
% Trks	9.0	9.0				
Growth Rate	1.788	1.765				
Years	20	30				
Facil Type	A	A				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.77	2.77				
Single Axle	0.51	0.51				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	13500	13600				
% T in ATHWLD	20	20				
FLEXIBLE	73417000	118155000				
RIGID	102243000	164547000				

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 (Frontage Roads)	Date for Memorandum	9/27/2016
Rd Type	FM	District	Austin
	Exsiting, No-Build and Build	County	Travis
Project	Section 1	CSJ	0015-13-388
Limits	From Riverside to SH 71	Analyst	LRT

Date:	Request	7/8/2016	Received	7/14/2016	Started	7/16/2016	Completed 9/27/2016
	District Contact	Carmen Ramos			Phone #	512/832-7075	

	Year	ADT's		% Trks ADT	% Trks DHV
Count				7.9	5.9
Base	2020	25200	# Trks	2000	
Forecast	2040	33800			
Forecast	2050	38100			

SPR Station	S-4	MC Stn	HP-871	% Trks	10.5	FR
Year	2015	Dir	N&S	Num Trks	15908	Used
Peak Hour	10.9	Year	2014	Axle Factor	2.77	2.47
DD	56	ADT	152170	% Single Axles	0.51	0.66
100-DD	44					
K-Factor	7.2					

Main Road Growth Rate	
Growth Rate after 20 Years	
20 Year Growth Factor	1.706
30 Year Growth Factor	1.706
Design Period 1	20
Design Period 2	30

TDM Assignment: None

LOD: 99999

Structural Number (SN)	3		
Slab Thickness (ST)	8		

	# Lanes
Existing	4
Proposed	4

Past Projects

Project	
From	
To	
Date	
County	
CSJ	

T. Log

ADT			
% Growth Rate			
K-Factor			
DD			
% Trucks ADT			
% Trucks DHV			
MC Station			
SPR Station			

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

	● FHWA Format	
Light Duty Vehicles	Motorcycles	572
	Passenger	105293
	Pickup or Van	30397
Single Units	Buses	613
	Other 2 Axle	3282
	3 Axles	770
	4 Axles or more	12
Truck Combs.	3-4 Axles	571
	5 Axles	10072
	6 Axles or more	63
Semi-Trailer-Trailer	5 Axles or less	432
	6 Axles	93
	7 Axles or more	0

	○ Texas 6 Format	
Light Duty Vehicles	Passenger	
	Panel & Pickup	
Single Units	Buses	
	Other 2 Axle	
	3 Axle	
	4 Axle or More	
Truck Combs.	3 Axle	
	4 Axle	
	5 Axle	
	6 Axle or more	
Semi-Trailer-Trailer	5 Axle	
	6 Axle	
	7 Axle or more	

FHWA Format Data

	Number	%
Light	136262	89.5
Medium	4180	2.7
Heavy	11728	7.7
Trucks	15908	10.5

Section 1

FM

	ADT	DHV
Light	92.1	94.1
Medium	2.0	1.5
Heavy	5.9	4.4

Total Vehicles	152170
Total Trucks	15908
Total Singles	22666.5
Total Tandems	21430.5
AXLE FACTOR	2.47
SINGLE AX FACT	0.66

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	20	20				
Year 2	40	50				
ADT	25200	25200				
% Trks	7.9	7.9				
Growth Rate	1.706	1.706				
Years	20	30				
Facil Type	C	C				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.47	2.47				
Single Axle	0.66	0.66				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	11900	12000				
% T in ATHWLD	30	30				
FLEXIBLE	6473000	10418000				
RIGID	8306000	13366000				

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 (Mainlanes)	Date for Memorandum	9/27/2016
Rd Type	IH	District	Austin
	Exsiting, No-Build and Build	County	Travis
Project	Section 2	CSJ	0015-13-388
Limits	From SH 71 to Hays County Line	Analyst	LRT

Date:	Request	7/8/2016	Received	7/14/2016	Started	7/16/2016	Completed	9/27/2016
	District Contact	Carmen Ramos			Phone #	512/832-7075		

	Year	ADT's		% Trks ADT	% Trks DHV
Count				11.6	5.2
Base	2020	182700	# Trks	21139	
Forecast	2040	250400			
Forecast	2050	282200			

SPR Station	S-4	MC Stn	MS-4	% Trks	12.5
Year	2015	Dir	N&S	Num Trks	16575
Peak Hour	10.9	Year	2015	Axle Factor	2.73
DD	56	ADT	132497	% Single Axles	0.50
100-DD	44				
K-Factor	7.2				

Main Road Growth Rate		TDM Assignment	None
Growth Rate after 20 Years			
20 Year Growth Factor	1.853		
30 Year Growth Factor	1.815	LOD	99999
Design Period 1	20		
Design Period 2	30		

Structural Number (SN)	3		
Slab Thickness (ST)	8		

	# Lanes
Existing	6
Proposed	6

Past Projects

Project	
From	
To	
Date	
County	
CSJ	

T. Log

ADT			
% Growth Rate			
K-Factor			
DD			
% Trucks ADT			
% Trucks DHV			
MC Station			
SPR Station			

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

● FHWA Format			○ Texas 6 Format		
Light	Motorcycles	369	**Light Duty**	Passenger	
Duty	Passenger	82113	**Vehicles**	Panel & Pickup	
Vehicles	Pickup or Van	33440	**Single**	Buses	
Single	Buses	279	**Units**	Other 2 Axle	
Units	Other 2 Axle	3766		3 Axle	
	3 Axles	984		4 Axle or More	
	4 Axles or more	78	**Truck**	3 Axle	
Truck	3-4 Axles	405	**Combs.**	4 Axle	
Combs.	5 Axles	10581		5 Axle	
	6 Axles or more	133		6 Axle or more	
Semi-	5 Axles or less	291	**Semi-**	5 Axle	
Trailer-	6 Axles	58	**Trailer-**	6 Axle	
Trailer	7 Axles or more	0	**Trailer**	7 Axle or more	

FHWA Format Data

	Number	%
Light	115922	87.5
Medium	4247	3.2
Heavy	12328	9.3
Trucks	16575	12.5

Section 1

IH

	ADT	DHV
Light	88.4	94.8
Medium	3.0	1.4
Heavy	8.6	3.8

Total Vehicles	132497
Total Trucks	16575
Total Singles	22565.5
Total Tandems	22750.5
AXLE FACTOR	2.73
SINGLE AX FACT	0.50

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	20	20				
Year 2	40	50				
ADT	182700	182700				
% Trks	11.6	11.6				
Growth Rate	1.853	1.815				
Years	20	30				
Facil Type	A	A				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.73	2.73				
Single Axle	0.50	0.50				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	13700	13700				
% T in ATHWLD	20	20				
FLEXIBLE	88211000	142023000				
RIGID	123500000	198839000				

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 (Frontage Roads)	Date for Memorandum	9/27/2016
Rd Type	FM	District	Austin
	Exsiting, No-Build and Build	County	Travis
Project	Section 2	CSJ	0015-13-388
Limits	From SH 71 to Hays County Line	Analyst	LRT

Date: Request	7/8/2016	Received	7/14/2016	Started	7/16/2016	Completed	9/27/2016
District Contact	Carmen Ramos			Phone #	512/832-7075		

	Year	ADT's		% Trks ADT	% Trks DHV
Count				4.1	3.1
Base	2020	61000	# Trks	2500	
Forecast	2040	82000			
Forecast	2050	92500			

SPR Station	S-4	MC Stn	MS-4	% Trks	12.5	FR
Year	2015	Dir	N&S	Num Trks	16575	Used
Peak Hour	10.9	Year	2015	Axle Factor	2.73	2.43
DD	56	ADT	132497	% Single Axles	0.50	0.65
100-DD	44					
K-Factor	7.2					

Main Road Growth Rate		TDM Assignment	None
Growth Rate after 20 Years			
20 Year Growth Factor	1.721		
30 Year Growth Factor	1.721	LOD	99999
Design Period 1	20		
Design Period 2	30		

					# Lanes
Structural Number (SN)	3			Existing	4
Slab Thickness (ST)	8			Proposed	4

Past Projects

Project	
From	
To	
Date	
County	
CSJ	

T. Log

ADT			
% Growth Rate			
K-Factor			
DD			
% Trucks ADT			
% Trucks DHV			
MC Station			
SPR Station			

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

	● FHWA Format			○ Texas 6 Format	
Light	Motorcycles	369	**Light Duty**	Passenger	
Duty	Passenger	82113	**Vehicles**	Panel & Pickup	
Vehicles	Pickup or Van	33440	**Single**	Buses	
Single	Buses	279	**Units**	Other 2 Axle	
Units	Other 2 Axle	3766		3 Axle	
	3 Axles	984		4 Axle or More	
	4 Axles or more	78	**Truck**	3 Axle	
Truck	3-4 Axles	405	**Combs.**	4 Axle	
Combs.	5 Axles	10581		5 Axle	
	6 Axles or more	133		6 Axle or more	
Semi-	5 Axles or less	291	**Semi-**	5 Axle	
Trailer-	6 Axles	58	**Trailer-**	6 Axle	
Trailer	7 Axles or more	0	**Trailer**	7 Axle or more	

FHWA Format Data

	Number	%
Light	**115922**	**87.5**
Medium	**4247**	**3.2**
Heavy	**12328**	**9.3**
Trucks	**16575**	**12.5**

Section 1

FM

	ADT	DHV
Light	**95.9**	**96.9**
Medium	**1.0**	**0.8**
Heavy	**3.1**	**2.3**

Total Vehicles	**132497**
Total Trucks	**16575**
Total Singles	**22565.5**
Total Tandems	**22750.5**
AXLE FACTOR	**2.43**
SINGLE AX FACT	**0.65**

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	**3, 8**					
Design Periods	**1**	**2**				
Year 1	**20**	**20**				
Year 2	**40**	**50**				
ADT	**61000**	**61000**				
% Trks	**4.1**	**4.1**				
Growth Rate	**1.721**	**1.721**				
Years	**20**	**30**				
Facil Type	**C**	**C**				
S.N.	**3**	**3**				
SLAB	**8**	**8**				
Weight Sta	**99999**	**99999**				
Axle Factor	**2.43**	**2.43**				
Single Axle	**0.65**	**0.65**				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	**3, 8**					
Design Periods	**1**	**2**				
ATHWLD	12000	12100				
% T in ATHWLD	30	30				
FLEXIBLE	8165000	13146000				
RIGID	10492000	16894000				

Texas
Department
of Transportation

File

MEMO

October 7, 2016

To: Terry McCoy, P.E., District Engineer
Attention: Lorena Echeverria De Misi, P.E., Director of TPD

Through: William E. Knowles, P.E,
Traffic Analysis Section Director, TPP

From: Lee Theobald
Transportation Analyst, TPP

Subject: Traffic Data
CSJ: 0015-10-062
I-35 (Mainlanes and Frontage Roads separate)
From FM 1431
To US 183
Travis and Williamson Counties

Attached are diagrams provided by Consultants depicting 2020, 2040 and 2050 average daily traffic volumes and turning movements from ramps to main lanes on I 35 from FM 1431 to US 183 for existing, no-build and build conditions. Also attached are tabulations showing traffic analysis for highway design for the 2020 to 2040 twenty year period and 2020 to 2050 thirty year period for the described limits of the route. Also included are tabulations showing data for use in air and noise analysis.

Due to differences in traffic volumes the project was separated into two sections.
Section 1: From FM 1431 to SH 45
Section 2: From SH 45 to US 183

Please refer to your Memo dated July 8, 2016.

If you have any questions or need additional information, please contact Lee Theobald at (512) 486-5143.

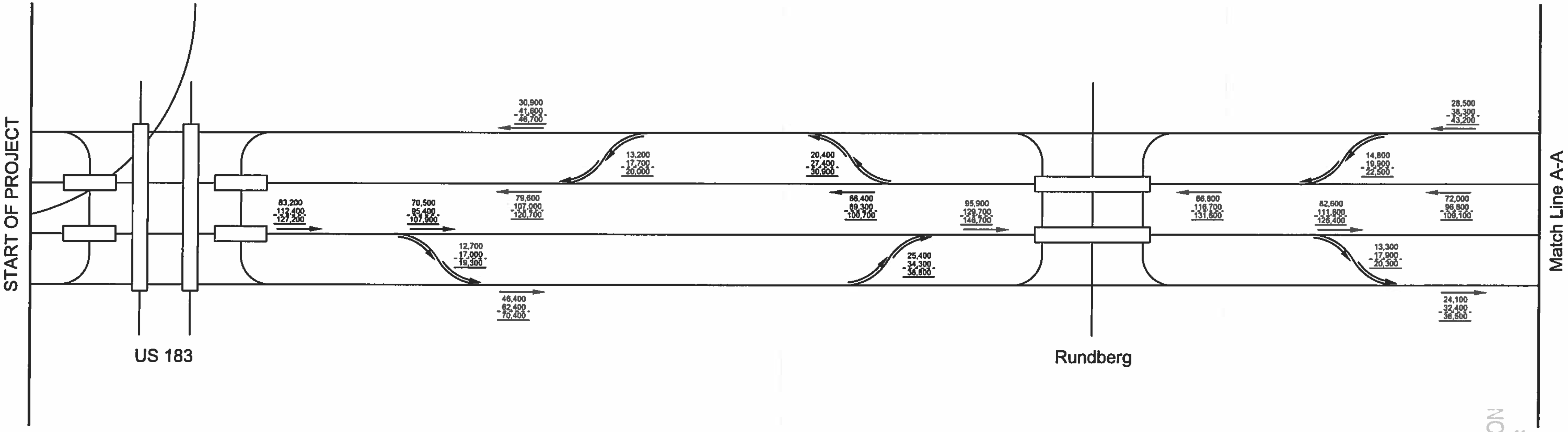
Attachments

CC: Carmen Ramos, Planner, Austin District
Design Division

EXISTING

N

NOT TO SCALE



LEGEND

1000 - 2020 ADT

1000 - 2040 ADT

1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM US 183 TO RM 1431

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
[illegible], P.E
Serial Number 84704

SHEET 1 OF 9

ALLIANCE
TRANSPORTATION GROUP
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Phone: 512-821-2081 • Fax: 512-821-2085
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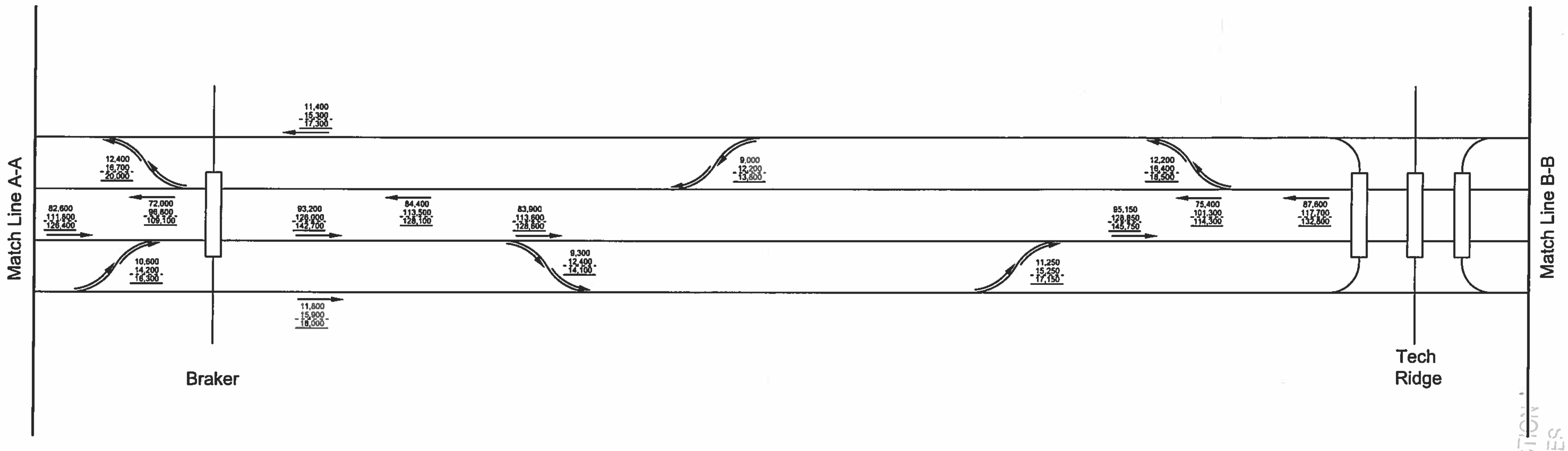

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1000 - 2040 ADT
1000 - 2050 ADT

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SHEET 2 OF 9

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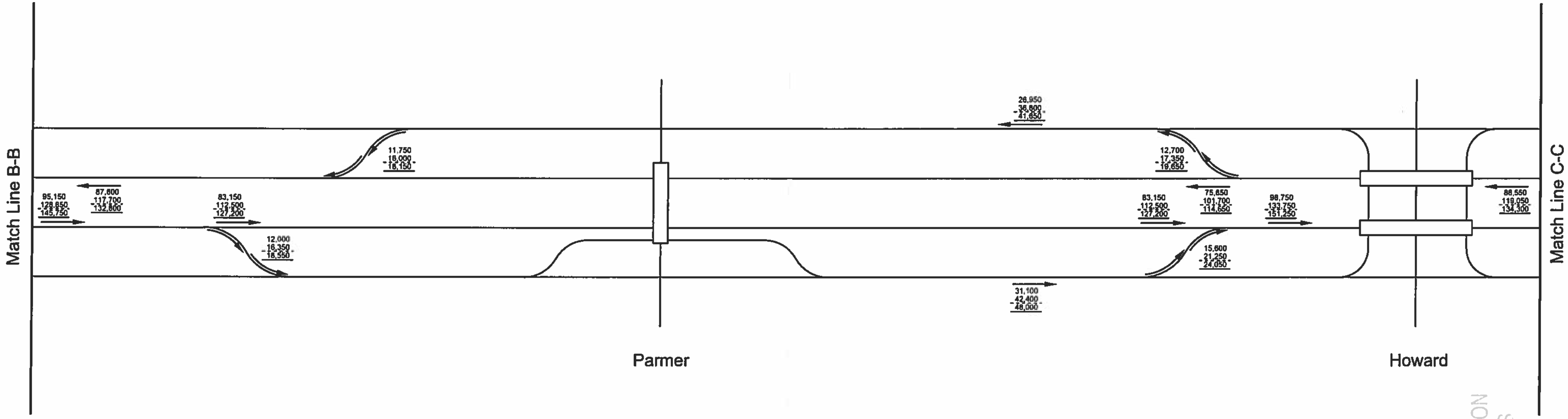

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2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
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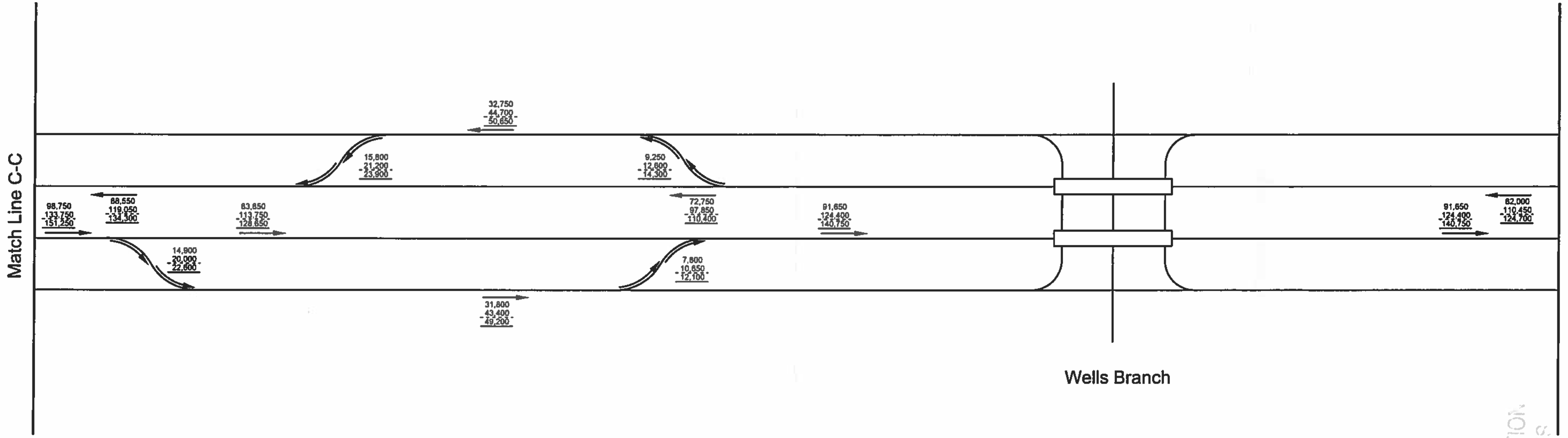

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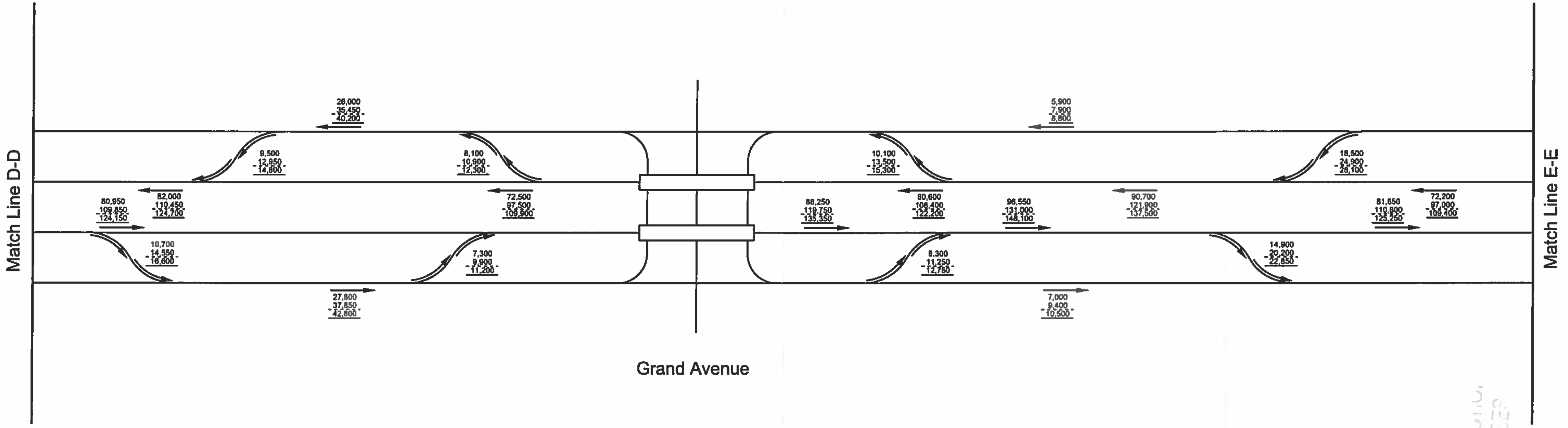

LEGEND

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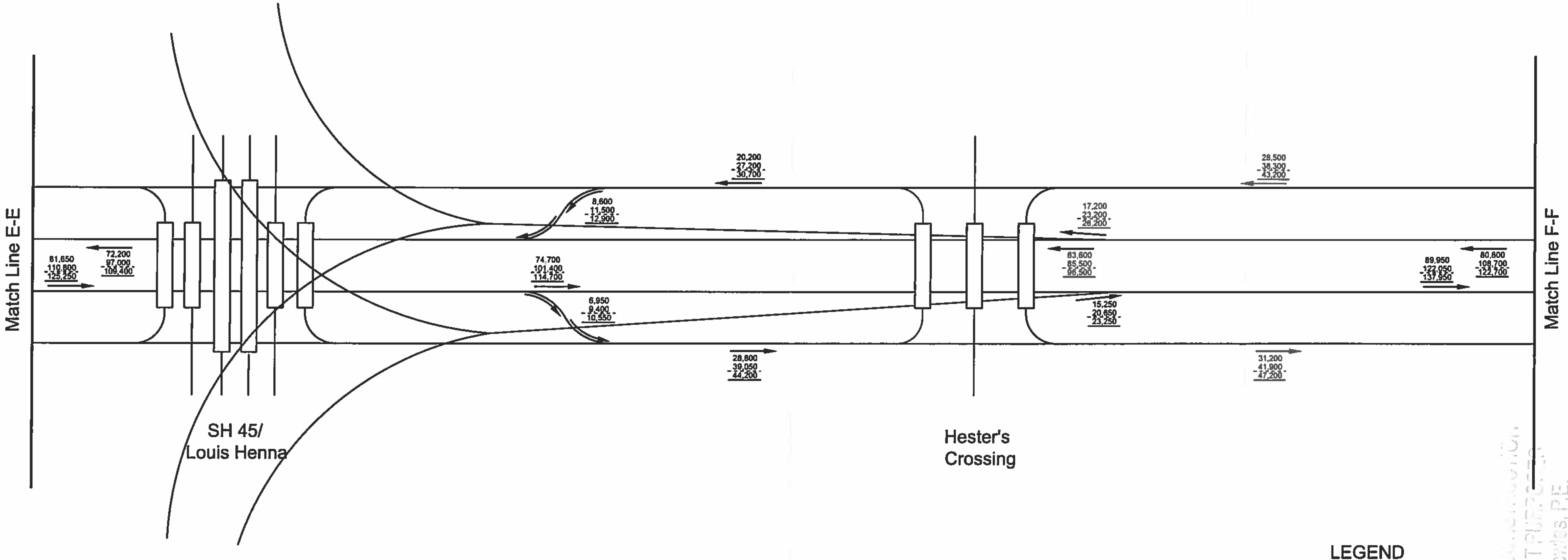

LEGEND
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1000 - 2040 ADT
1000 - 2050 ADT

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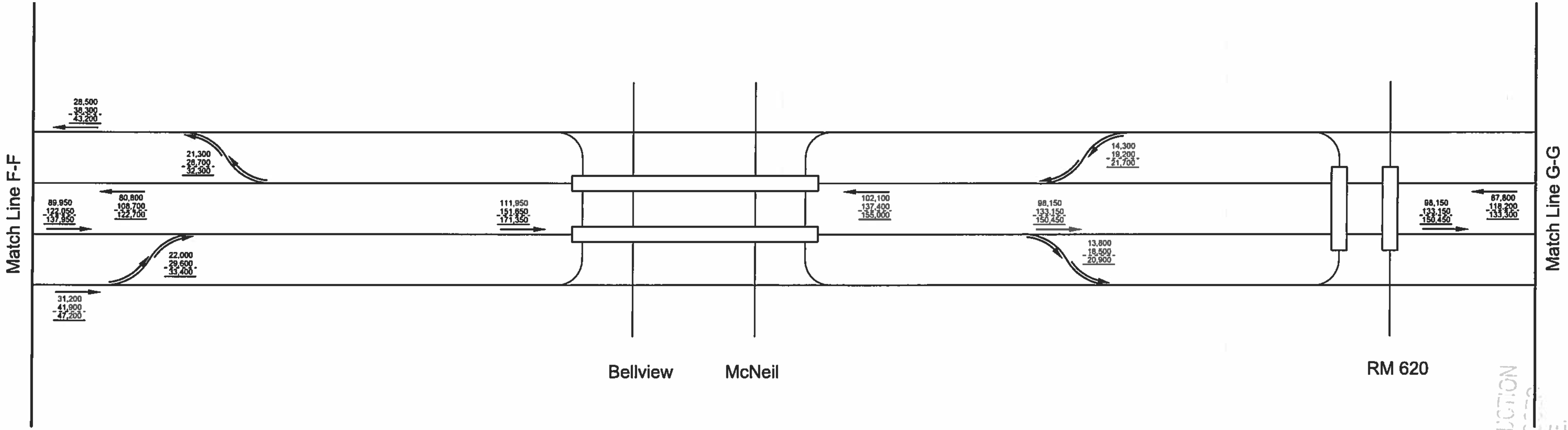

LEGEND

1000 - 2020 ADT

1000 - 2040 ADT

1000 - 2050 ADT

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Serial Number 84704

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS ALONG I-35 FROM US 183 TO RM 1431

SHEET 7 OF 9

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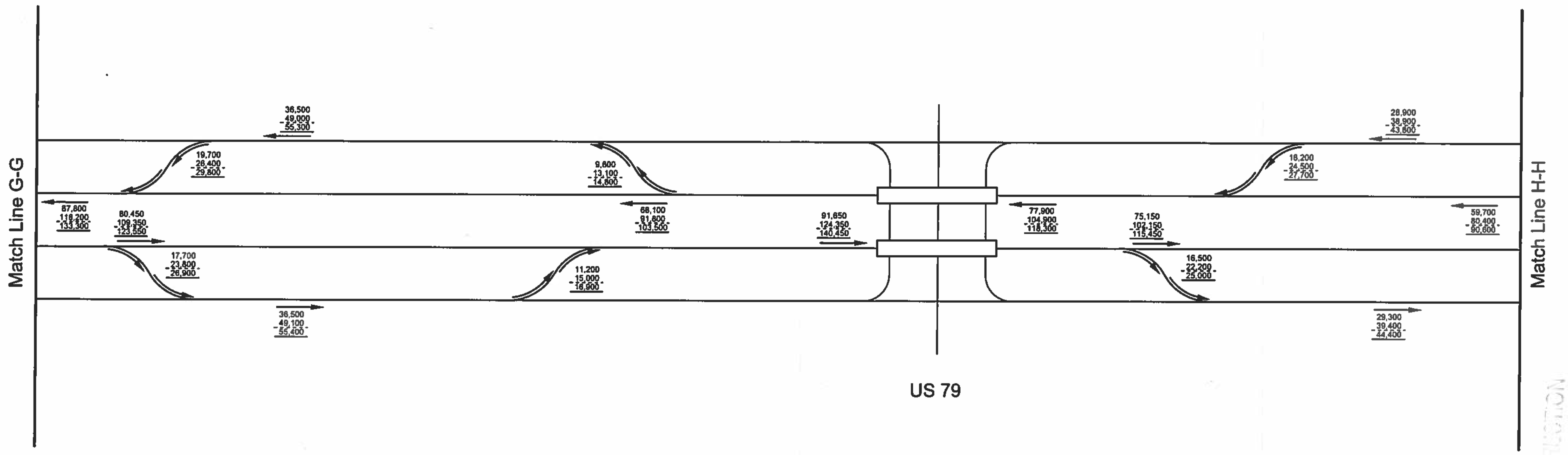

LEGEND
1000 - 2020 ADT
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SHEET 8 OF 9

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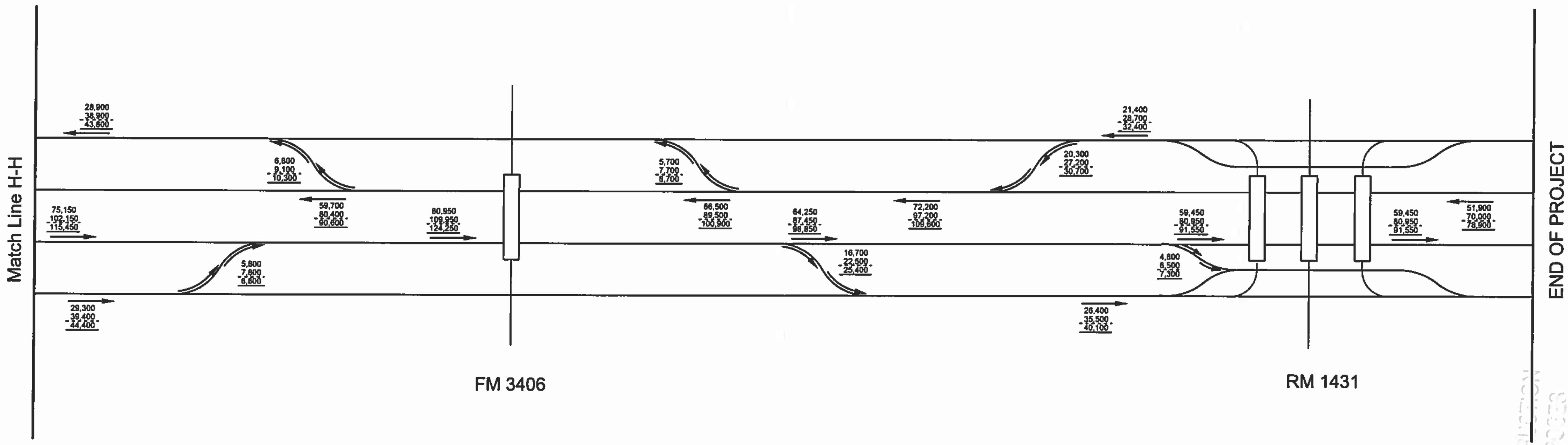

LEGEND

1000 - 2020 ADT
1000 - 2040 ADT
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2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
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SHEET 9 OF 9

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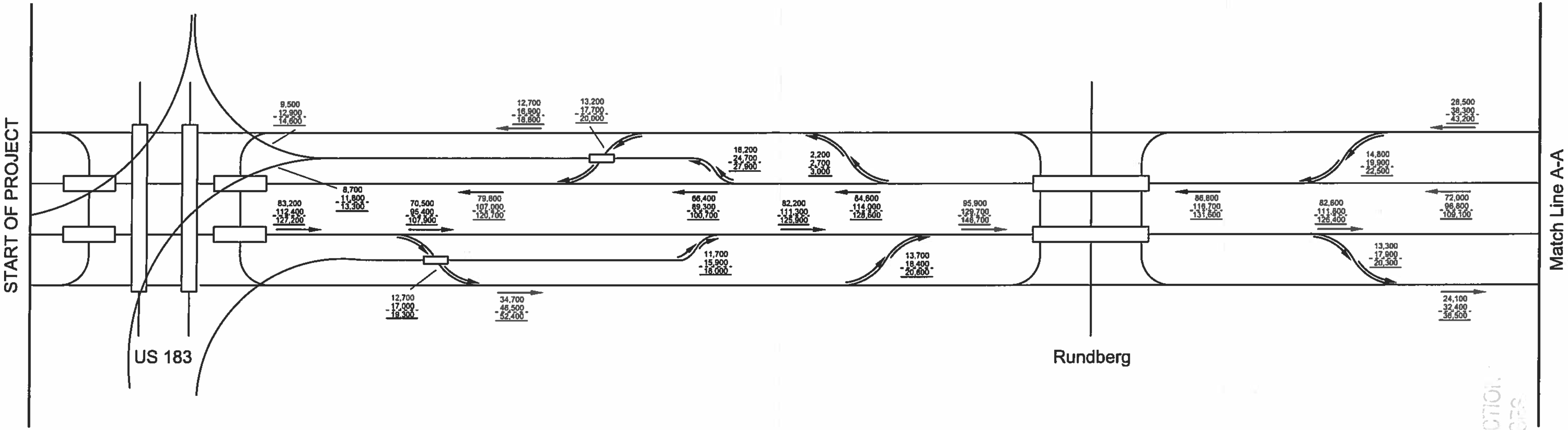

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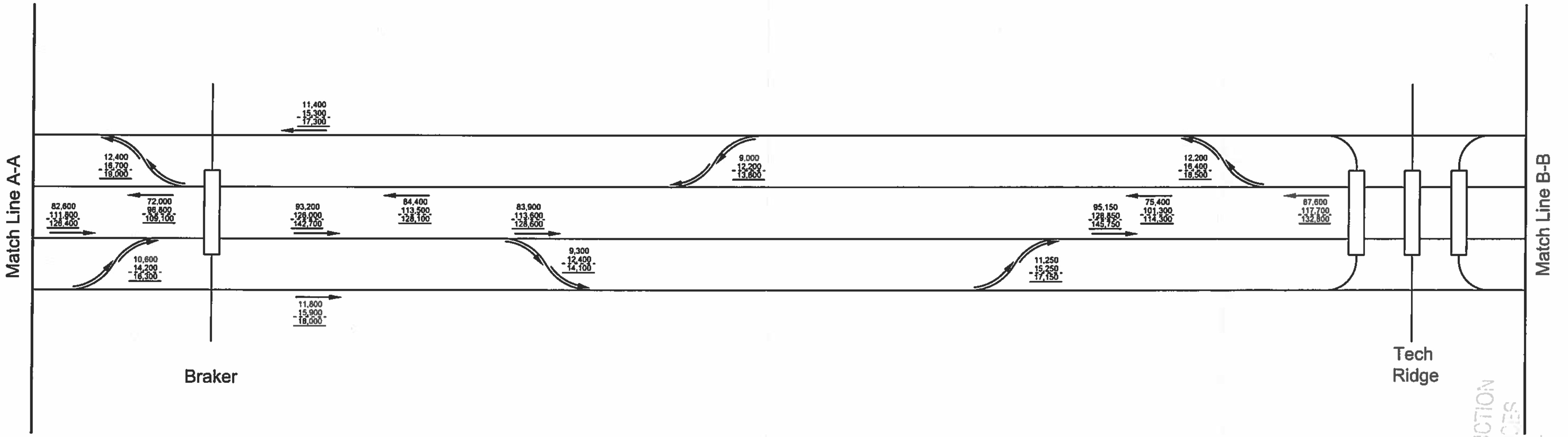

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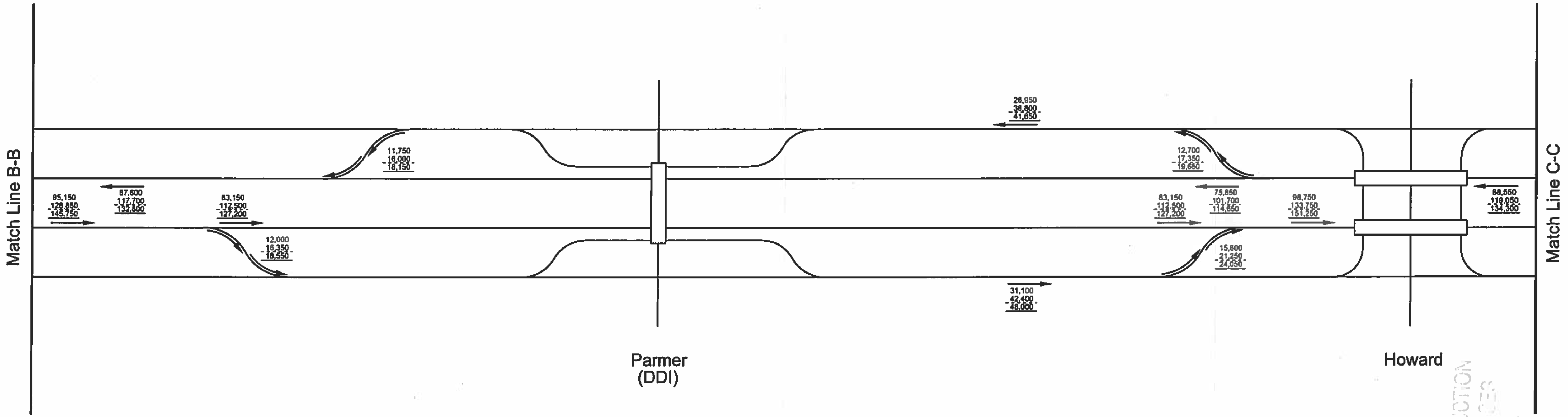

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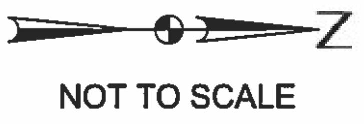

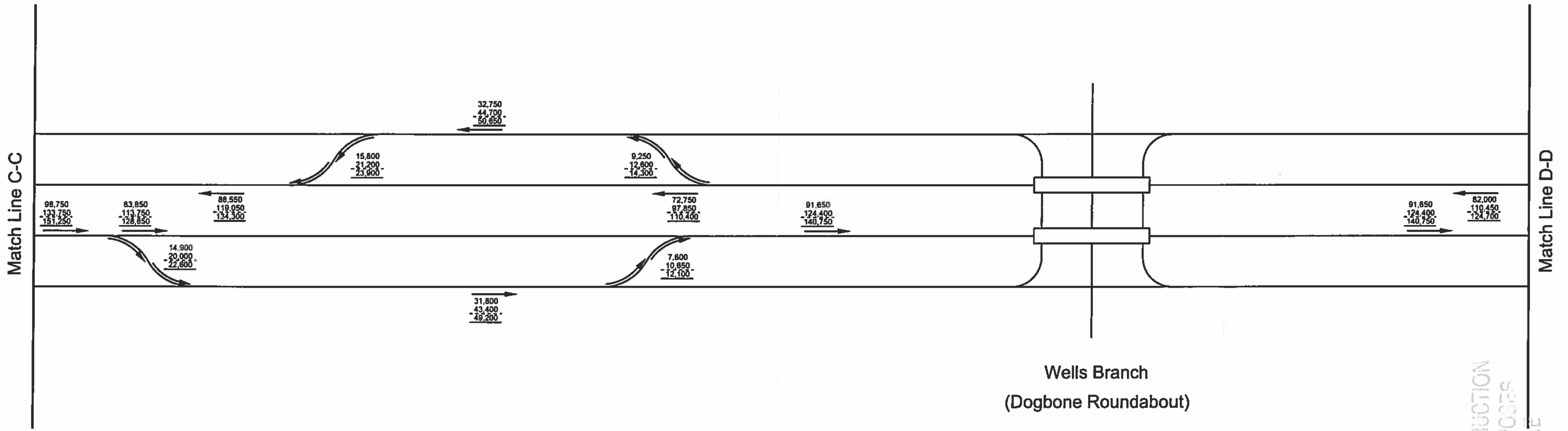

LEGEND
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2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
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SHEET 4 OF 9

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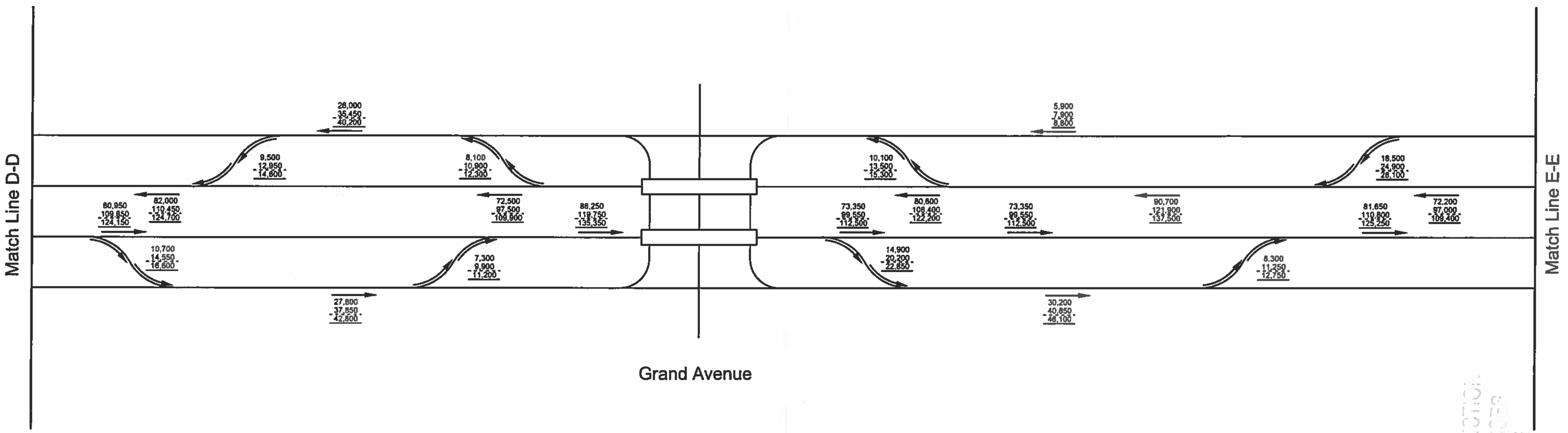

LEGEND

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2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
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SHEET 5 OF 9

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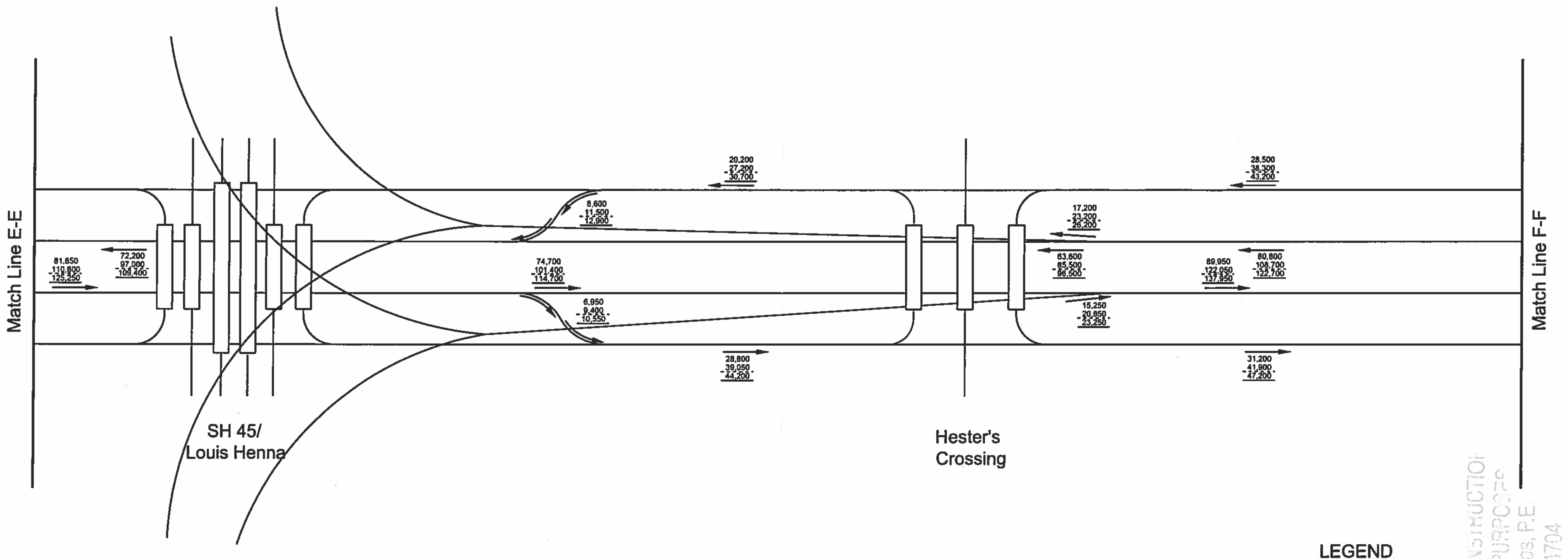

LEGEND

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2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
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FOR CONSTRUCTIO
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William Erick Knowles, P.E.
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SHEET 6 OF 9

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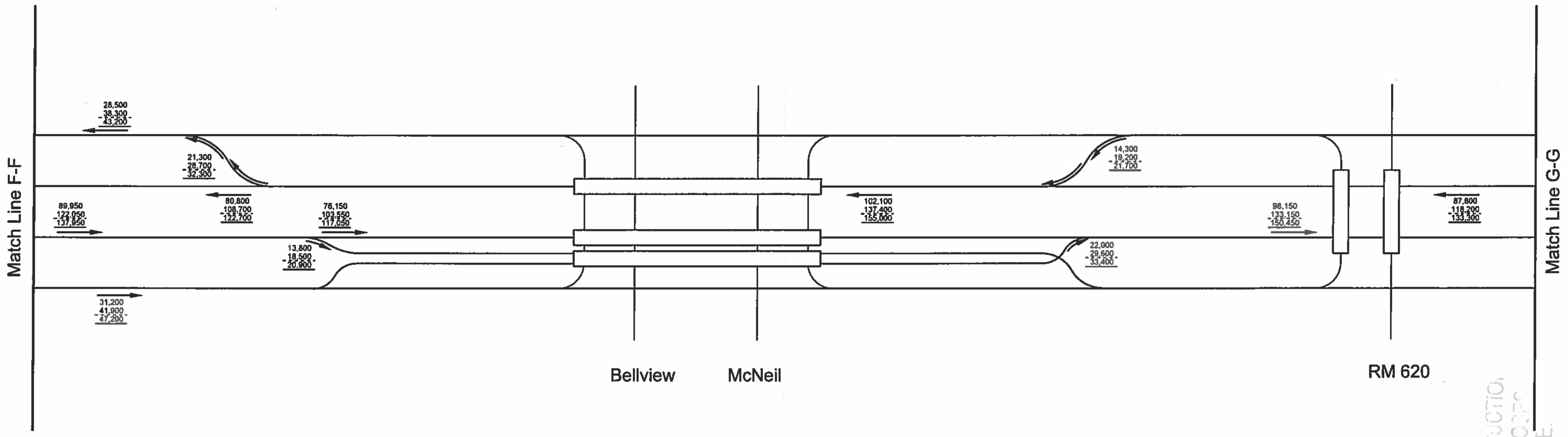

LEGEND

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2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
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William Eric Knowles, P.E.
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SHEET 7 OF 9

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NO-BUILD

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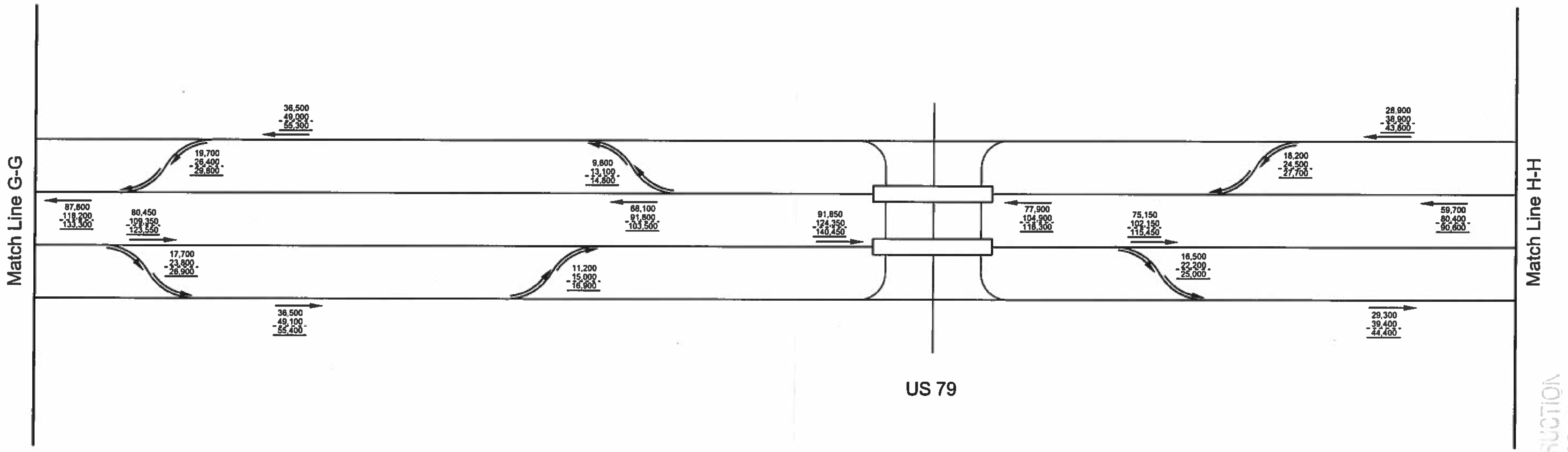

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SHEET 8 OF 9

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NO-BUILD

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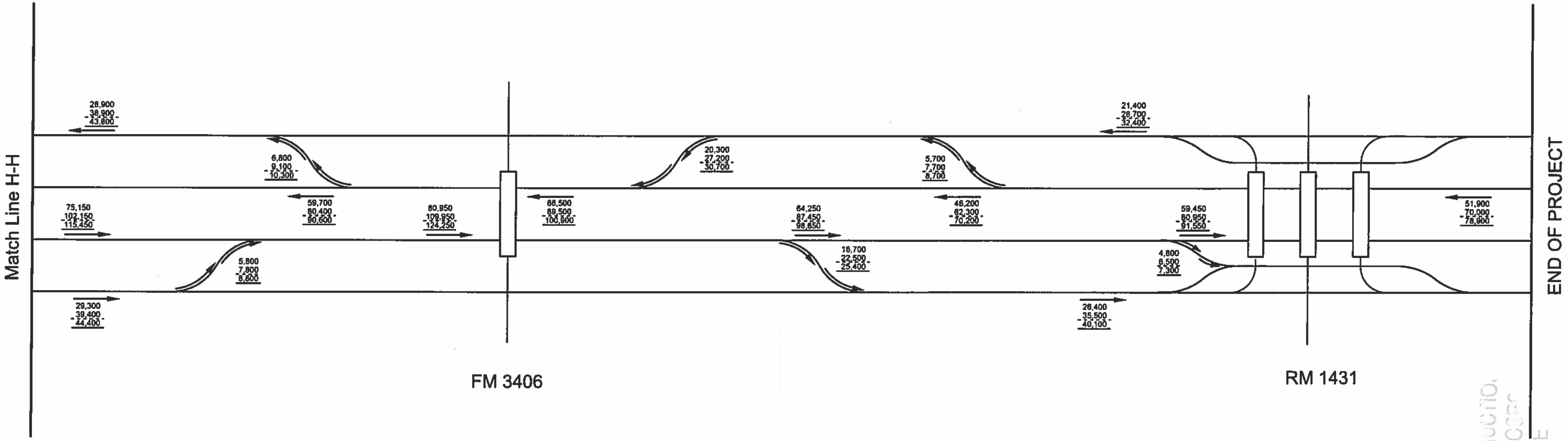
NOT TO SCALE



LEGEND
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2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM US 183 TO RM 1431

[illegible] FOR CONSTRUCTIO[illegible]
[illegible] OR PERMIT PURPOSES
[illegible] Knowles, P.E
Serial Number 84704

SHEET 9 OF 9

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BUILD

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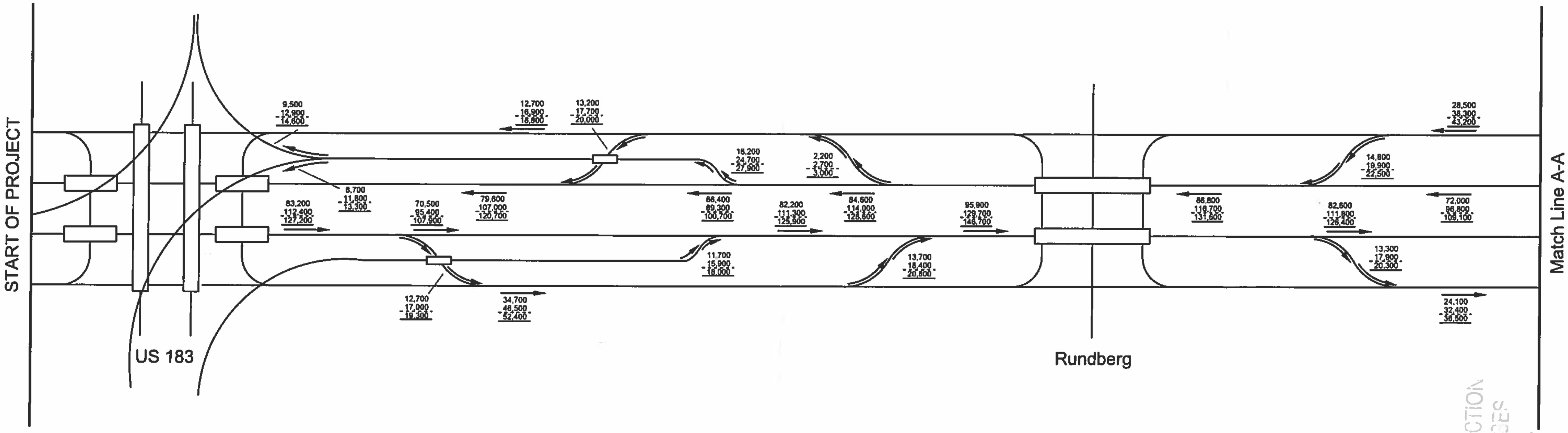

LEGEND
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[illegible] FOR CONSTRUCTION
[illegible] PERMIT PURPOSES
[illegible] Knowles, P.E.
Serial Number 84704

SHEET 1 OF 9

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BUILD

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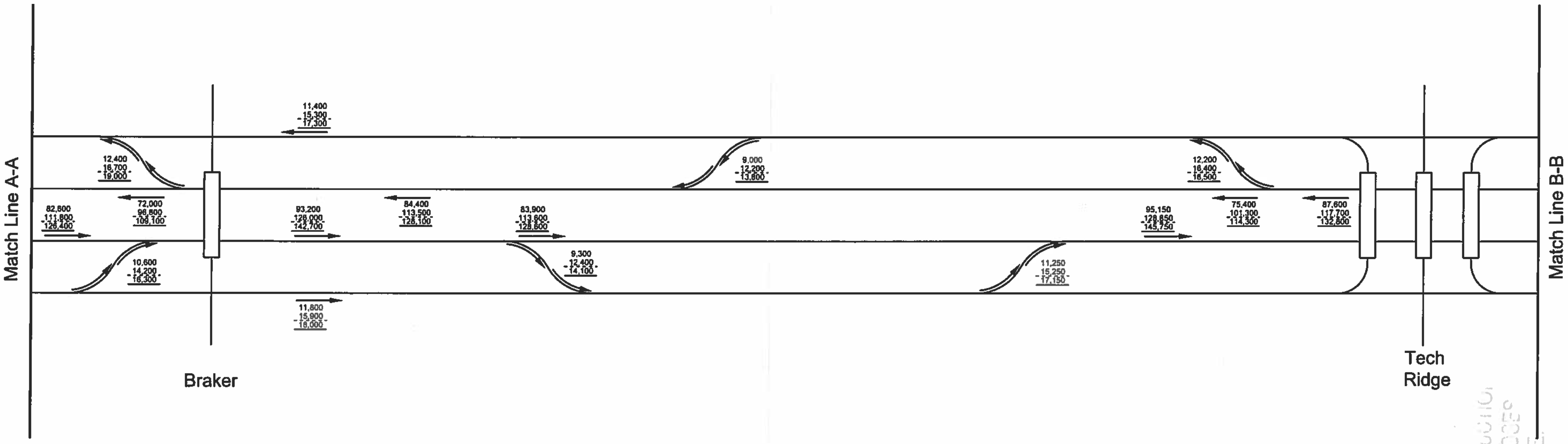

LEGEND
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SHEET 2 OF 9

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BUILD

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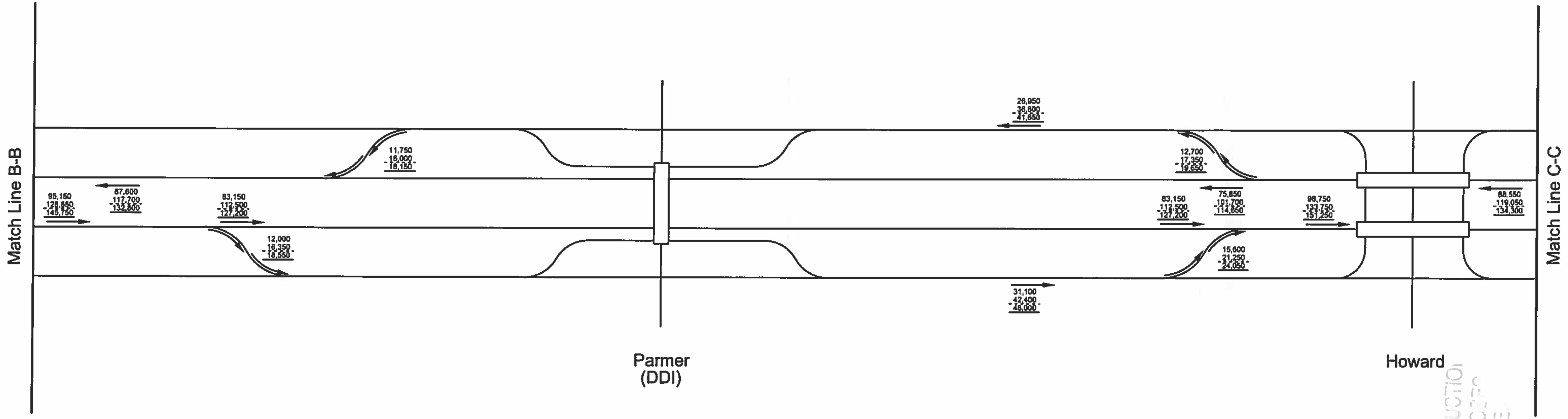

LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

...CONSTRUCTIO
...PERMIT PURPOSES
...Eric Knowles, P.E.
Serial Number 84704

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM US 183 TO RM 1431

SHEET 3 OF 9

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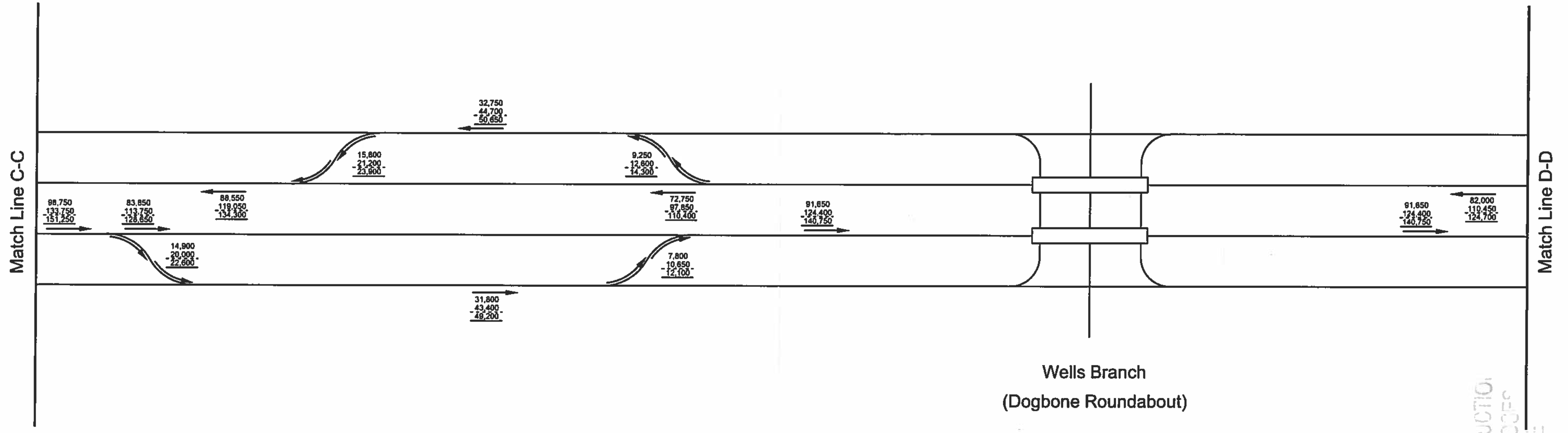
BUILD

N

NOT TO SCALE



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

NOT INTENDED FOR CONSTRUCTION, BIDDING OR PERMIT PURPOSES
William Erich Knowles, P.E.
Serial Number 84704

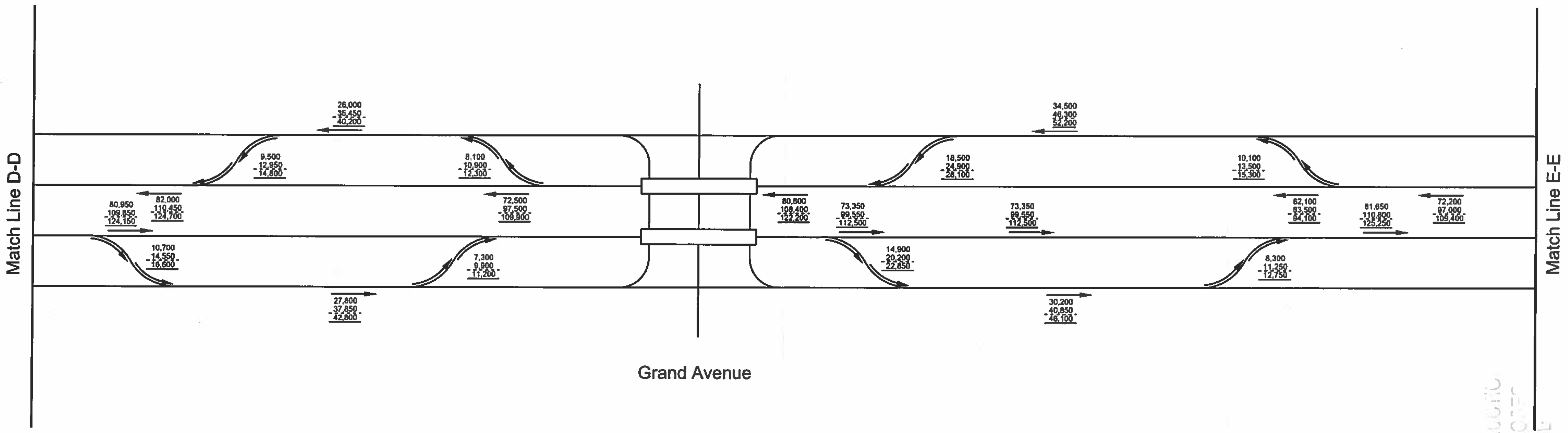
2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM US 183 TO RM 1431

SHEET 4 OF 9

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

BUILD

NOT TO SCALE



LEGEND

1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM US 183 TO RM 1431

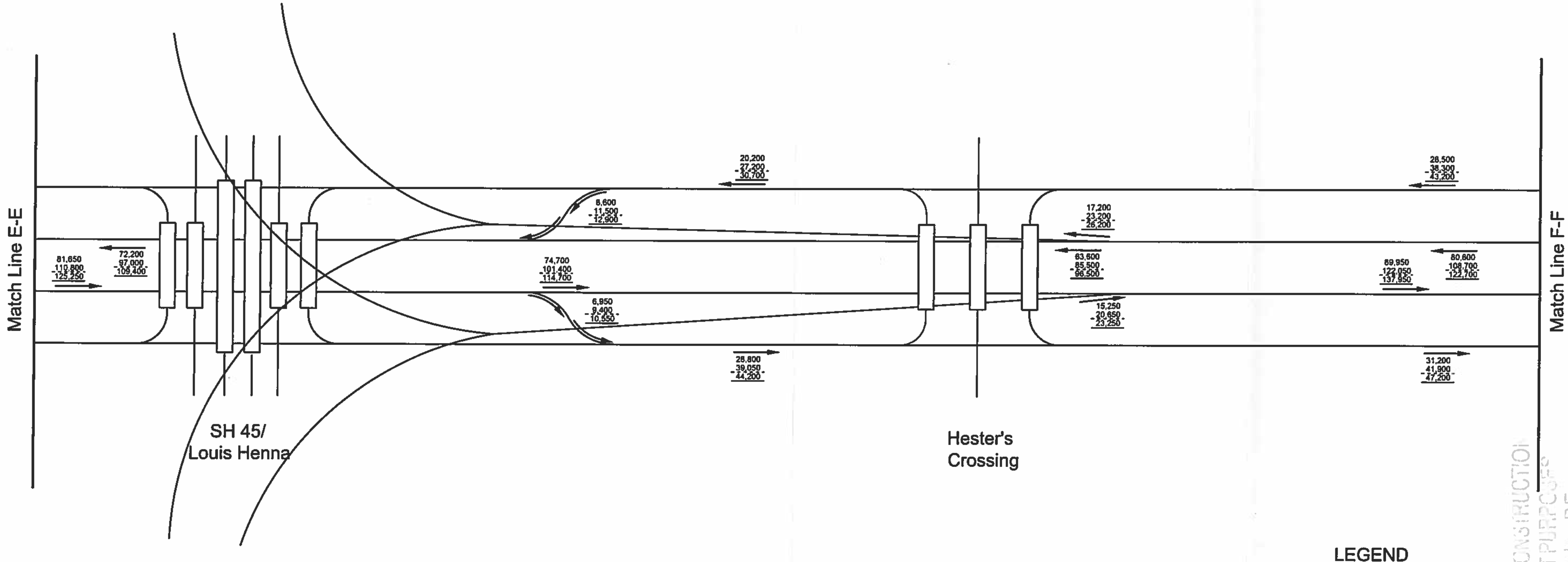
NOT INTENDED FOR CONSTRUCTION,
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84704

SHEET 5 OF 9

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 612

BUILD

NOT TO SCALE



LEGEND

1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM US 183 TO RM 1431

OT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E
Serial Number 84704

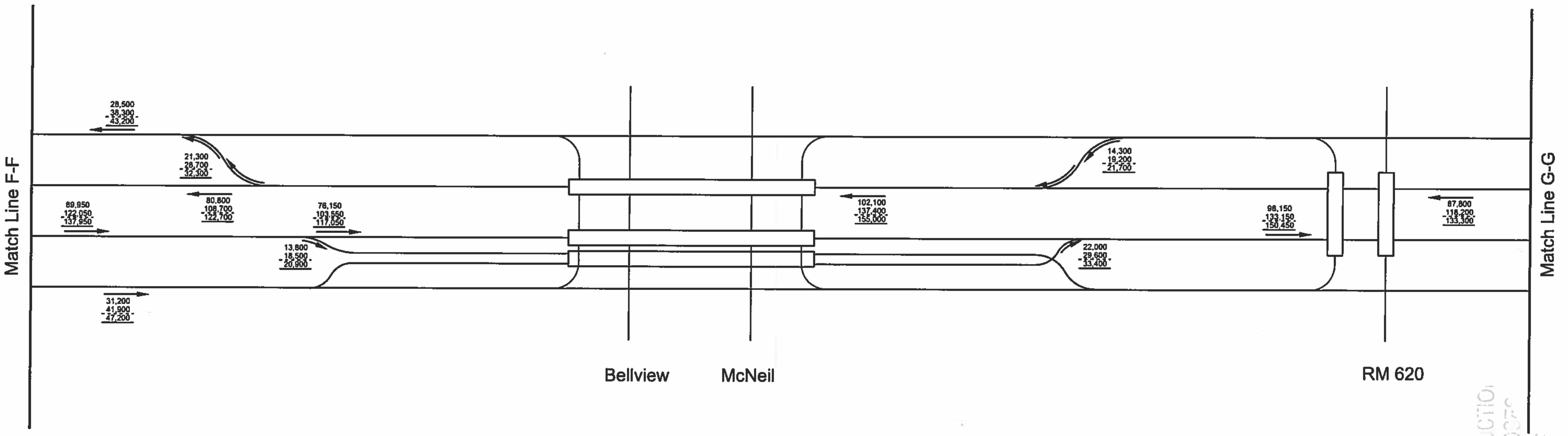
SHEET 6 OF 9

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

BUILD

N

NOT TO SCALE



2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM US 183 TO RM 1431

LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

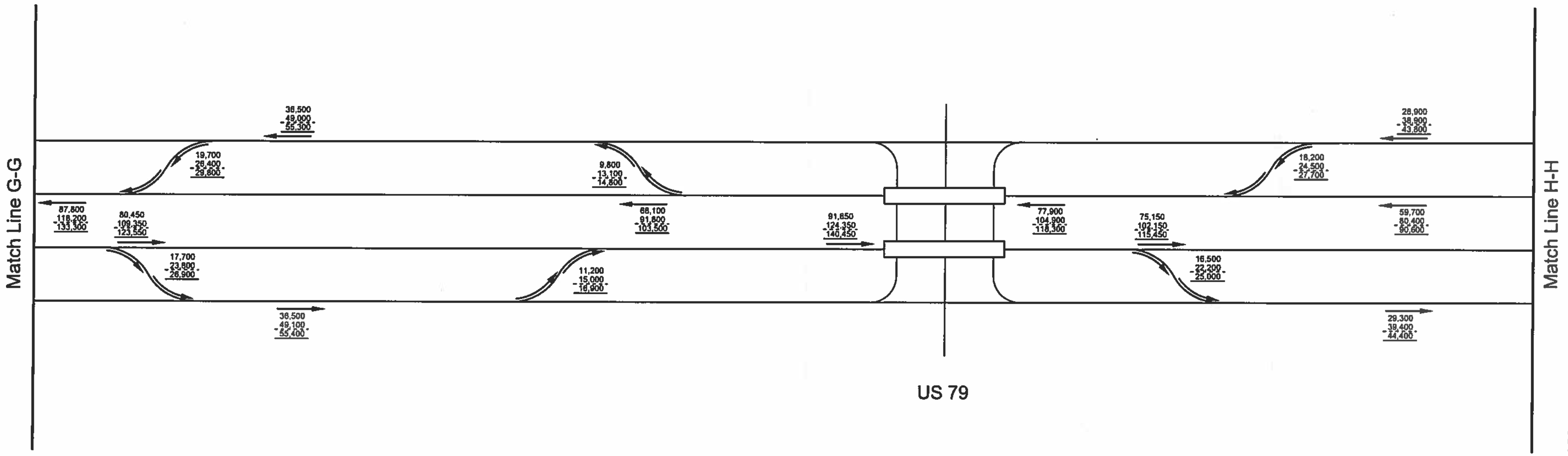
OT INTENDED FOR CONSTRUCTIO
IDDING OR PERMIT PURPOSE
William Erich Knowles, P.E
Serial Number 84704

SHEET 7 OF 9

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd. Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

BUILD

NOT TO SCALE



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM US 183 TO RM 1431

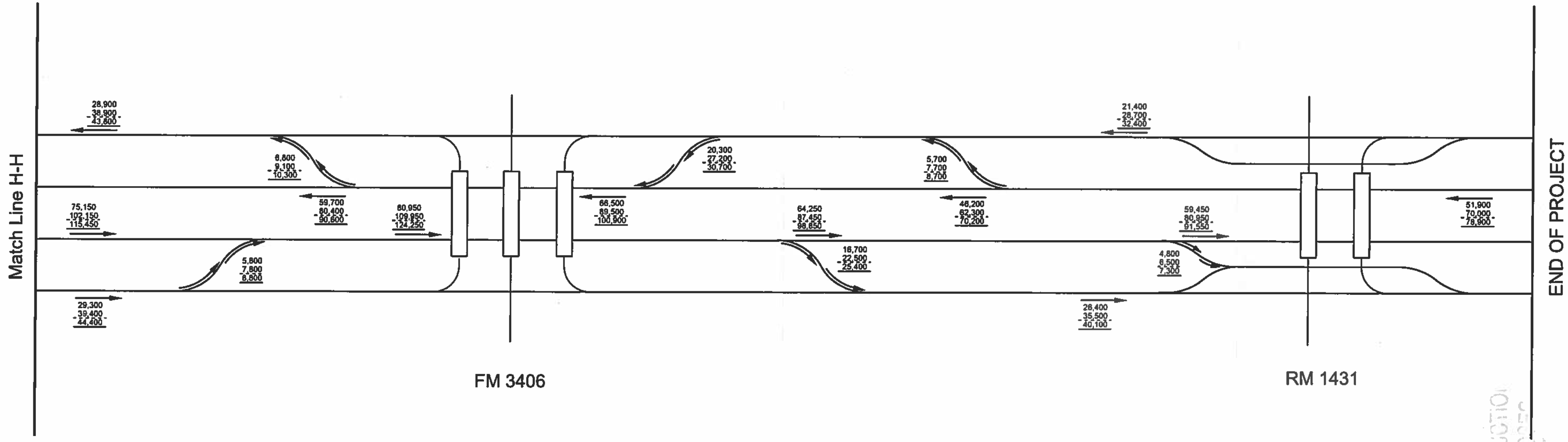
[illegible] FOR CONSTRUCTION
[illegible] OF PERMIT PURPOSES
William Eric Knowles, P.E
Serial Number 84704

SHEET 8 OF 9

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

BUILD

NOT TO SCALE



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040, AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AT SPECIFIED POINTS
ALONG I-35 FROM US 183 TO RM 1431

SHEET 9 OF 9

ALLIANCE
TRANSPORTATION GROUP
11500 Metric Blvd, Bldg M-1, Ste 150 • Austin, TX • 78758
Phone: 512-821-2081 • Fax: 512-821-2085
TBPE Firm Registration No. F - 812

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

October 3, 2016

			Base Year						Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
Description of Location	Average Daily Traffic		Dir Dist %	K Factor	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2040			ADT	DHV						
I-35 (Mainlanes) Existing, No-Build and Build Section 1 From FM 1431 to SH 45 Williamson County	170,750	230,750	51 - 49	7.1	10.6	4.8	13,500	30	79,988,000	3	113,900,000	8"

Data for Use in Air & Noise Analysis

	Base Year	
Vehicle Class	**% of ADT**	**% of DHV**
Light Duty	89.4	95.2
Medium Duty	1.7	0.8
Heavy Duty	8.9	4.0

			Base Year						Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
Description of Location	Average Daily Traffic		Dir Dist %	K Factor	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2050			ADT	DHV						
I-35 (Mainlanes) Existing, No-Build and Build Section 1 From FM 1431 to SH 45 Williamson County	170,750	260,650	51 - 49	7.1	10.6	4.8	13,600	30	128,916,000	3	183,572,000	8"

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

October 4, 2016

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
			Dir Dist %	K Factor	Percent Trucks							
	2020	2040			ADT	DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
<u>I-35 (Frontage Roads)</u> Existing, No-Build and Build <u>Section 1</u> From FM 1431 to SH 45 Williamson County	59,700	80,200	51 - 49	7.1	3.5	2.6	12,000	40	7,375,000	3	9,694,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year	
	% of ADT	% of DHV
Light Duty	96.5	97.4
Medium Duty	0.6	0.5
Heavy Duty	2.9	2.1

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
			Dir Dist %	K Factor	Percent Trucks							
	2020	2050			ADT	DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
<u>I-35 (Frontage Roads)</u> Existing, No-Build and Build <u>Section 1</u> From FM 1431 to SH 45 Williamson County	59,700	90,400	51 - 49	7.1	3.5	2.6	12,000	40	11,869,000	3	15,601,000	8"

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

October 4, 2016

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
			Dir Dist %	K Factor	Percent Trucks							
	2020	2040			ADT	DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
I 35 (Mainlanes) Existing Condition Section 2 From SH 45 to US 183 Travis County	136,900	184,700	56 - 44	7.3	12.9	5.8	13,600	20	68,588,000	3	93,822,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year	
	% of ADT	% of DHV
Light Duty	87.1	94.2
Medium Duty	4.6	2.1
Heavy Duty	8.3	3.7

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
			Dir Dist %	K Factor	Percent Trucks							
	2020	2050			ADT	DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
I 35 (Mainlanes) Existing Condition Section 2 From SH 45 to US 183 Travis County	136,900	208,600	56 - 44	7.3	12.9	5.8	13,600	20	110,529,000	3	151,193,000	8"

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

October 4, 2016

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
			Dir Dist	K	Percent Trucks							
	2020	2040	%	Factor	ADT	DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
I 35 (Mainlanes) No Build and Build Conditions Section 2 From SH 45 to US 183 Travis County	166,800	225,300	56 - 44	7.3	11.8	5.3	13,700	20	76,533,000	3	104,663,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year	
	% of ADT	% of DHV
Light Duty	88.2	94.7
Medium Duty	4.2	1.9
Heavy Duty	7.6	3.4

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
			Dir Dist	K	Percent Trucks							
	2020	2050	%	Factor	ADT	DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
I 35 (Mainlanes) No Build and Build Conditions Section 2 From SH 45 to US 183 Travis County	166,800	254,500	56 - 44	7.3	11.8	5.3	13,700	20	123,350,000	3	168,688,000	8"

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

October 4, 2016

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
			Dir Dist %	K Factor	Percent Trucks				Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2040			ADT	DHV						
I 35 (Frontage Roads) Existing Condition Section 2 From SH 45 to US 183 Travis County	90,500	121,700	56 - 44	7.3	4.0	3.0	12,300	20	9,399,000	3	10,755,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year	
	% of ADT	% of DHV
Light Duty	96.0	97.0
Medium Duty	2.9	2.2
Heavy Duty	1.1	0.8

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
			Dir Dist %	K Factor	Percent Trucks				Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2050			ADT	DHV						
I 35 (Frontage Roads) Existing Condition Section 2 From SH 45 to US 183 Travis County	90,500	137,100	56 - 44	7.3	4.0	3.0	12,300	20	15,121,000	3	17,302,000	8"

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

October 4, 2016

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
			Dir Dist %	K Factor	Percent Trucks							
	2020	2040			ADT	DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
I 35 (Frontage Roads) No Build and Build Conditions Section 2 From SH 45 to US 183 Travis County	60,600	81,100	56 - 44	7.3	4.7	3.5	12,100	20	7,346,000	3	8,419,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year	
	% of ADT	% of DHV
Light Duty	95.3	96.5
Medium Duty	3.5	2.6
Heavy Duty	1.2	0.9

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
			Dir Dist %	K Factor	Percent Trucks							
	2020	2050			ADT	DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
I 35 (Frontage Roads) No Build and Build Conditions Section 2 From SH 45 to US 183 Travis County	60,600	91,200	56 - 44	7.3	4.7	3.5	12,200	20	11,805,000	3	13,529,000	8"

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 (Mainlanes)	Date for Memorandum	10/7/2016
Rd Type	IH	District	Austin
	Exsiting, No-Build and Build	County	Williamson
Project	Section 1	CSJ	0015-10-062
Limits	From FM 1431 to SH 45	Analyst	LRT

Date: Request 7/8/2016 Received 7/14/2016 Started 7/16/2016 Completed 10/3/2016

District Contact Carmen Ramos Phone # 512/832-7075

	Year	ADT's
Count		
Base	2020	170750
Forecast	2040	230750
Forecast	2050	260650

% Trks ADT 10.6

Trks 18180

% Trks DHV 4.8

SPR Station	S-246	MC Stn	HP-878	% Trks	11.1
Year	2015	Dir	N&S	Num Trks	15161
Peak Hour	7.4	Year	2015	Axle Factor	2.83
DD	51	ADT	136929	% Single Axles	0.46
100-DD	49				
K-Factor	7.1				

Main Road Growth Rate	
Growth Rate after 20 Years	
20 Year Growth Factor	1.757
30 Year Growth Factor	1.755
Design Period 1	20
Design Period 2	30

TDM Assignment None

LOD 99999

Structural Number (SN)	3		
Slab Thickness (ST)	8		

	# Lanes
Existing	6
Proposed	8

Past Projects

Project	
From	
To	
Date	
County	
CSJ	

T. Log

ADT	N/A		
% Growth Rate			
K-Factor			
DD			
% Trucks ADT			
% Trucks DHV			
MC Station			
SPR Station			

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

	● FHWA Format			○ Texas 6 Format	
Light Duty Vehicles	Motorcycles	135	**Light Duty Vehicles**	Passenger	
	Passenger	108084		Panel & Pickup	
	Pickup or Van	13549	**Single Units**	Buses	
Single Units	Buses	295		Other 2 Axle	
	Other 2 Axle	1924		3 Axle	
	3 Axles	755		4 Axle or More	
	4 Axles or more	478	**Truck Combs.**	3 Axle	
Truck Combs.	3-4 Axles	561		4 Axle	
	5 Axles	10614		5 Axle	
	6 Axles or more	96		6 Axle or more	
Semi-Trailer-Trailer	5 Axles or less	246	**Semi-Trailer-Trailer**	5 Axle	
	6 Axles	192		6 Axle	
	7 Axles or more	0		7 Axle or more	

FHWA Format Data

	Number	%
Light	121768	88.9
Medium	2499	1.8
Heavy	12662	9.2
Trucks	15161	11.1

Section 1

IH

	ADT	DHV
Light	89.4	95.2
Medium	1.7	0.8
Heavy	8.9	4.0

Total Vehicles	136929
Total Trucks	15161
Total Singles	19781.5
Total Tandems	23125.5
AXLE FACTOR	2.83
SINGLE AX FACT	0.46

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	20	20				
Year 2	40	50				
ADT	170750	170750				
% Trks	10.6	10.6				
Growth Rate	1.757	1.755				
Years	20	30				
Facil Type	A	A				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.83	2.83				
Single Axle	0.46	0.46				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	13500	13600				
% T in ATHWLD	30	30				
FLEXIBLE	79988000	128916000				
RIGID	113900000	183572000				

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 (Frontage Roads)	Date for Memorandum	10/7/2016
Rd Type	FM	District	Austin
	Exsiting, No-Build and Build	County	Williamson
Project	Section 1	CSJ	0015-10-062
Limits	From FM 1431 to SH 45	Analyst	LRT

Date:	Request	7/8/2016	Received	7/14/2016	Started	7/16/2016	Completed 10/4/2016
	District Contact	Carmen Ramos			Phone #	512/832-7075	

	Year	ADT's		% Trks ADT	% Trks DHV
Count				3.5	2.6
Base	2020	59700	# Trks	2100	
Forecast	2040	80200			
Forecast	2050	90400			

SPR Station	S-246	MC Stn	HP-878	% Trks	11.1	FR
Year	2015	Dir	N&S	Num Trks	15161	USED
Peak Hour	7.4	Year	2015	Axle Factor	2.83	2.53
DD	51	ADT	136929	% Single Axles	0.46	0.61
100-DD	49					
K-Factor	7.1					

Main Road Growth Rate	
Growth Rate after 20 Years	
20 Year Growth Factor	1.717
30 Year Growth Factor	1.714
Design Period 1	20
Design Period 2	30

TDM Assignment: None

LOD: 99999

Structural Number (SN)	3		
Slab Thickness (ST)	8		

	# Lanes
Existing	6
Proposed	8

Past Projects

Project	
From	
To	
Date	
County	
CSJ	

T. Log

ADT	N/A		
% Growth Rate			
K-Factor			
DD			
% Trucks ADT			
% Trucks DHV			
MC Station			
SPR Station			

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

	● FHWA Format			○ Texas 6 Format	
Light Duty Vehicles	Motorcycles	135	**Light Duty Vehicles**	Passenger	
	Passenger	108084		Panel & Pickup	
	Pickup or Van	13549	**Single Units**	Buses	
Single Units	Buses	295		Other 2 Axle	
	Other 2 Axle	1924		3 Axle	
	3 Axles	755		4 Axle or More	
	4 Axles or more	478	**Truck Combs.**	3 Axle	
Truck Combs.	3-4 Axles	561		4 Axle	
	5 Axles	10614		5 Axle	
	6 Axles or more	96		6 Axle or more	
Semi-Trailer-Trailer	5 Axles or less	246	**Semi-Trailer-Trailer**	5 Axle	
	6 Axles	192		6 Axle	
	7 Axles or more	0		7 Axle or more	

FHWA Format Data

	Number	%
Light	121768	88.9
Medium	2499	1.8
Heavy	12662	9.2
Trucks	15161	11.1

Section 1

FM

	ADT	DHV
Light	96.5	97.4
Medium	0.6	0.5
Heavy	2.9	2.1

Total Vehicles	136929
Total Trucks	15161
Total Singles	19781.5
Total Tandems	23125.5
AXLE FACTOR	2.53
SINGLE AX FACT	0.61

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	20	20				
Year 2	40	50				
ADT	59700	59700				
% Trks	3.5	3.5				
Growth Rate	1.717	1.714				
Years	20	30				
Facil Type	C	C				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.53	2.53				
Single Axle	0.61	0.61				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	12000	12000				
% T in ATHWLD	40	40				
FLEXIBLE	7375000	11869000				
RIGID	9694000	15601000				

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I 35 (Mainlanes)	Date for Memorandum	10/7/2016
Rd Type	IH	District	Austin
	Existing Condition	County	Travis
Project	Section 2	CSJ	0015-10-062
Limits	From SH 45 to US 183	Analyst	LRT

Date: Request	7/8/2016	Received	7/14/2016	Started	7/16/2016	Completed	10/4/2016
District Contact	Carmen Ramos			Phone #	512/832-7075		

	Year	ADT's		% Trks ADT	% Trks DHV
Count				**12.9**	**5.8**
Base	2020	**136900**	# Trks	**17660**	
Forecast	2040	**184700**			
Forecast	2050	**208600**			

SPR Station	S-190	MC Stn	MS-190	% Trks	13.3
Year	2015	Dir	N&S	Num Trks	17050
Peak Hour	10.1	Year	2015	Axle Factor	2.68
DD	56	ADT	128465	% Single Axles	0.55
100-DD	**44**				
K-Factor	7.3				

Main Road Growth Rate		TDM Assignment	None
Growth Rate after 20 Years			
20 Year Growth Factor	**1.746**		
30 Year Growth Factor	**1.746**	LOD	99999
Design Period 1	20		
Design Period 2	30		

					# Lanes
Structural Number (SN)	3			Existing	6
Slab Thickness (ST)	8			Proposed	8

Past Projects

Project	
From	
To	
Date	
County	
CSJ	

T. Log

ADT	N/A		
% Growth Rate			
K-Factor			
DD			
% Trucks ADT			
% Trucks DHV			
MC Station			
SPR Station			

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

● FHWA Format		
Light Duty Vehicles	Motorcycles	147
	Passenger	74596
	Pickup or Van	36672
Single Units	Buses	326
	Other 2 Axle	5443
	3 Axles	521
	4 Axles or more	85
Truck Combs.	3-4 Axles	496
	5 Axles	9696
	6 Axles or more	52
Semi-Trailer-Trailer	5 Axles or less	262
	6 Axles	169
	7 Axles or more	0

○ Texas 6 Format		
Light Duty Vehicles	Passenger	
	Panel & Pickup	
Single Units	Buses	
	Other 2 Axle	
	3 Axle	
	4 Axle or More	
Truck Combs.	3 Axle	
	4 Axle	
	5 Axle	
	6 Axle or more	
Semi-Trailer-Trailer	5 Axle	
	6 Axle	
	7 Axle or more	

FHWA Format Data	Number	%
Light	111415	86.7
Medium	6017	4.7
Heavy	11033	8.6
Trucks	17050	13.3

Section 1

IH

	ADT	DHV
Light	87.1	94.2
Medium	4.6	2.1
Heavy	8.3	3.7

Total Vehicles	128465
Total Trucks	17050
Total Singles	25118.0
Total Tandems	20519.0
AXLE FACTOR	2.68
SINGLE AX FACT	0.55

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	20	20				
Year 2	40	50				
ADT	136900	136900				
% Trks	12.9	12.9				
Growth Rate	1.746	1.746				
Years	20	30				
Facil Type	A	A				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.68	2.68				
Single Axle	0.55	0.55				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	13600	13600				
% T in ATHWLD	20	20				
FLEXIBLE	68588000	110529000				
RIGID	93822000	151193000				

10/4/2016

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I 35 (Mainlanes)	Date for Memorandum	10/7/2016
Rd Type	IH	District	Austin
	No Build and Build Conditions	County	Travis
Project	Section 2	CSJ	0015-10-062
Limits	From SH 45 to US 183	Analyst	LRT

Date:	Request	7/8/2016	Received	7/14/2016	Started	7/16/2016	Completed 10/4/2016
	District Contact	Carmen Ramos			Phone #	512/832-7075	

	Year	ADT's		% Trks ADT	% Trks DHV
Count				11.8	5.3
Base	2020	**166800**	# Trks	**19682**	
Forecast	2040	**225300**			
Forecast	2050	**254500**			

SPR Station	S-190	MC Stn	MS-190	% Trks	13.3
Year	2015	Dir	N&S	Num Trks	17050
Peak Hour	10.1	Year	2015	Axle Factor	2.68
DD	56	ADT	128465	% Single Axles	0.55
100-DD	**44**				
K-Factor	7.3				

Main Road Growth Rate	
Growth Rate after 20 Years	
20 Year Growth Factor	**1.754**
30 Year Growth Factor	**1.753**
Design Period 1	20
Design Period 2	30

TDM Assignment None

LOD 99999

Structural Number (SN)	3		
Slab Thickness (ST)	8		

	# Lanes
Existing	6
Proposed	8

Past Projects

Project	
From	
To	
Date	
County	
CSJ	

T. Log

ADT	N/A		
% Growth Rate			
K-Factor			
DD			
% Trucks ADT			
% Trucks DHV			
MC Station			
SPR Station			

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

	● FHWA Format	
Light Duty Vehicles	Motorcycles	147
	Passenger	74596
	Pickup or Van	36672
Single Units	Buses	326
	Other 2 Axle	5443
	3 Axles	521
	4 Axles or more	85
Truck Combs.	3-4 Axles	496
	5 Axles	9696
	6 Axles or more	52
Semi-Trailer-Trailer	5 Axles or less	262
	6 Axles	169
	7 Axles or more	0

	○ Texas 6 Format	
Light Duty Vehicles	Passenger	
	Panel & Pickup	
Single Units	Buses	
	Other 2 Axle	
	3 Axle	
	4 Axle or More	
Truck Combs.	3 Axle	
	4 Axle	
	5 Axle	
	6 Axle or more	
Semi-Trailer-Trailer	5 Axle	
	6 Axle	
	7 Axle or more	

FHWA Format Data	Number	%
Light	111415	86.7
Medium	6017	4.7
Heavy	11033	8.6
Trucks	17050	13.3

Section 1

IH

	ADT	DHV
Light	88.2	94.7
Medium	4.2	1.9
Heavy	7.6	3.4

Total Vehicles	128465
Total Trucks	17050
Total Singles	25118.0
Total Tandems	20519.0
AXLE FACTOR	2.68
SINGLE AX FACT	0.55

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	20	20				
Year 2	40	50				
ADT	166800	166800				
% Trks	11.8	11.8				
Growth Rate	1.754	1.753				
Years	20	30				
Facil Type	A	A				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.68	2.68				
Single Axle	0.55	0.55				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	13700	13700				
% T in ATHWLD	20	20				
FLEXIBLE	76533000	123350000				
RIGID	104663000	168688000				

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I 35 (Frontage Roads)	Date for Memorandum	10/7/2016
Rd Type	FM	District	Austin
	Existing Condition	County	Travis
Project	Section 2	CSJ	0015-10-062
Limits	From SH 45 to US 183	Analyst	LRT

Date: Request	7/8/2016	Received	7/14/2016	Started	7/16/2016	Completed	10/4/2016
District Contact	Carmen Ramos			Phone #	512/832-7075		

	Year	ADT's		% Trks ADT	% Trks DHV
Count				4.0	3.0
Base	2020	**90500**	# Trks	**3620**	
Forecast	2040	**121700**			
Forecast	2050	**137100**			

SPR Station	S-190	MC Stn	MS-190FR	% Trks	4.9
Year	2015	Dir	N&S	Num Trks	2716
Peak Hour	10.1	Year	2015	Axle Factor	2.23
DD	56	ADT	55005	% Single Axles	0.80
100-DD	**44**				
K-Factor	7.3				

Main Road Growth Rate		TDM Assignment	None
Growth Rate after 20 Years			
20 Year Growth Factor	**1.724**		
30 Year Growth Factor	**1.716**	LOD	99999
Design Period 1	20		
Design Period 2	30		

					# Lanes
Structural Number (SN)	3			Existing	4
Slab Thickness (ST)	8			Proposed	4

Past Projects

Project	
From	
To	
Date	
County	
CSJ	

T. Log

ADT	N/A		
% Growth Rate			
K-Factor			
DD			
% Trucks ADT			
% Trucks DHV			
MC Station			
SPR Station			

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

	● FHWA Format	
Light Duty Vehicles	Motorcycles	57
	Passenger	35235
	Pickup or Van	16997
Single Units	Buses	61
	Other 2 Axle	1901
	3 Axles	114
	4 Axles or more	30
Truck Combs.	3-4 Axles	83
	5 Axles	507
	6 Axles or more	13
Semi-Trailer-Trailer	5 Axles or less	6
	6 Axles	1
	7 Axles or more	0

	○ Texas 6 Format	
Light Duty Vehicles	Passenger	
	Panel & Pickup	
Single Units	Buses	
	Other 2 Axle	
	3 Axle	
	4 Axle or More	
Truck Combs.	3 Axle	
	4 Axle	
	5 Axle	
	6 Axle or more	
Semi-Trailer-Trailer	5 Axle	
	6 Axle	
	7 Axle or more	

FHWA Format Data

	Number	%
Light	52289	95.1
Medium	2003	3.6
Heavy	713	1.3
Trucks	2716	4.9

Section 1

FM

	ADT	DHV
Light	96.0	97.0
Medium	2.9	2.2
Heavy	1.1	0.8

Total Vehicles	55005
Total Trucks	2716
Total Singles	4829.5
Total Tandems	1226.5
AXLE FACTOR	2.23
SINGLE AX FACT	0.80

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	20	20				
Year 2	40	50				
ADT	90500	90500				
% Trks	4.0	4.0				
Growth Rate	1.724	1.716				
Years	20	30				
Facil Type	C	C				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.23	2.23				
Single Axle	0.80	0.80				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	12300	12300				
% T in ATHWLD	20	20				
FLEXIBLE	9399000	15121000				
RIGID	10755000	17302000				

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I 35 (Frontage Roads)	Date for Memorandum	10/7/2016
Rd Type	FM	District	Austin
	No Build and Build Conditions	County	Travis
Project	Section 2	CSJ	0015-10-062
Limits	From SH 45 to US 183	Analyst	LRT

Date:	Request	7/8/2016	Received	7/14/2016	Started	7/16/2016	Completed 10/4/2016
	District Contact	Carmen Ramos				Phone #	512/832-7075

	Year	ADT's		% Trks ADT	% Trks DHV
Count				4.7	3.5
Base	2020	60600	# Trks	2848	
Forecast	2040	81100			
Forecast	2050	91200			

SPR Station	S-190	MC Stn	MS-190FR	% Trks	4.9
Year	2015	Dir	N&S	Num Trks	2716
Peak Hour	10.1	Year	2015	Axle Factor	2.23
DD	56	ADT	55005	% Single Axles	0.80
100-DD	44				
K-Factor	7.3				

Main Road Growth Rate	
Growth Rate after 20 Years	
20 Year Growth Factor	1.691
30 Year Growth Factor	1.683
Design Period 1	20
Design Period 2	30

TDM Assignment: None

LOD: 99999

Structural Number (SN)	3		
Slab Thickness (ST)	8		

	# Lanes
Existing	4
Proposed	4

Past Projects

Project	
From	
To	
Date	
County	
CSJ	

T. Log

ADT	N/A		
% Growth Rate			
K-Factor			
DD			
% Trucks ADT			
% Trucks DHV			
MC Station			
SPR Station			

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

	● FHWA Format			○ Texas 6 Format	
Light Duty Vehicles	Motorcycles	57	**Light Duty Vehicles**	Passenger	
	Passenger	35235		Panel & Pickup	
	Pickup or Van	16997	**Single Units**	Buses	
Single Units	Buses	61		Other 2 Axle	
	Other 2 Axle	1901		3 Axle	
	3 Axles	114		4 Axle or More	
	4 Axles or more	30	**Truck Combs.**	3 Axle	
Truck Combs.	3-4 Axles	83		4 Axle	
	5 Axles	507		5 Axle	
	6 Axles or more	13		6 Axle or more	
Semi-Trailer-Trailer	5 Axles or less	6	**Semi-Trailer-Trailer**	5 Axle	
	6 Axles	1		6 Axle	
	7 Axles or more	0		7 Axle or more	

FHWA Format Data

	Number	%
Light	52289	95.1
Medium	2003	3.6
Heavy	713	1.3
Trucks	2716	4.9

Section 1

FM

	ADT	DHV
Light	95.3	96.5
Medium	3.5	2.6
Heavy	1.2	0.9

Total Vehicles	55005
Total Trucks	2716
Total Singles	4829.5
Total Tandems	1226.5
AXLE FACTOR	2.23
SINGLE AX FACT	0.80

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	20	20				
Year 2	40	50				
ADT	60600	60600				
% Trks	4.7	4.7				
Growth Rate	1.691	1.683				
Years	20	30				
Facil Type	C	C				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.23	2.23				
Single Axle	0.80	0.80				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	12100	12200				
% T in ATHWLD	20	20				
FLEXIBLE	7346000	11805000				
RIGID	8419000	13529000				

Texas
Department
of Transportation

FILE

MEMO

March 1, 2018

To: Terry G. McCoy, P.E., District Engineer
Attention: Lorena E. Echeverria De Misi, P.E., Director of TPD

Through: William E. Knowles, P.E.
Traffic Analysis Section Director, TPP

From: James Burnett
Planner, TPP

Subject: Traffic Data
CSJ: 0015-09-185
I-35 (Mainlanes and Frontage Roads separate):
From RM 2243
To RM 1431
Williamson County

Attached are diagrams depicting 2020, 2040 and 2050 average daily traffic volumes and turning movements on I-35 from RM 2243 to RM 1431 for existing and proposed conditions. Also attached are tabulations showing traffic analysis for highway design for the 2020 to 2040 twenty year period and 2020 to 2050 thirty year period for the described limits of the route. Also included are tabulations showing data for use in air and noise analysis.

Due to significant differences in traffic volumes the project was separated into three sections.

Section 1: From RM 2243 to SE Inner Loop
Section 2: From SE Inner Loop to Westinghouse Rd.
Section 3: From Westinghouse Rd. to RM 1431

Please refer to your original request dated November 21, 2017.

If you have any questions or need additional information, please contact James Burnett at (512) 486-5165.

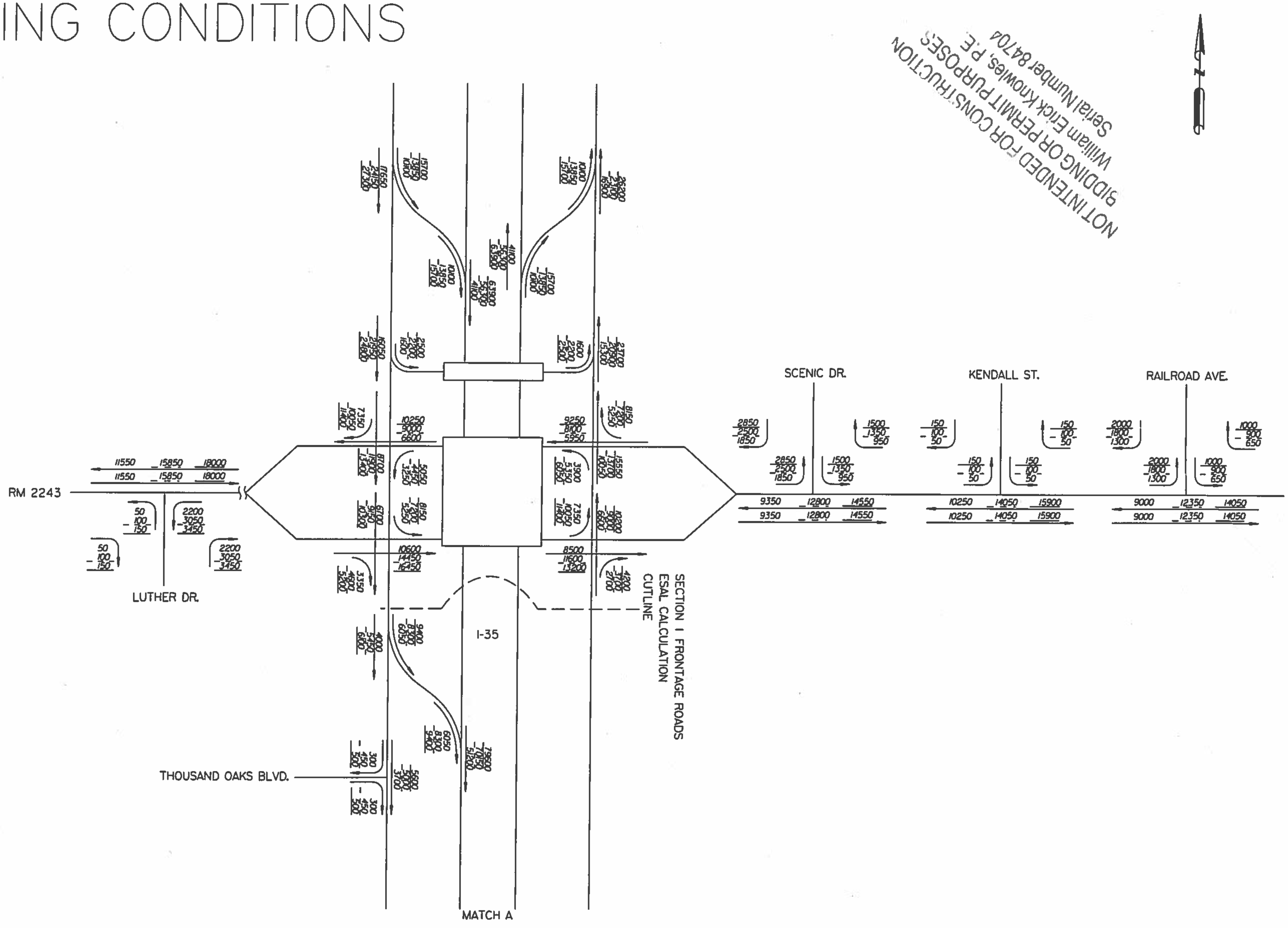
JWB

Attachments

CC: Carmen Ramos
Planner, Austin District
Design Division

EXISTING CONDITIONS

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84704



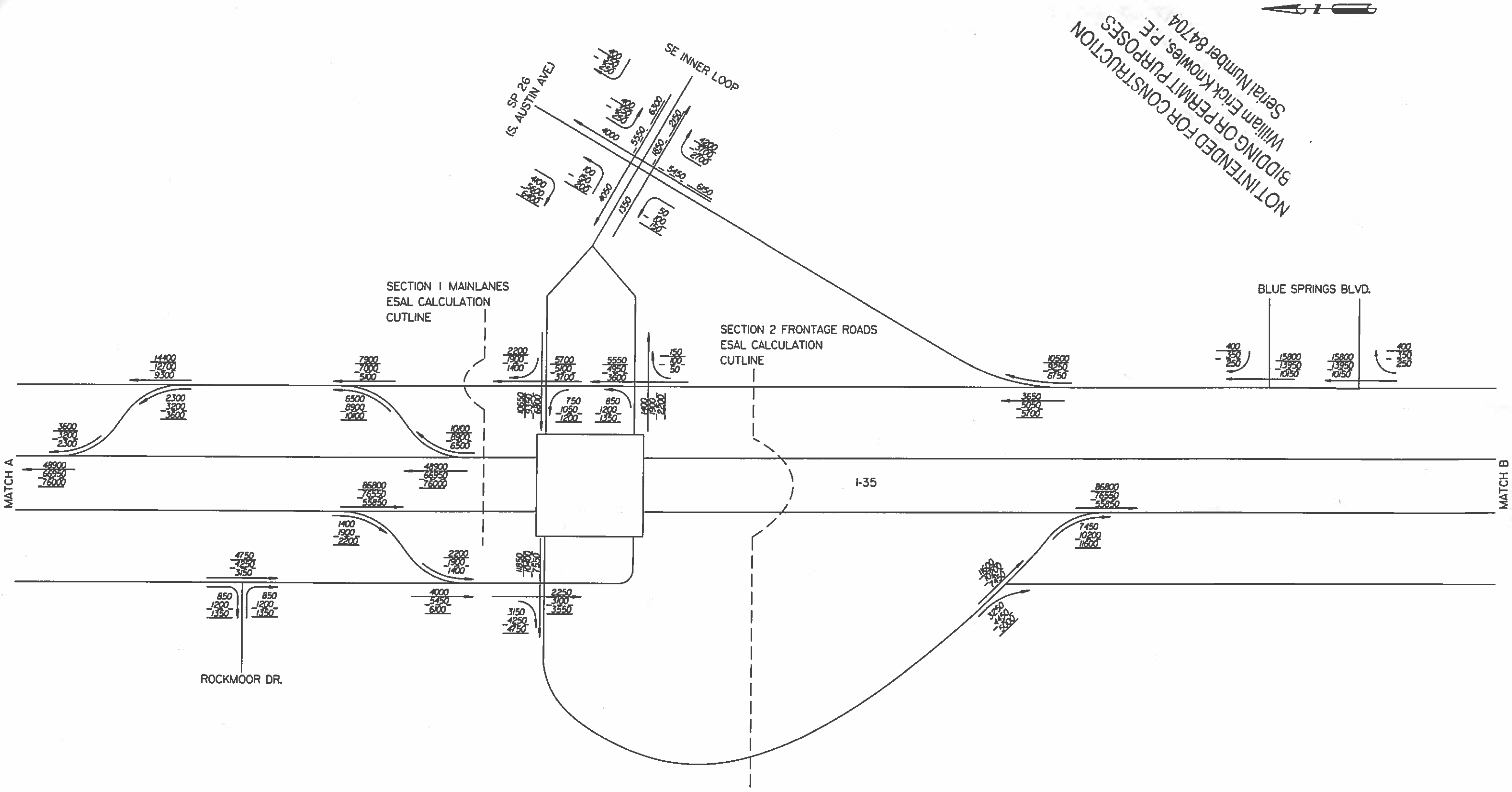
LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040 AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
I-35 FROM RM 2243 TO RM 1431
WILLIAMSON COUNTY

TRANSPORTATION PLANNING AND PROGRAMMING DIVISION
MARCH 1, 2018

SHEET 1 OF 4

EXISTING CONDITIONS



NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84704

LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

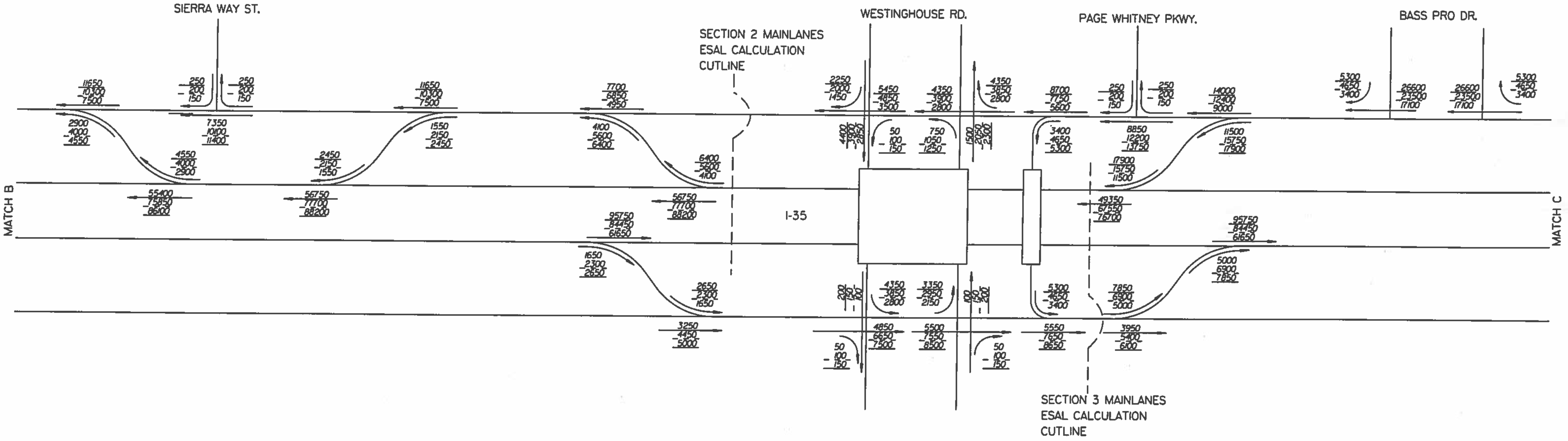
2020, 2040 AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
I-35 FROM RM 2243 TO RM 1431
WILLIAMSON COUNTY

TRANSPORTATION PLANNING AND PROGRAMMING DIVISION
MARCH 1, 2018

SHEET 2 OF 4

EXISTING CONDITIONS

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84704



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

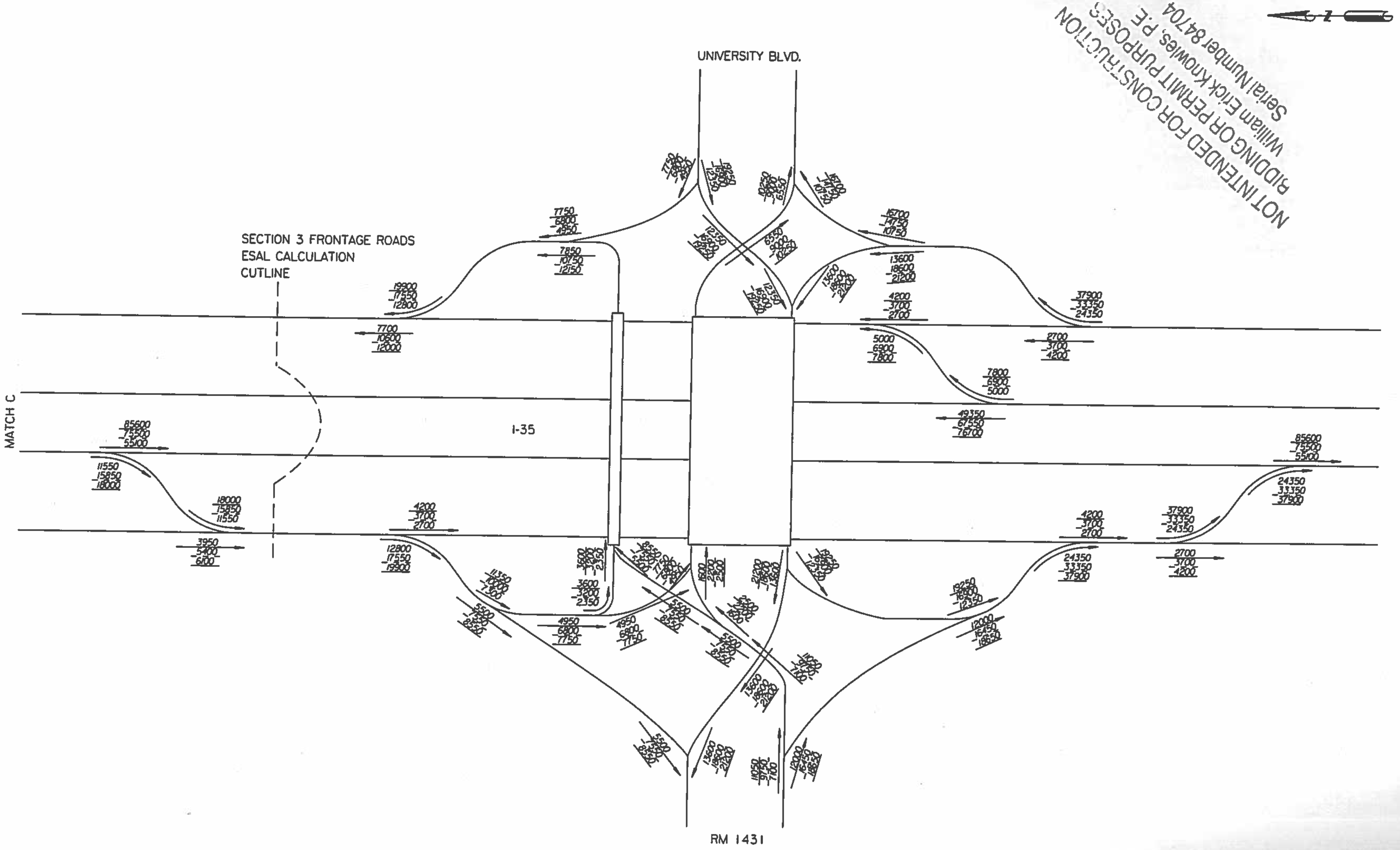
2020, 2040 AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG I-35 FROM RM 2243 TO RM 1431
WILLIAMSON COUNTY

TRANSPORTATION PLANNING AND PROGRAMMING DIVISION
MARCH 1, 2018

SHEET 3 OF 4

EXISTING CONDITIONS

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84704



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

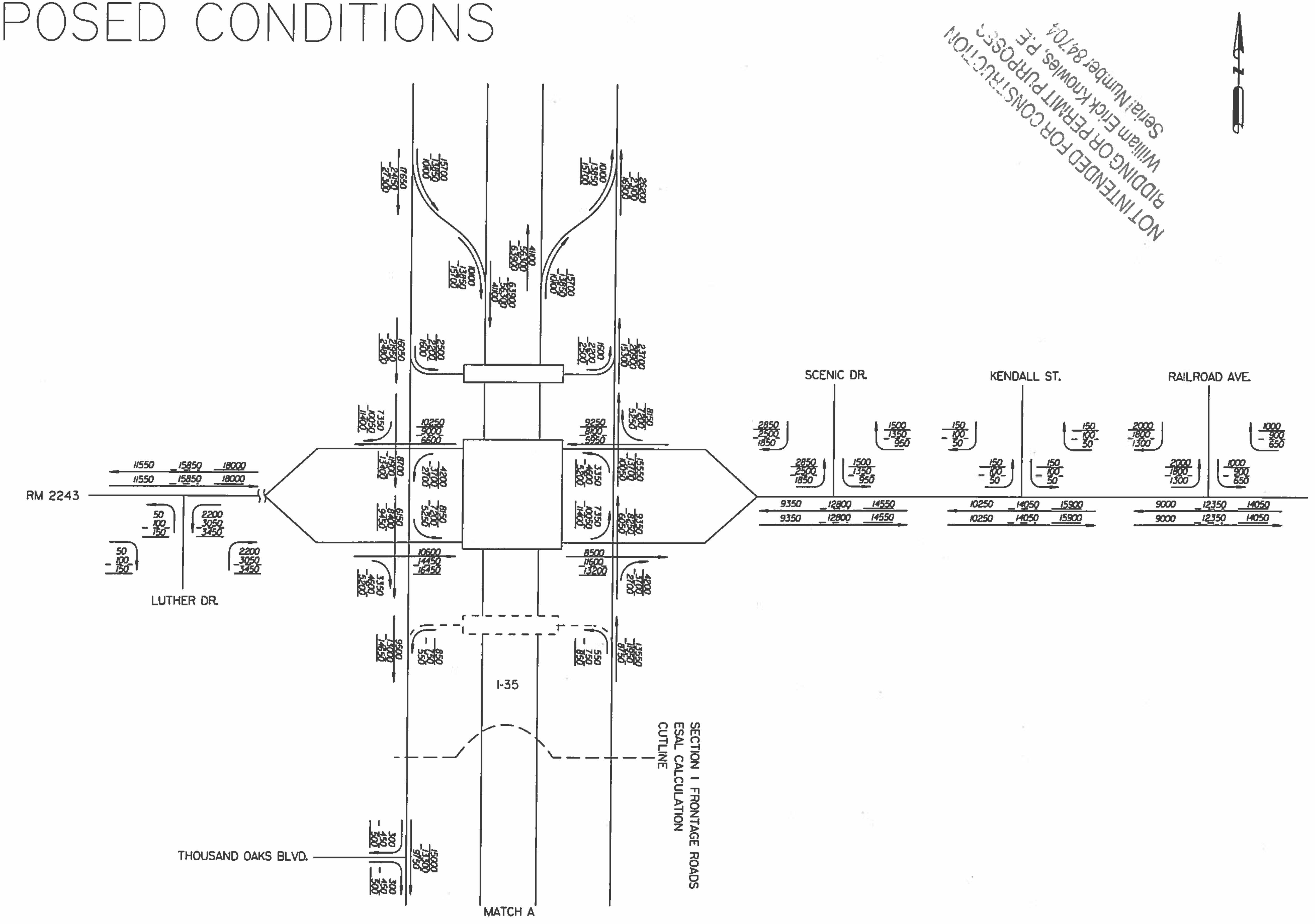
2020, 2040 AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG I-35 FROM RM 2243 TO RM 1431
WILLIAMSON COUNTY

TRANSPORTATION PLANNING AND PROGRAMMING DIVISION
MARCH 1, 2018

SHEET 4 OF 4

PROPOSED CONDITIONS

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84704



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

—— EXISTING CONDITION
- - - PROPOSED CONDITION

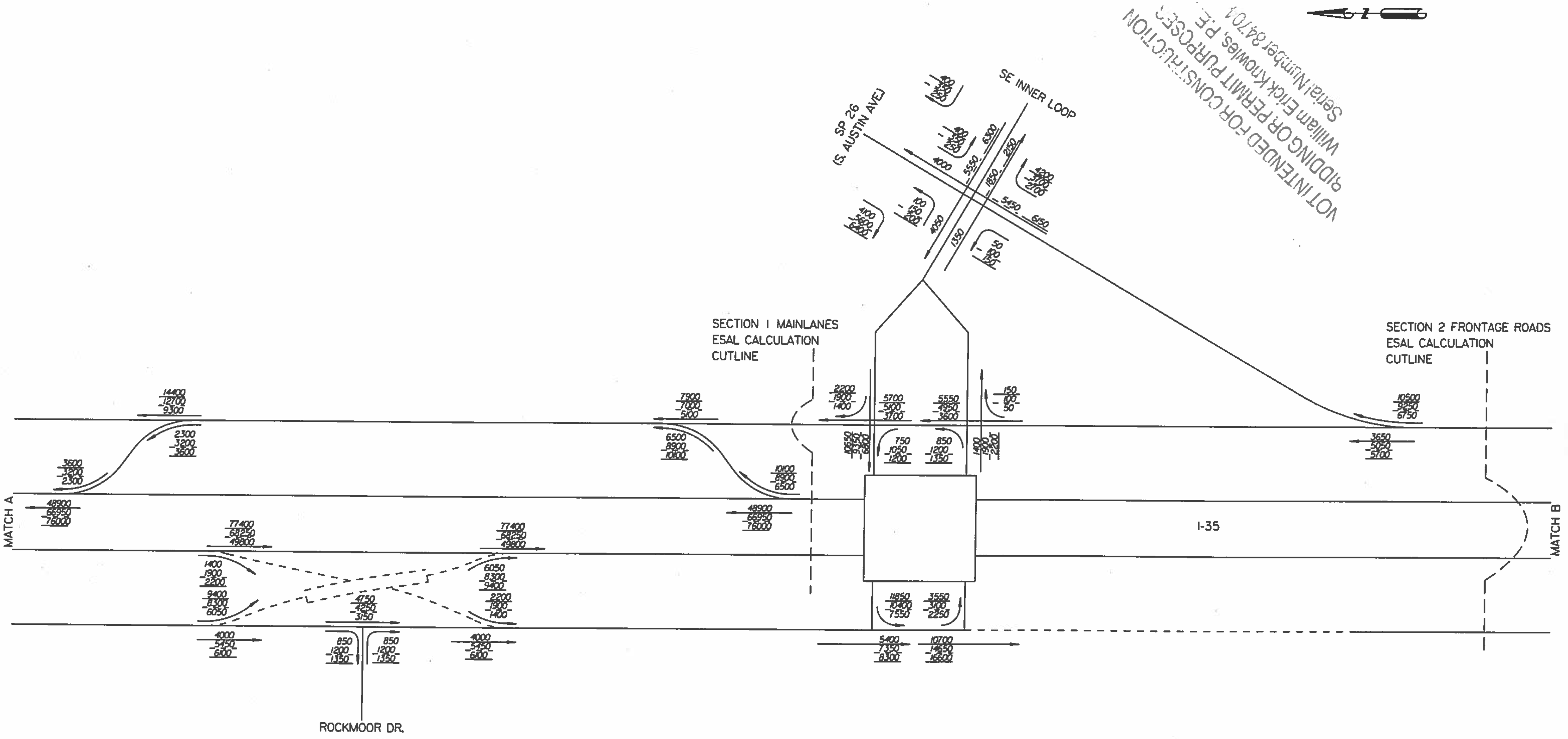
2020, 2040 AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
I-35 FROM RM 2243 TO RM 1431
WILLIAMSON COUNTY

TRANSPORTATION PLANNING AND PROGRAMMING DIVISION
MARCH 1, 2018

SHEET 1 OF 4

PROPOSED CONDITIONS

NOT INTENDED FOR CONSTRUCTION, BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84701



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

——— EXISTING CONDITION
- - - PROPOSED CONDITION

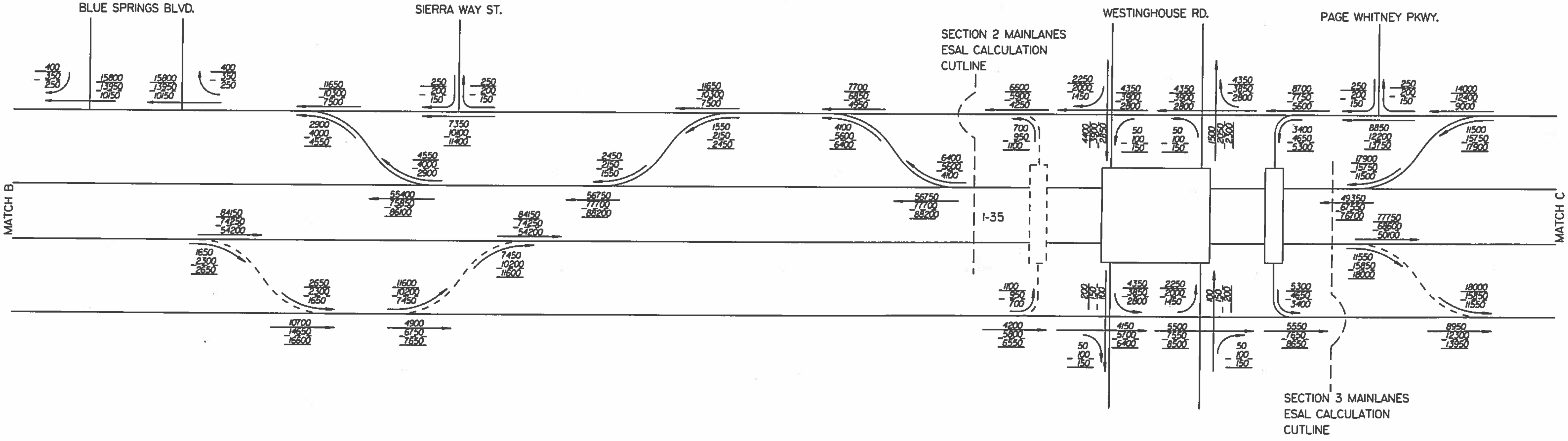
2020, 2040 AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
I-35 FROM RM 2243 TO RM 1431
WILLIAMSON COUNTY

TRANSPORTATION PLANNING AND PROGRAMMING DIVISION
MARCH 1, 2018

SHEET 2 OF 4

PROPOSED CONDITIONS

NOT INTENDED FOR CONSTRUCTION,
BIDDING OR PERMIT PURPOSES.
William Erick Knowles, P.E.
Serial Number 84704



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

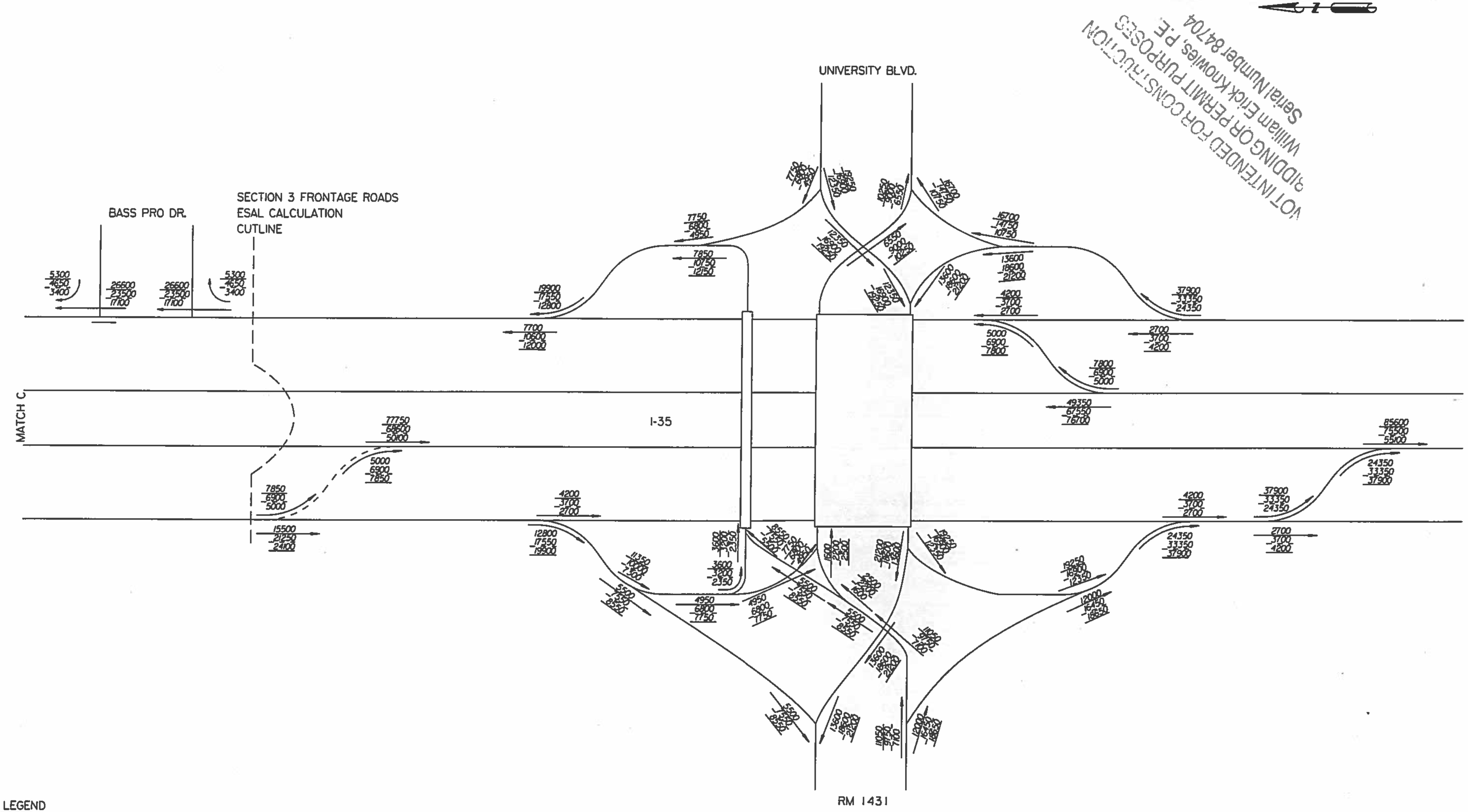
—— EXISTING CONDITION
– – – PROPOSED CONDITION

2020, 2040 AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
I-35 FROM RM 2243 TO RM 1431
WILLIAMSON COUNTY

TRANSPORTATION PLANNING AND PROGRAMMING DIVISION
MARCH 1, 2018

SHEET 3 OF 4

PROPOSED CONDITIONS



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

—— EXISTING CONDITION
- - - PROPOSED CONDITION

2020, 2040 AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG
I-35 FROM RM 2243 TO RM 1431
WILLIAMSON COUNTY

TRANSPORTATION PLANNING AND PROGRAMMING DIVISION
MARCH 1, 2018

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District **February 22, 2018**

			Base Year						Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
Description of Location	Average Daily Traffic		Dir Dist	K	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2040	%	Factor	ADT	DHV						
I-35 MLs - Existing & Proposed Conditions - Section 1 From RM 2243 To SE Inner Loop Williamson County	111,250	152,400	55 - 45	8.2	12.4	5.6	13,300	30	63,395,000	3	90,685,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year	
	% of ADT	% of DHV
Light Duty	87.6	94.4
Medium Duty	1.6	0.7
Heavy Duty	10.8	4.9

			Base Year						Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
Description of Location	Average Daily Traffic		Dir Dist	K	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2050	%	Factor	ADT	DHV						
I-35 MLs - Existing & Proposed Conditions - Section 1 From RM 2243 To SE Inner Loop Williamson County	111,250	172,900	55 - 45	8.2	12.4	5.6	13,300	30	102,487,000	3	146,606,000	8"

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84704

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

February 23, 2018

Description of Location	Average Daily Traffic		Base Year					ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
			Dir Dist %	K Factor	Percent Trucks					Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2040			ADT	DHV							
I-35 MLs - Existing & Proposed Conditions - Sections 2 & 3 From SE Inner Loop to Westinghouse Rd. and From Westinghouse Rd. to RM 1431 Williamson County	122,500	167,750	55 - 45	8.2	12.7	5.7		13,400	30	71,474,000	3	102,249,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year	
	% of ADT	% of DHV
Light Duty	87.3	94.3
Medium Duty	1.6	0.7
Heavy Duty	11.1	5.0

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
			Dir Dist %	K Factor	Percent Trucks				Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2050			ADT	DHV						
I-35 MLs - Existing & Proposed Conditions - Sections 2 & 3 From SE Inner Loop to Westinghouse Rd. and From Westinghouse Rd. to RM 1431 Williamson County	122,500	190,350	55 - 45	8.2	12.7	5.7	13,500	30	115,555,000	3	165,309,000	8"

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84704

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

February 23, 2018

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
	2020	2040	Dir Dist %	K Factor	Percent Trucks ADT	Percent Trucks DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
I-35 FRs - Existing & Proposed Conditions - Section 1 From RM 2243 To SE Inner Loop Williamson County	19,350	26,450	55 - 45	8.2	12.9	9.7	12,100	40	9,079,000	3	12,098,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year % of ADT	Base Year % of DHV
Light Duty	87.1	90.3
Medium Duty	1.6	1.2
Heavy Duty	11.3	8.5

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
	2020	2050	Dir Dist %	K Factor	Percent Trucks ADT	Percent Trucks DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
I-35 FRs - Existing & Proposed Conditions - Section 1 From RM 2243 To SE Inner Loop Williamson County	19,350	29,900	55 - 45	8.2	12.9	9.7	12,100	40	14,643,000	3	19,512,000	8"

NOT INTENDED FOR CONSTRUCTIO
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84704

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

February 23, 2018

Description of Location	Average Daily Traffic 2020	Average Daily Traffic 2040	Base Year Dir Dist %	Base Year K Factor	Base Year Percent Trucks ADT	Base Year Percent Trucks DHV	ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040) Flexible Pavement	S N	Rigid Pavement	SLAB
<u>I-35 FRs - Existing Conditions - Section 2</u> From SE Inner Loop To Westinghouse Rd. Williamson County	14,350	19,700	55 - 45	8.2	7.8	5.9	11,500	40	4,097,000	3	5,448,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year % of ADT	Base Year % of DHV
Light Duty	92.2	94.1
Medium Duty	1.0	0.8
Heavy Duty	6.8	5.1

Description of Location	Average Daily Traffic 2020	Average Daily Traffic 2050	Base Year Dir Dist %	Base Year K Factor	Base Year Percent Trucks ADT	Base Year Percent Trucks DHV	ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050) Flexible Pavement	S N	Rigid Pavement	SLAB
<u>I-35 FRs - Existing Conditions - Section 2</u> From SE Inner Loop To Westinghouse Rd. Williamson County	14,350	22,300	55 - 45	8.2	7.8	5.9	11,500	40	6,614,000	3	8,797,000	8"

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84704

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

February 23, 2018

Austin District

			Base Year						Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
Description of Location	Average Daily Traffic		Dir Dist %	K Factor	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2040			ADT	DHV						
I-35 FRs - Existing Conditions - Section 3 From Westinghouse Rd. To RM 1431 Williamson County	36,000	49,400	55 - 45	8.2	7.4	5.6	12,100	40	9,753,000	3	12,967,000	8"

Data for Use in Air & Noise Analysis

	Base Year	
Vehicle Class	% of ADT	% of DHV
Light Duty	92.6	94.4
Medium Duty	0.9	0.7
Heavy Duty	6.5	4.9

			Base Year						Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
Description of Location	Average Daily Traffic		Dir Dist %	K Factor	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2050			ADT	DHV						
I-35 FRs - Existing Conditions - Section 3 From Westinghouse Rd. To RM 1431 Williamson County	36,000	56,000	55 - 45	8.2	7.4	5.6	12,100	40	15,760,000	3	20,954,000	8"

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 8470

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

February 23, 2018

									Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
			Base Year									
Description of Location	Average Daily Traffic		Dir Dist %	K Factor	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2040			ADT	DHV						
I-35 FRs - Proposed Conditions - Section 2 From SE Inner Loop To Westinghouse Rd. Williamson County	21,100	28,950	55 - 45	8.2	7.8	5.9	11,900	40	6,021,000	3	8,008,000	8"

Data for Use in Air & Noise Analysis

	Base Year	
Vehicle Class	**% of ADT**	**% of DHV**
Light Duty	92.2	94.1
Medium Duty	1.0	0.8
Heavy Duty	6.8	5.1

									Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
			Base Year									
Description of Location	Average Daily Traffic		Dir Dist %	K Factor	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2050			ADT	DHV						
I-35 FRs - Proposed Conditions - Section 2 From SE Inner Loop To Westinghouse Rd. Williamson County	21,100	32,800	55 - 45	8.2	7.8	5.9	11,900	40	9,727,000	3	12,936,000	8"

OT INTENDED FOR CONSTRUCTION
IDDING OR PERMIT PURPOSES
Villiam Erick Knowles, P.E.
Serial Number 84704

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

February 23, 2018

Austin District

Description of Location	Average Daily Traffic 2020	Average Daily Traffic 2040	Base Year Dir Dist %	Base Year K Factor	Base Year Percent Trucks ADT	Base Year Percent Trucks DHV	ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040) Flexible Pavement	S N	Rigid Pavement	SLAB
<u>I-35 FRs - Proposed Conditions - Section 3</u> From Westinghouse Rd. To RM 1431 Williamson County	41,000	56,300	55 - 45	8.2	7.1	5.3	12,200	40	10,666,000	3	14,178,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year % of ADT	Base Year % of DHV
Light Duty	92.9	94.7
Medium Duty	0.9	0.7
Heavy Duty	6.2	4.6

Description of Location	Average Daily Traffic 2020	Average Daily Traffic 2050	Base Year Dir Dist %	Base Year K Factor	Base Year Percent Trucks ADT	Base Year Percent Trucks DHV	ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050) Flexible Pavement	S N	Rigid Pavement	SLAB
<u>I-35 FRs - Proposed Conditions - Section 3</u> From Westinghouse Rd. To RM 1431 Williamson County	41,000	63,850	55 - 45	8.2	7.1	5.3	12,200	40	17,240,000	3	22,918,000	8"

OT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84704

Texas Department of Transportation

Request for Traffic Data

Form 2124
(Rev. 09/16)
Page 1 of 1

March 1, 2018
Due Date

Date: 11/21/2017

District: Austin **County:** Williamson **CSJ:** 0015-09-185

Highway: IH 35 (mainlane and frontage roads separate)

Limits: RM 2243 to RM 1431

Texas Reference Marker System

From Marker: 260 From Displacement: 0.033 From DFO: 259.544

To Marker: 255 To Displacement: 0.224 To DFO: 254.536

Is it in the UTP: ☒Yes ☐No District Priority: 3 Est. Letting Date: 03/01/2020

Existing Number of Lanes: 6

Proposed Number of Lanes: 6

11-21-17
Corridor Limits changed & provided in share point. Also, line diagrams updated

District Contact Person: Carmen Ramos

Phone Number: 512-832-7075

Please attach an 8-1/2" x 11" location map and make note of any existing or proposed development that will be a traffic generator. NOTE:

The following to be completed (Please mark information to be provided):

☒ 1. Basic Highway Traffic Data for pavement design
(No line diagram analysis required)
- A. Base year/ Beginning year: 2020
- B. Forecasted 20 year: 2040
- C. Forecasted 30 year: 2050
- D. Directional Distribution
- E. K-factor
- F. Percent Trucks ADT/DHV
- G. Average Ten Heaviest Wheel Loads (ATHWLD)
- H. Percent Tandem Axles in the ATHWLD
- I. One Directional cumulative 18 KSA at the end of the 20 years/30 years
- J. Slab Thickness (8" unless otherwise specified):
- K. Structural Number (3 unless otherwise specified):

Counts Requested
11/30/2017

Counts uploa to STA1 12-18

☒ 2. Vehicle classification for environmental studies (Air and Noise Analysis)
☒ 3. Line diagram analysis (straight line turning movements; please provide line diagram).
☒ 4. Complete Corridor Analysis (includes basic highway traffic data for pavement design, environmental studies and detailed schematic turning movements; *please provide detailed schematic*).
☐ 5. Consultant Corridor Information Packet
☐ 6. No build traffic analysis.
- ☐ EA
- ☐ EIS
- ☐ EA/EIS Reevaluation

Note: If complete corridor analysis is requested, please attach a traffic schematic diagram.

Traffic Data Request Form

Request ID *(auto generated on save)*	2017046	
Date Created *(auto generated on save)*	21/11/2017 16 21	2017-11-21T16 21 00
District*	Austin	
County*	☑ Williamson	Terry McCoy@txdot.gov Lorena EcheverriadeMisi
CSJ*	0015-09-185	
Project Highway*	IH 35 (mainlane & frontage road sepa	
Limit (From)*	RM 2243	
Limit (To)*	RM 1431	
Number of Lanes Existing*	6	
Number of Lanes Proposed*	6	
District Contact Person*	Carmen Ramos	
Contact Number*	512-832-7075	
Estimated Letting Date*	3/1/2020	
District Priority*	3	
Attach Drawings or other documents*	0015-09-185 RM 2243 to RM 1431 Location Map pdf 20171120_RM 2243 to RM 1431STICK DIAGRAM pdf Austin District Traffic Request Priority List xls Request for Traffic Data_Form 2124 (Rev 0916) pdf	
Special Instructions *Note If complete corridor analysis is requested, please attach a traffic schematic diagram.*	This request replaces the submittal from the Austin District on July 12, 2017. The limits have been changed on IH 35, from RM 2243 to SE Inner Loop to RM 2243 to RM 1431. Attached are the revised traffic request form, project location map, and line diagram. This request is priority #3 on the Austin District's priority list.	

The following to be completed (Please mark information to be provided)

1. Basic highway traffic data for pavement design	**A. Base Year**	2020
	B. Forecasted 20 Years	☑ **2040**
	C. Forecasted 30 years	☑ **2050**
	D. Directional Distribution	
	E. K-factor	
	F. Percent Trucks ADT/DHV	
	G. Average Ten Heaviest Wheel Loads (ATHWLD)	
	H. Percent Tandem Axles in the ATHWLD	
	I. One Directional cumulative 18 KSA at the end of the 20/30 years	

J. Slab Thickness *(8" unless otherwise specified)* 8

K. Structural Number *(3" unless otherwise specified)* 3

2. Vehicle Classification for environmental studies (Air and Noise Analysis) ☑

3. Line Diagram Analysis (straight line turning movements: please provide line diagram) ☑

4. Complete Corridor analysis (includes basic highway traffic data for pavement design and environmental studies and detailed schematic turning movements; please provide detailed schematic) ☐

5. Consultant Corridor Information Packet ☐

6. No build Traffic Analysis ☐

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 MLs - Existing & Proposed Conditions - Section 1	District	Austin
Rd Type	IH	County	Williamson
Direction	Two-Way	CSJ	0015-09-185
Section 1	From RM 2243		
Limits	To SE Inner Loop	Analyst	JWB

Date	Request	11/21/2017	Received	11/21/2017	Started	1/3/2018	Completed 2/23/2018
	District Contact	Carmen Ramos			Phone #	(512) 832-7075	

	Year	ADT's		% Trks ADT	% Trks DHV
Count	2016	102950		12.4	5.6
Base	2020	111250	# Trks	13825	
Forecast	2040	152400			
Forecast	2050	172900			

SPR Station	S-399	MC Stn	HP-877	% Trks	13.5
Year	2016	Dir		Num Trks	14993
Peak Hour	10.0	Year	2016	Axle Factor	2.90
DD	55	ADT	110972	% Single Axles	0.45
100-DD	45				
K-Factor	8.2				

Main Road Growth Rate	2.0	TDM Assignment	
Growth Rate after 20 Years	2.0		
20 Year Growth Factor	1.849		
30 Year Growth Factor	1.847	LOD	99999
Design Period 1	20		
Design Period 2	30		

				# Lanes	
Structural Number (SN)	3			Existing	6
Slab Thickness (ST)	8			Proposed	6

Past Projects

Project	I-35 (Mainlanes and Frontage Roads, separate)
From	South of RM 2243
To	North of RM 2243
Date	3/11/2016
County	Williamson
CSJ	0015-09-185

Items Done on This Project

Straight Line Turning Movements	X	Detailed Schematic Turning Movements	X
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

1) See included relevant existing conditions schematic diagram - worksheet 2 and/or proposed conditions schematic diagram - worksheet for above Count, Base, and both Forecast years' ADTs.

2) See included relevant Truck Calculations for Frontage Road and Mainlane Split for above base year % Trks ADT and # Trks.

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

FHWA Format Vehicle Class. Counts		
Light Duty Vehicles	Motorcycles	319
	Passenger	76942
	Pickup or Van	18718
Single Units	Buses	213
	Other 2 Axle	1389
	3 Axles	750
	4 Axles or more	274
Truck Combs.	3-4 Axles	485
	5 Axles	11179
	6 Axles or more	149
Semi-Trailer-Trailer	5 Axles or less	435
	6 Axles	119
	7 Axles or more	0

	Number	%
Light	95979	86.5
Medium	1844	1.7
Heavy	13149	11.8
Trucks	14993	13.5

SECTION 1

IH

	ADT	DHV
Light	87.6	94.4
Medium	1.6	0.7
Heavy	10.8	4.9

Total Vehicles	110972
Total Trucks	14993
Total Singles	19419.5
Total Tandems	24041.5
AXLE FACTOR	2.90
SINGLE AX FACT	0.45

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	20	20				
Year 2	40	50				
ADT	111250	111250				
% Trks	12.4	12.4				
Growth Rate	1.849	1.847				
Years	20	30				
Facil Type	A	A				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.90	2.90				
Single Axle	0.45	0.45				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	13300	13300				
% T in ATHWLD	30	30				
FLEXIBLE	63395000	102487000				
RIGID	90685000	146606000				

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 MLs - Existing & Proposed Conditions - Sections 2 & 3	District	Austin
Rd Type	IH	County	Williamson
Direction	Two-Way	CSJ	0015-09-185
Section 2	From SE Inner Loop to Westinghouse Rd. and		
Section 3	From Westinghouse Rd. to RM 1431	Analyst	JWB

Date	Request	11/21/2017	Received	11/21/2017	Started	1/3/2018	Completed 2/23/2018
	District Contact	Carmen Ramos				Phone #	(512) 832-7075

	Year	ADT's
Count	2016	113350
Base	2020	122500
Forecast	2040	167750
Forecast	2050	190350

	% Trks ADT	% Trks DHV
	12.7	5.7
# Trks	15576	

SPR Station	S-399	MC Stn	HP-877	% Trks	13.5
Year	2016	Dir		Num Trks	14993
Peak Hour	10.0	Year	2016	Axle Factor	2.90
DD	55	ADT	110972	% Single Axles	0.45
100-DD	45				
K-Factor	8.2				

Main Road Growth Rate	2.0
Growth Rate after 20 Years	2.0
20 Year Growth Factor	1.847
30 Year Growth Factor	1.846
Design Period 1	20
Design Period 2	30

TDM Assignment

LOD	99999

Structural Number (SN)	3		
Slab Thickness (ST)	8		

	# Lanes
Existing	6
Proposed	6

Past Projects

Project	I-35 (Mainlanes and Frontage Roads, separate)
From	South of RM 2243
To	North of RM 2243
Date	3/11/2016
County	Williamson
CSJ	0015-09-185

Items Done on This Project

Straight Line Turning Movements	X	Detailed Schematic Turning Movements	X
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

1) See included relevant existing conditions schematic diagram - worksheet 2 and/or proposed conditions schematic diagram - worksheet for above Count, Base, and both Forecast years' ADTs.

2) See included relevant Truck Calculations for Frontage Road and Mainlane Split for above base year % Trks ADT and # Trks.

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

FHWA Format Vehicle Class. Counts		
Light Duty Vehicles	Motorcycles	319
	Passenger	76942
	Pickup or Van	18718
Single Units	Buses	213
	Other 2 Axle	1389
	3 Axles	750
	4 Axles or more	274
Truck Combs.	3-4 Axles	485
	5 Axles	11179
	6 Axles or more	149
Semi-Trailer-Trailer	5 Axles or less	435
	6 Axles	119
	7 Axles or more	0

	Number	%
Light	95979	86.5
Medium	1844	1.7
Heavy	13149	11.8
Trucks	14993	13.5

SECTIONS 2 & 3

IH

	ADT	DHV
Light	87.3	94.3
Medium	1.6	0.7
Heavy	11.1	5.0

Total Vehicles	110972
Total Trucks	14993
Total Singles	19419.5
Total Tandems	24041.5

AXLE FACTOR	2.90
SINGLE AX FACT	0.45

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	20	20				
Year 2	40	50				
ADT	122500	122500				
% Trks	12.7	12.7				
Growth Rate	1.847	1.846				
Years	20	30				
Facil Type	A	A				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.90	2.90				
Single Axle	0.45	0.45				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	13400	13500				
% T in ATHWLD	30	30				
FLEXIBLE	71474000	115555000				
RIGID	102249000	165309000				

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 FRs - Existing & Proposed Conditions - Section 1	District	Austin
Rd Type	FM	County	Williamson
Direction	Two-Way	CSJ	0015-09-185
Section 1	From RM 2243		
Limits	To SE Inner Loop	Analyst	JWB

Date:	Request	11/21/2017	Received	11/21/2017	Started	1/3/2018	Completed 2/23/2018
	District Contact	Carmen Ramos				Phone #	(512) 832-7075

	Year	ADT's
Count	2016	17900
Base	2020	19350
Forecast	2040	26450
Forecast	2050	29900

% Trks ADT 12.9

Trks 2500

% Trks DHV 9.7

SPR Station	S-399
Year	2016
Peak Hour	10.0
DD	55
100-DD	45
K-Factor	8.2

MC Stn	HP-877
Dir	
Year	2016
ADT	110972

% Trks	13.5
Num Trks	14993
Axle Factor	2.90
% Single Axles	0.45

Main Road Growth Rate	2.0
Growth Rate after 20 Years	2.0
20 Year Growth Factor	1.835
30 Year Growth Factor	1.817
Design Period 1	20
Design Period 2	30

TDM Assignment

LOD 99999

	# Lanes
Existing	N/A
Proposed	N/A

Structural Number (SN)	3
Slab Thickness (ST)	8

Past Projects

Project	I-35 (Mainlanes and Frontage Roads, separate)
From	South of RM 2243
To	North of RM 2243
Date	3/11/2016
County	Williamson
CSJ	0015-09-185

Items Done on This Project

Straight Line Turning Movements	X	Detailed Schematic Turning Movements	X
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

1) See included relevant existing conditions schematic diagram - worksheet 2 and/or proposed conditions schematic diagram - worksheet for above Count, Base, and both Forecast years' ADTs.

2) See included relevant Truck Calculations for Frontage Road and Mainlane Split for above base year % Trks ADT and # Trks.

3) Data Calculations for Use in Air & Noise Analysis Axle Factor and Single Ax Fact values adjusted from 2.90 and 0.45 respectively to 2.60 and 0.60 respectively for FRs.

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

FHWA Format Vehicle Class. Counts		
Light Duty Vehicles	Motorcycles	319
	Passenger	76942
	Pickup or Van	18718
Single Units	Buses	213
	Other 2 Axle	1389
	3 Axles	750
	4 Axles or more	274
Truck Combs.	3-4 Axles	485
	5 Axles	11179
	6 Axles or more	149
Semi-Trailer-Trailer	5 Axles or less	435
	6 Axles	119
	7 Axles or more	0

	Number	%
Light	95979	86.5
Medium	1844	1.7
Heavy	13149	11.8
Trucks	14993	13.5

SECTION 1

FM

	ADT	DHV
Light	87.1	90.3
Medium	1.6	1.2
Heavy	11.3	8.5

Total Vehicles	110972
Total Trucks	14993
Total Singles	19419.5
Total Tandems	24041.5
AXLE FACTOR	2.60
SINGLE AX FACT	0.60

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	20	20				
Year 2	40	50				
ADT	19350	19350				
% Trks	12.9	12.9				
Growth Rate	1.835	1.817				
Years	20	30				
Facil Type	C	C				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.60	2.60				
Single Axle	0.60	0.60				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	12100	12100				
% T in ATHWLD	40	40				
FLEXIBLE	9079000	14643000				
RIGID	12098000	19512000				

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 FRs - Existing Conditions - Section 2	District	Austin
Rd Type	FM	County	Williamson
Direction	Two-Way	CSJ	0015-09-185
Section 2	From SE Inner Loop		
Limits	To Westinghouse Rd.	Analyst	JWB

Date Request 11/21/2017 Received 11/21/2017 Started 1/3/2018 Completed 2/23/2018

District Contact Carmen Ramos

Phone # (512) 832-7075

	Year	ADT's
Count	2016	13300
Base	2020	14350
Forecast	2040	19700
Forecast	2050	22300

% Trks ADT 7.8

Trks 1120

% Trks DHV 5.9

SPR Station	S-399	MC Stn	HP-877	% Trks	13.5
Year	2016	Dir		Num Trks	14993
Peak Hour	10.0	Year	2016	Axle Factor	2.90
DD	55	ADT	110972	% Single Axles	0.45
100-DD	45				
K-Factor	8.2				

Main Road Growth Rate	2.0
Growth Rate after 20 Years	2.0
20 Year Growth Factor	1.864
30 Year Growth Factor	1.847
Design Period 1	20
Design Period 2	30

TDM Assignment

LOD 99999

Structural Number (SN)	3		
Slab Thickness (ST)	8		

	# Lanes
Existing	N/A
Proposed	N/A

Past Projects

Project	I-35 (Mainlanes and Frontage Roads, separate)
From	South of RM 2243
To	North of RM 2243
Date	3/11/2016
County	Williamson
CSJ	0015-09-185

Items Done on This Project

Straight Line Turning Movements	X	Detailed Schematic Turning Movements	X
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

1) See included relevant existing conditions schematic diagram - worksheet 2 for above Count, Base, and both Forecast years' ADTs.

2) See included relevant Truck Calculations for Frontage Road and Mainlane Split for above base year % Trks ADT and # Trks.

3) Data Calculations for Use in Air & Noise Analysis Axle Factor and Single Ax Fact values adjusted from 2.90 and 0.45 respectively to 2.60 and 0.60 respectively for FRs..

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

FHWA Format Vehicle Class. Counts		
Light Duty Vehicles	Motorcycles	319
	Passenger	76942
	Pickup or Van	18718
Single Units	Buses	213
	Other 2 Axle	1389
	3 Axles	750
	4 Axles or more	274
Truck Combs.	3-4 Axles	485
	5 Axles	11179
	6 Axles or more	149
Semi-Trailer-Trailer	5 Axles or less	435
	6 Axles	119
	7 Axles or more	0

	Number	%
Light	95979	86.5
Medium	1844	1.7
Heavy	13149	11.8
Trucks	14993	13.5

SECTION 2

FM

	ADT	DHV
Light	92.2	94.1
Medium	1.0	0.8
Heavy	6.8	5.1

Total Vehicles	110972
Total Trucks	14993
Total Singles	19419.5
Total Tandems	24041.5
AXLE FACTOR	2.60
SINGLE AX FACT	0.60

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	20	20				
Year 2	40	50				
ADT	14350	14350				
% Trks	7.8	7.8				
Growth Rate	1.864	1.847				
Years	20	30				
Facil Type	C	C				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.60	2.60				
Single Axle	0.60	0.60				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	11500	11500				
% T in ATHWLD	40	40				
FLEXIBLE	4097000	6614000				
RIGID	5448000	8797000				

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 FRs - Existing Conditions - Section 3	District	Austin
Rd Type	FM	County	Williamson
Direction	Two-Way	CSJ	0015-09-185
Section 3	From Westinghouse Rd.		
Limits	To RM 1431	Analyst	JWB

Date: Request	11/21/2017	Received	11/21/2017	Started	1/3/2018	Completed	2/23/2018
District Contact	Carmen Ramos			Phone #	(512) 832-7075		

	Year	ADT's		% Trks ADT	% Trks DHV
Count	2016	33350		7.4	5.6
Base	2020	36000	# Trks	2652	
Forecast	2040	49400			
Forecast	2050	56000			

SPR Station	S-399	MC Stn	HP-877	% Trks	13.5
Year	2016	Dir		Num Trks	14993
Peak Hour	10.0	Year	2016	Axle Factor	2.90
DD	55	ADT	110972	% Single Axles	0.45
100-DD	45				
K-Factor	8.2				

Main Road Growth Rate	2.0	TDM Assignment	
Growth Rate after 20 Years	2.0		
20 Year Growth Factor	1.861		
30 Year Growth Factor	1.852	LOD	99999
Design Period 1	20		
Design Period 2	30		

			# Lanes
Structural Number (SN)	3	Existing	N/A
Slab Thickness (ST)	8	Proposed	N/A

Past Projects

Project	I-35 (Mainlanes and Frontage Roads, separate)
From	South of RM 2243
To	North of RM 2243
Date	3/11/2016
County	Williamson
CSJ	0015-09-185

Items Done on This Project

Straight Line Turning Movements	X	Detailed Schematic Turning Movements	X
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

1) See included relevant existing conditions schematic diagram - worksheet 2 for above Count, Base, and both Forecast years' ADTs.

2) See included relevant Truck Calculations for Frontage Road and Mainlane Split for above base year % Trks ADT and # Trks.

3) Data Calculations for Use in Air & Noise Analysis Axle Factor and Single Ax Fact values adjusted from 2.90 and 0.45 respectively to 2.60 and 0.60 respectively for FRs.

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

FHWA Format Vehicle Class. Counts		
Light	Motorcycles	319
Duty	Passenger	76942
Vehicles	Pickup or Van	18718
Single	Buses	213
Units	Other 2 Axle	1389
	3 Axles	750
	4 Axles or more	274
Truck	3-4 Axles	485
Combs.	5 Axles	11179
	6 Axles or more	149
Semi-	5 Axles or less	435
Trailer-	6 Axles	119
Trailer	7 Axles or more	0

	Number	%
Light	95979	86.5
Medium	1844	1.7
Heavy	13149	11.8
Trucks	14993	13.5

SECTION 3

FM

	ADT	DHV
Light	92.6	94.4
Medium	0.9	0.7
Heavy	6.5	4.9

Total Vehicles	110972
Total Trucks	14993
Total Singles	19419.5
Total Tandems	24041.5
AXLE FACTOR	2.60
SINGLE AX FACT	0.60

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	20	20				
Year 2	40	50				
ADT	36000	36000				
% Trks	7.4	7.4				
Growth Rate	1.861	1.852				
Years	20	30				
Facil Type	C	C				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.60	2.60				
Single Axle	0.60	0.60				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	12100	12100				
% T in ATHWLD	40	40				
FLEXIBLE	9753000	15760000				
RIGID	12967000	20954000				

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 FRs - Proposed Conditions - Section 2	District	Austin
Rd Type	FM	County	Williamson
Direction	Two-Way	CSJ	0015-09-185
Section 2	From SE Inner Loop		
Limits	To Westinghouse Rd.	Analyst	JWB

Date	Request	11/21/2017	Received	11/21/2017	Started	1/3/2018	Completed 2/23/2018
	District Contact	Carmen Ramos			Phone #	(512) 832-7075	

	Year	ADT's
Count	2016	19550
Base	2020	21100
Forecast	2040	28950
Forecast	2050	32800

	% Trks ADT	% Trks DHV
	7.8	5.9
# Trks	1656	

SPR Station	S-399	MC Stn	HP-877	% Trks	13.5
Year	2016	Dir		Num Trks	14993
Peak Hour	10.0	Year	2016	Axle Factor	2.90
DD	55	ADT	110972	% Single Axles	0.45
100-DD	45				
K-Factor	8.2				

Main Road Growth Rate	2.0
Growth Rate after 20 Years	2.0
20 Year Growth Factor	1.860
30 Year Growth Factor	1.848
Design Period 1	20
Design Period 2	30

TDM Assignment

LOD	99999

Structural Number (SN)	3
Slab Thickness (ST)	8

	# Lanes
Existing	N/A
Proposed	N/A

Past Projects

Project	I-35 (Mainlanes and Frontage Roads, separate)
From	South of RM 2243
To	North of RM 2243
Date	3/11/2016
County	Williamson
CSJ	0015-09-185

Items Done on This Project

Straight Line Turning Movements	X	Detailed Schematic Turning Movements	X
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

1) See included relevant proposed conditions schematic diagram - worksheet for above Count, Base, and both Forecast years' ADTs.

2) See included relevant Truck Calculations for Frontage Road and Mainlane Split for above base year % Trks ADT and # Trks.

3) Data Calculations for Use in Air & Noise Analysis Axle Factor and Single Ax Fact values adjusted from 2.90 and 0.45 respectively to 2.60 and 0.60 respectively for FRs.

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

FHWA Format Vehicle Class. Counts		
Light Duty Vehicles	Motorcycles	319
	Passenger	76942
	Pickup or Van	18718
Single Units	Buses	213
	Other 2 Axle	1389
	3 Axles	750
	4 Axles or more	274
Truck Combs.	3-4 Axles	485
	5 Axles	11179
	6 Axles or more	149
Semi-Trailer-Trailer	5 Axles or less	435
	6 Axles	119
	7 Axles or more	0

	Number	%
Light	95979	86.5
Medium	1844	1.7
Heavy	13149	11.8
Trucks	14993	13.5

SECTION 2

FM

	ADT	DHV
Light	92.2	94.1
Medium	1.0	0.8
Heavy	6.8	5.1

Total Vehicles	110972
Total Trucks	14993
Total Singles	19419.5
Total Tandems	24041.5
AXLE FACTOR	2.60
SINGLE AX FACT	0.60

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	20	20				
Year 2	40	50				
ADT	21100	21100				
% Trks	7.8	7.8				
Growth Rate	1.860	1.848				
Years	20	30				
Facil Type	C	C				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.60	2.60				
Single Axle	0.60	0.60				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	11900	11900				
% T in ATHWLD	40	40				
FLEXIBLE	6021000	9727000				
RIGID	8008000	12936000				

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

FHWA Format Vehicle Class. Counts		
Light Duty Vehicles	Motorcycles	319
	Passenger	76942
	Pickup or Van	18718
Single Units	Buses	213
	Other 2 Axle	1389
	3 Axles	750
	4 Axles or more	274
Truck Combs.	3-4 Axles	485
	5 Axles	11179
	6 Axles or more	149
Semi-Trailer-Trailer	5 Axles or less	435
	6 Axles	119
	7 Axles or more	0

	Number	%
Light	**95979**	**86.5**
Medium	**1844**	**1.7**
Heavy	**13149**	**11.8**
Trucks	**14993**	**13.5**

SECTION 2

FM

	ADT	DHV
Light	**92.2**	**94.1**
Medium	**1.0**	**0.8**
Heavy	**6.8**	**5.1**

Total Vehicles	**110972**
Total Trucks	**14993**
Total Singles	**19419.5**
Total Tandems	**24041.5**
AXLE FACTOR	**2.60**
SINGLE AX FACT	**0.60**

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	**3, 8**					
Design Periods	**1**	**2**				
Year 1	**20**	**20**				
Year 2	**40**	**50**				
ADT	**21100**	**21100**				
% Trks	**7.8**	**7.8**				
Growth Rate	**1.860**	**1.848**				
Years	**20**	**30**				
Facil Type	**C**	**C**				
S.N.	**3**	**3**				
SLAB	**8**	**8**				
Weight Sta	**99999**	**99999**				
Axle Factor	**2.60**	**2.60**				
Single Axle	**0.60**	**0.60**				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	**3, 8**					
Design Periods	**1**	**2**				
ATHWLD	11900	11900				
% T in ATHWLD	40	40				
FLEXIBLE	6021000	9727000				
RIGID	8008000	12936000				

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 FRs - Proposed Conditions - Section 3	District	Austin
Rd Type	FM	County	Williamson
Direction	Two-Way	CSJ	0015-09-185
Section 3	From Westinghouse Rd.		
Limits	To RM 1431	Analyst	JWB

Date:	Request	11/21/2017	Received	11/21/2017	Started	1/3/2018	Completed 2/23/2018
	District Contact	Carmen Ramos			Phone #	(512) 832-7075	

	Year	ADT's		% Trks ADT	% Trks DHV
Count	2016	38000		7.1	5.3
Base	2020	41000	# Trks	2900	
Forecast	2040	56300			
Forecast	2050	63850			

SPR Station	S-399	MC Stn	HP-877	% Trks	13.5
Year	2016	Dir		Num Trks	14993
Peak Hour	10.0	Year	2016	Axle Factor	2.90
DD	55	ADT	110972	% Single Axles	0.45
100-DD	45				
K-Factor	8.2				

Main Road Growth Rate	2.0	TDM Assignment	
Growth Rate after 20 Years	2.0		
20 Year Growth Factor	1.866		
30 Year Growth Factor	1.858	LOD	99999
Design Period 1	20		
Design Period 2	30		

			# Lanes
Structural Number (SN)	3	Existing	N/A
Slab Thickness (ST)	8	Proposed	N/A

Past Projects

Project	I-35 (Mainlanes and Frontage Roads, separate)
From	South of RM 2243
To	North of RM 2243
Date	3/11/2016
County	Williamson
CSJ	0015-09-185

Items Done on This Project

Straight Line Turning Movements	X	Detailed Schematic Turning Movements	X
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

1) See included relevant proposed conditions schematic diagram - worksheet for above Count, Base, and both Forecast years' ADTs.

2) See included relevant Truck Calculations for Frontage Road and Mainlane Split for above base year % Trks ADT and # Trks.

3) Data Calculations for Use in Air & Noise Analysis Axle Factor and Single Ax Fact values adjusted from 2.90 and 0.45 respectively to 2.60 and 0.60 respectively for FRs.

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

FHWA Format Vehicle Class. Counts		
Light	Motorcycles	319
Duty	Passenger	76942
Vehicles	Pickup or Van	18718
Single	Buses	213
Units	Other 2 Axle	1389
	3 Axles	750
	4 Axles or more	274
Truck	3-4 Axles	485
Combs.	5 Axles	11179
	6 Axles or more	149
Semi-	5 Axles or less	435
Trailer-	6 Axles	119
Trailer	7 Axles or more	0

	Number	%
Light	95979	86.5
Medium	1844	1.7
Heavy	13149	11.8
Trucks	14993	13.5

SECTION 3

FM

	ADT	DHV
Light	92.9	94.7
Medium	0.9	0.7
Heavy	6.2	4.6

Total Vehicles	110972
Total Trucks	14993
Total Singles	19419.5
Total Tandems	24041.5
AXLE FACTOR	2.60
SINGLE AX FACT	0.60

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8							
Design Periods	1	2						
Year 1	20	20						
Year 2	40	50						
ADT	41000	41000						
% Trks	7.1	7.1						
Growth Rate	1.866	1.858						
Years	20	30						
Facil Type	C	C						
S.N.	3	3						
SLAB	8	8						
Weight Sta	99999	99999						
Axle Factor	2.60	2.60						
Single Axle	0.60	0.60						

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8							
Design Periods	1	2						
ATHWLD	12200	12200						
% T in ATHWLD	40	40						
FLEXIBLE	10666000	17240000						
RIGID	14178000	22918000						

Texas
Department
of Transportation

File

MEMO

June 23, 2016

To: Terry G. McCoy, P.E., District Engineer
Attention: Lorena Echeverria De Misi, P.E., Director of TPD

Through: William E. Knowles, P.E.
Traffic Analysis Section Director, TPP

From: Lee Theobald
Transportation Analyst

Subject: Traffic Data
CSJ: 0015-08-140
I 35
At CR 305
Williamson County

Attached is a diagram depicting 2018, 2038 and 2048 average daily traffic volumes and turning movements on I 35 at CR 305 for existing and proposed conditions. Also attached are tabulations showing traffic analysis for highway design for the 2018 to 2038 twenty year period and 2018 to 2038 thirty year period for the described limits of the route along with CR 305. Also included are tabulations showing data for use in air and noise analysis.

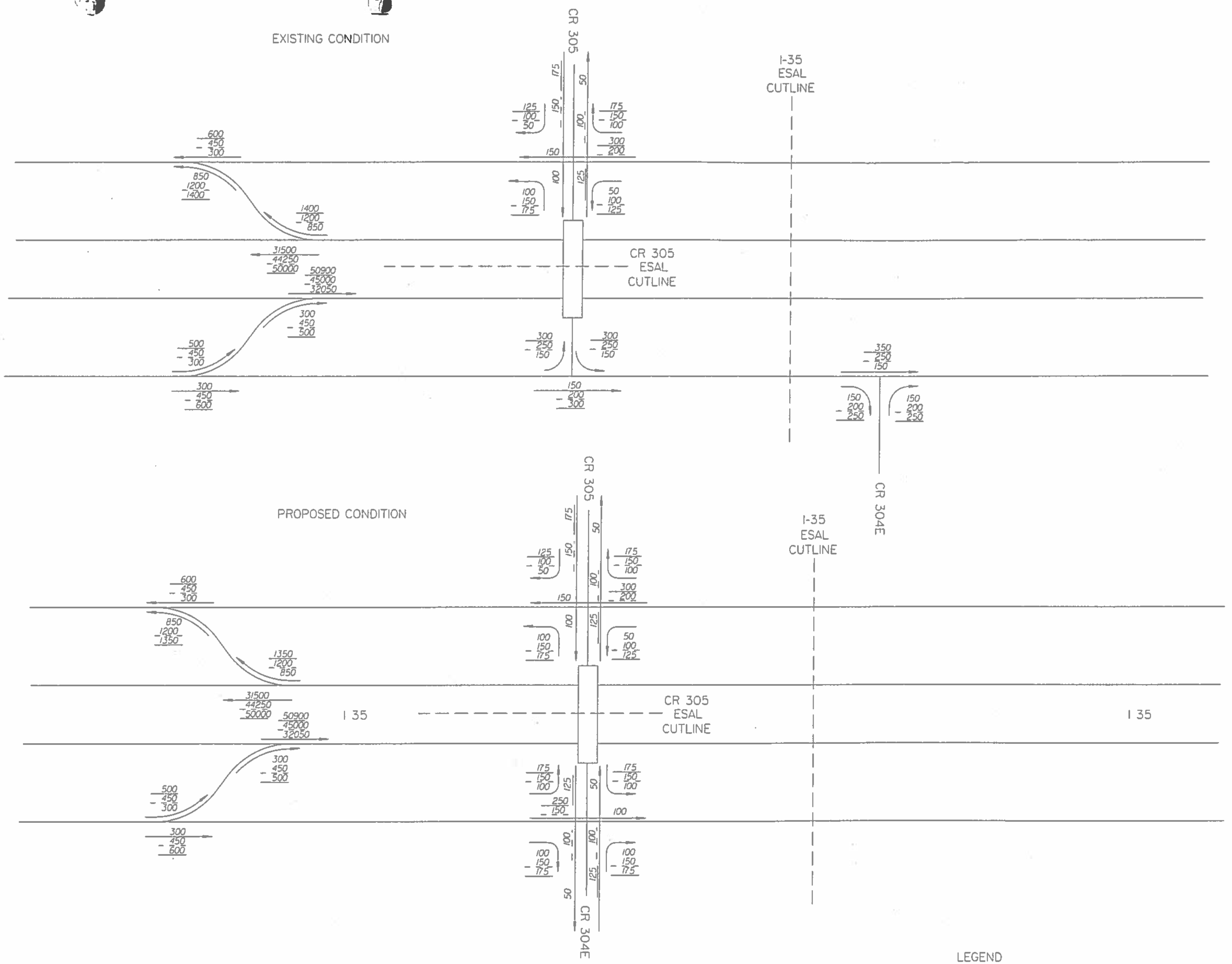
Please refer to your original request dated April 18, 2016.

If you have any questions or need additional information, please contact Lee Theobald at (512) 486-5143.

Attachments

CC: Carmen Ramos, Planner, Austin District
Design Division

NOT INTENDED FOR CONSTRUCTION, BIDDING OR PERMIT PURPOSES.
William Erick Knowles, P.E.
Serial Number 84704



LEGEND
1000 - 2018 ADT
1000 - 2038 ADT
1000 - 2048 ADT

2018, 2038 AND 2048 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG I 35 AT CR 305 WILLIAMSON COUNTY

TRANSPORTATION PLANNING AND PROGRAMMING DIVISION
JUNE 21, 2016

SHEET 1 OF 1

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

June 21, 2016

	Base Year								Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2018 to 2038)			
Description of Location	Average Daily Traffic		Dir Dist %	K Factor	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2018	2038			ADT	DHV						
I 35 (Existing and Proposed) At CR 305 Williamson County	65,300	91,800	54 - 46	10.2	25.0	11.3	13,400	30	79,286,000	3	114,465,000	8"

Data for Use in Air & Noise Analysis		
	Base Year	
Vehicle Class	% of ADT	% of DHV
Light Duty	75.0	88.7
Medium Duty	2.2	1.0
Heavy Duty	22.8	10.3

	Base Year								Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2018 to 2048)			
Description of Location	Average Daily Traffic		Dir Dist %	K Factor	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2018	2048			ADT	DHV						
I 35 (Existing and Proposed) At CR 305 Williamson County	65,300	104,000	54 - 46	10.2	25.0	11.3	13,500	30	128,158,000	3	185,022,000	8"

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84704

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District **June 21, 2016**

	Average Daily Traffic		Base Year						Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2018 to 2038)			
Description of Location	2018	2038	Dir Dist %	K Factor	Percent Trucks ADT	Percent Trucks DHV	ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	SN	Rigid Pavement	SLAB
CR 305 (Existing and Proposed) At I 35 Williamson County	300	500	60 - 40	12.4	8.3	6.2	8,700	50	63,000	3	69,000	8"

Data for Use in Air & Noise Analysis

	Base Year	
Vehicle Class	% of ADT	% of DHV
Light Duty	91.7	93.8
Medium Duty	5.8	4.4
Heavy Duty	2.5	1.8

	Average Daily Traffic		Base Year						Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2018 to 2048)			
Description of Location	2018	2048	Dir Dist %	K Factor	Percent Trucks ADT	Percent Trucks DHV	ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	SN	Rigid Pavement	SLAB
CR 305 (Existing and Proposed) At I 35 Williamson County	300	600	60 - 40	12.4	8.3	6.2	8,900	50	107,000	3	116,000	8"

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84704

Texas
Department
of Transportation

MEMO

April 18, 2016

To: Bill Knowles, P.E.
Director, Transportation Analysis

From: Carmen Ramos
Austin District

Subject: Traffic Request

County: Williamson
CSJ: 0015-08-140
Highway: IH 35
Limits: at CR 305

Attached please find our request for traffic data for IH 35 at CR 305. This transmittal includes the following documents:

1. Completed TRAFFIC REQUEST FORM
2. Project Location Map
3. Line Diagram
4. Schematic
5. District Priority List

Please feel free to contact Carmen Ramos at (512) 832-7075 if you should have any questions or need additional information.

ATTACHMENTS

cc: Janie Temple, TPP
Robert Williams, TPP
Gabe Contreras, TPP
Deena Salas, TPP
Marisabel Ramthun, P.E., Austin District

Texas Department of Transportation

REQUEST FOR TRAFFIC DATA

Form 2124
(6/2004)
Page 1 of 1

Date: 4/6/2016

District: Austin **County:** Williamson **CSJ:** 0015-08-140

Highway: IH 35
Limits: at CR 305

Texas Reference Marker System
From Marker: 277 From Displacement: 0.023 From DFO: 276.464
To Marker: 277 To Displacement: 0.313 To DFO: 276.754

Is it in the UTP? ☒ Yes ☐ No District Priority: 12 Est. Letting Date: 9/1/2017

Existing Number of Lanes: 2
Proposed Number of Lanes: 2

District Contact Person: Carmen Ramos
Phone Number: 512/832-7075

Please attach an 8-1/2" x 11" location map and make note of any existing or proposed development that will be a traffic generator.

The following to be completed (Please mark information to be provided):

RECEIVED
APR 18 2016
BY TPP

☒ 1. Basic Highway Traffic Data for pavement design
(No line diagram analysis required)
   - A. Base year/Beginning year: 2018
   - B. Forecasted 20 year: 2038
   - C. Forecasted 30 year: 2048
   - D. Directional Distribution
   - E. K-factor
   - F. Percent Trucks ADT/DHV
   - G. Average Ten Heaviest Wheel Loads (ATHWLD)
   - H. Percent Tandem Axles in the ATHWLD
   - I. One Directional cumulative 18 KSA at the end of the 20 years/30years
   - J. Slab Thickness (8" unless otherwise specified): ______
   - K. Structural Number (3 unless otherwise specified): ______

☒ 2. Vehicle classification for environmental studies (Air and Noise Analysis).

☒ 3. Line diagram analysis (straight line turning movements; please provide line diagram).

☒ 4. Complete Corridor Analysis (includes basic highway traffic data for pavement design, environmental studies and detailed schematic turning movements; *please provide detailed schematic*).

Note: If complete corridor analysis is requested, please attach a traffic schematic diagram.

Texas
Department
of Transportation

MEMO

April 18, 2016

To: Bill Knowles, P.E.
Director, Transportation Analysis

From: CR Carmen Ramos
Austin District

Subject: Traffic Request

County: Williamson
CSJ: 0015-08-140
Highway: IH 35
Limits: at CR 305

Attached please find our request for traffic data for IH 35 at CR 305. This transmittal includes the following documents:

1. Completed TRAFFIC REQUEST FORM
2. Project Location Map
3. Line Diagram
4. Schematic
5. District Priority List

Please feel free to contact Carmen Ramos at (512) 832-7075 if you should have any questions or need additional information.

ATTACHMENTS

cc: Janie Temple, TPP
Robert Williams, TPP
Gabe Contreras, TPP
Deena Salas, TPP
Marisabel Ramthun, P.E., Austin District

RECEIVED TPP
0257 APR 22 16

Texas Department of Transportation

REQUEST FOR TRAFFIC DATA

Form 2124
(6/2004)
Page 1 of 1

Date: 4/6/2016

District: Austin **County:** Williamson **CSJ:** 0015-08-140

Highway: IH 35
Limits: at CR 305

Texas Reference Marker System

From Marker: 277 From Displacement: 0.023 From DFO: 276.464
To Marker: 277 To Displacement: 0.313 To DFO: 276.754

Is it in the UTP? ☒ Yes ☐ No District Priority: 12 Est. Letting Date: 9/1/2017

Existing Number of Lanes: 2
Proposed Number of Lanes: 2

District Contact Person: Carmen Ramos
Phone Number: 512/832-7075

Please attach an 8-1/2" x 11" location map and make note of any existing or proposed development that will be a traffic generator.

The following to be completed (Please mark information to be provided):

RECEIVED
APR 25 2016
BY TPP

☒ 1. Basic Highway Traffic Data for pavement design
(No line diagram analysis required)
- A. Base year/Beginning year: 2018
- B. Forecasted 20 year: 2038
- C. Forecasted 30 year: 2048
- D. Directional Distribution
- E. K-factor
- F. Percent Trucks ADT/DHV
- G. Average Ten Heaviest Wheel Loads (ATHWLD)
- H. Percent Tandem Axles in the ATHWLD
- I. One Directional cumulative 18 KSA at the end of the 20 years/30years
- J. Slab Thickness (8" unless otherwise specified): ______
- K. Structural Number (3 unless otherwise specified): ______

☒ 2. Vehicle classification for environmental studies (Air and Noise Analysis).

☒ 3. Line diagram analysis (straight line turning movements; please provide line diagram).

☒ 4. Complete Corridor Analysis (includes basic highway traffic data for pavement design, environmental studies and detailed schematic turning movements; *please provide detailed schematic*).

Note: If complete corridor analysis is requested, please attach a traffic schematic diagram.

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I 35	Date for Memorandum	6/21/2016
Rd Type	IH	District	Austin
		County	Williamson
Project Limits	At CR 305	CSJ	0015-08-140
		Analyst	LRT

Date: Request 4/18/2016 Received 4/18/2016 Started 6/14/2016 Completed 6/16/2016

District Contact: Carmen Ramos

Phone #: 512/832-7075

	Year	ADT's
Count	2014	60065
Base	2018	**65300**
Forecast	2038	**91800**
Forecast	2048	**104000**

% Trks ADT: **25.0**

Trks: **16325**

% Trks DHV: **11.3**

SPR Station	S-215	MC Stn	LW-513	% Trks	28.5
Year	2014	Dir	N&S	Num Trks	14059
Peak Hour	10.9	Year	2014	Axle Factor	2.98
DD	54	ADT	49359	% Single Axles	0.43
100-DD	46				
K-Factor	10.2				

Main Road Growth Rate	2.2
Growth Rate after 20 Years	2.0
20 Year Growth Factor	**2.029**
30 Year Growth Factor	**1.975**
Design Period 1	20
Design Period 2	30

TDM Assignment: None

LOD: 99999

# Lanes	
Existing	2
Proposed	2

Structural Number (SN)	3		
Slab Thickness (ST)	8		

Past Projects	
Project	
From	
To	
Date	
County	
CSJ	

T. Log			
ADT	See Attached		
% Growth Rate			
K-Factor			
DD			
% Trucks ADT			
% Trucks DHV			
MC Station			
SPR Station			

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	X
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

Used S-215 and LW-513 for ATR and MC instead of Tlog closer to the project

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

● FHWA Format			○ Texas 6 Format		
Light Duty Vehicles	Motorcycles	66	**Light Duty Vehicles**	Passenger	
	Passenger	27745		Panel & Pickup	
	Pickup or Van	7489	**Single Units**	Buses	
Single Units	Buses	217		Other 2 Axle	
	Other 2 Axle	940		3 Axle	
	3 Axles	359		4 Axle or More	
	4 Axles or more	16	**Truck Combs.**	3 Axle	
Truck Combs.	3-4 Axles	199		4 Axle	
	5 Axles	11572		5 Axle	
	6 Axles or more	100		6 Axle or more	
Semi-Trailer-Trailer	5 Axles or less	583	**Semi-Trailer-Trailer**	5 Axle	
	6 Axles	73		6 Axle	
	7 Axles or more	0		7 Axle or more	

FHWA Format Data	Number	%
Light	35300	71.5
Medium	1256	2.5
Heavy	12803	25.9
Trucks	14059	28.5

Section 1

IH

	ADT	DHV
Light	75.0	88.7
Medium	2.2	1.0
Heavy	22.8	10.3

Total Vehicles	49359
Total Trucks	14059
Total Singles	18065.5
Total Tandems	23891.5
AXLE FACTOR	2.98
SINGLE AX FACT	0.43

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	18	18				
Year 2	38	48				
ADT	65300	65300				
% Trks	25.0	25.0				
Growth Rate	2.029	1.975				
Years	20	30				
Facil Type	A	A				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.98	2.98				
Single Axle	0.43	0.43				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	13400	13500				
% T in ATHWLD	30	30				
FLEXIBLE	79286000	128158000				
RIGID	114465000	185022000				

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	CR 305	Date for Memorandum	6/21/2016
Rd Type	FM	District	Austin
		County	Williamson
Project Limits	At I 35	CSJ	0015-08-140
		Analyst	LRT

Date: Request	4/18/2016	Received	4/18/2016	Started	6/14/2016	Completed	6/16/2016
District Contact	Carmen Ramos			Phone #	512/832-7075		

	Year	ADT's
Count	2014	300
Base	2018	300
Forecast	2038	500
Forecast	2048	600

	% Trks ADT	% Trks DHV
	8.3	6.2
# Trks	25	

SPR Station	S-278	MC Stn	LP-808	% Trks	6.4
Year	2014	Dir	E&W	Num Trks	65
Peak Hour	15.1	Year	2015	Axle Factor	2.08
DD	60	ADT	1009	% Single Axles	0.86
100-DD	40				
K-Factor	12.4				

Main Road Growth Rate	2.2
Growth Rate after 20 Years	2.0
20 Year Growth Factor	3.333
30 Year Growth Factor	3.333
Design Period 1	20
Design Period 2	30

TDM Assignment: None

LOD: 99999

Structural Number (SN)	3		
Slab Thickness (ST)	8		

	# Lanes
Existing	2
Proposed	2

Past Projects

Project	
From	
To	N/A
Date	
County	
CSJ	

T. Log

ADT	See Attached		
% Growth Rate			
K-Factor			
DD			
% Trucks ADT			
% Trucks DHV			
MC Station			
SPR Station			

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	X
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet	X		

NOTES:

Used S-278 and LP-808 for ATR and MC there is no Tlog entry these matched closely with the project

TA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

● FHWA Format			○ Texas 6 Format		
Light Duty Vehicles	Motorcycles	17	Light Duty Vehicles	Passenger	
	Passenger	548		Panel & Pickup	
	Pickup or Van	379	Single Units	Buses	
Single Units	Buses	16		Other 2 Axle	
	Other 2 Axle	27		3 Axle	
	3 Axles	17		4 Axle or More	
	4 Axles or more	0	Truck Combs.	3 Axle	
Truck Combs.	3-4 Axles	5		4 Axle	
	5 Axles	0		5 Axle	
	6 Axles or more	0		6 Axle or more	
Semi-Trailer-Trailer	5 Axles or less	0	Semi-Trailer-Trailer	5 Axle	
	6 Axles	0		6 Axle	
	7 Axles or more	0		7 Axle or more	

FHWA Format Data

	Number	%
Light	944	93.6
Medium	45	4.5
Heavy	20	2.0
Trucks	65	6.4

Section 1

FM

	ADT	DHV
Light	91.7	93.8
Medium	5.8	4.4
Heavy	2.5	1.8

Total Vehicles	1009
Total Trucks	65
Total Singles	115.5
Total Tandems	19.5
AXLE FACTOR	2.08
SINGLE AX FACT	0.86

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	18	18				
Year 2	38	48				
ADT	300	300				
% Trks	8.3	8.3				
Growth Rate	3.333	3.333				
Years	20	30				
Facil Type	C	C				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.08	2.08				
Single Axle	0.86	0.86				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	8700	8900				
% T in ATHWLD	50	50				
FLEXIBLE	63000	107000				
RIGID	69000	116000				

TRAFFIC VOLUME REGRESSION WORKSHEET

June 14, 2016

PROJECT: I 35
LIMITS: At CR 305

District: Austin
County: Williamson
CSJ: 0015-08-140

ROUTE	I 35	I 35	I 35									
LOCATION	SP 215	H 5	T 52									
1994	33000	33000	33000									
1995	35000	36000	36000									
1996	37000	38000	38000									
1997	35000	39000	37000									
1998	40000	42000	42000									
1999	43000	44000	44000									
2000	46000	47000	49000									
2001	46000	48000	48000									
2002	48000	50000	50000									
2003	47000	48000	49000									
2004	48000	40000	41000									
2005	49110	40330	42310									
2006	50000	40000	38000									
2007	51000	55000	55000									
2008	51000	57000	57000									
2009	53000	58000	60000									
2010	56000	59000	57000									
2011	57000	60000	59000									
2012	57000	61000	58000									
2013	52146	61841	58763									
2014	59986	69918	65365									
	Regr01	Regr02	Regr03	Regr04	Regr05	Regr06	Regr07	Regr08	Regr09	Regr10	Regr11	Regr12
Low Linear Annual Growth Rate	1.2%	1.3%	1.2%									
Forecast Lnr. An. Grwth Rate	2.0% ☑	2.3% ☑	2.2% ☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
High Linear Annual Growth Rate	2.8%	3.3%	3.1%									
Estimated Standard Deviation	2193.04	4638.84	4624.84									
B (Slope)	1202	1478	1344									
A (Intercept)	35328	34129	35010									
R²	0.959	0.892	0.875									
Confidence Interval	+/- 90% CI 471	+/- 90% CI [illegible]	+/- 90% CI [illegible]									
GR's for Non-Regression vol's only												

Avg. of selected Forecast Linear Annual Growth Rates: 2.2%

Avg. of all Forecast Linear Annual Growth Rates: 2.2%

PROJECTIONS OF ABOVE TRAFFIC VOLUME DATA TO FORECASTED YEARS

Use last Count Year from above. ☑

Do not use last Count Year from above. ☐
Enter any one of previous count years from above. 2010

Enter Base Year 2018

Pivot Growth Rate at 20 Years from Count Year (most commonly used). ☑

Pivot Growth Rate (GR) at other than 20 Years from Count Year. ☐
Enter years from Count Year for pivoting Growth Rate (e.g. for pivoting growth ten years from Count Year, enter 10) 10

Enter Model Year 2030

Optional input: SPR Station, Yr
Optional input: K-Factor
Optional input: Dir. Dist.

Enter Earliest Variable Year 2015
Enter Latest Variable Year 2025

Pre-20/Pivot Yr Growth Rates Selection

Use Relative Low & Non-Regression GR's ○
Use Relative Frcst & Non-Regression GR's ○
Use Relative High & Non-Regression GR's ○
Use Avg. of Selected Low Growth Rates ○ 1.2%
Use Avg. of Selected Forecast Growth Rates ○ 2.2%
Use Avg. of Selected High Growth Rates ○ 3.1%
Use Avg. of All Low Growth Rates ○ 1.2%
Use Avg. of All Forecast Growth Rates ● 2.2%
Use Avg. of All High Growth Rates ○ 3.1%
Use **Highest** Forecast Growth Rate ○ 2.3%
Use **Lowest** Forecast Growth Rate ○ 2.0%
Use Manually Selected Growth Rate ○ 4.0%

Post-20/Pivot Year Growth Rate Note: If Pre-20/Pivot Yr GR is 2.0% or less, that rate is used in the projections, not the rate below.
Enter Growth Rate (2.0% most common) 2.0%

ROUTE	I 35	I 35	I 35									
LOCATION	SP 215	H 5	T 52									
20/PIVOT YR AN. GROWTH RATE	2.2%	2.2%	2.2%									
Count Year - 2014	59986	69918	65365									
Base Year - 2018	65300	76100	71100									
Ten Year Forecast - 2028	78500	91500	85500									
Twenty Year Forecast - 2038	91200	106300	99400									
Thirty Year Forecast - 2048	103200	120300	112400									
Forty Year Forecast - 2058	115200	134200	125500									
GR Pivot Year Forecast - 2034	86400	100700	94100									
Earliest Var Yr Frcst - 2015	61300	71500	66800									
Latest Var Yr Frcst - 2025	74500	86800	81200									
Model Year Forecast - 2030												
Model Traffic Assignment												
Difference of Model Yr Forecast from Model Traffic Assignment												
Above Difference in DDHV												
% Difference of Model Yr Forecast from Model Traffic Assignment												

FILE

Texas Department of Transportation

MEMO

June 8, 2016

To: Terry G. McCoy, P.E., District Engineer
Lorena E. Echeverria De Misi, P.E., Director of TPD

Through: William E. Knowles, P.E.
Traffic Analysis Section Director, TPP

From: Gabriel Contreras
Transportation Analyst, TPP

Subject: Traffic Data
CSJ: 0015-08-142
I-35: (Mainlanes and Frontage Roads, separate)
From FM 972
To Bud Stockton Loop
Williamson County

Attached are copies of schematics depicting 2020, 2040 and 2050 anticipated average daily traffic volumes and turning movements along I-35 for both existing and proposed conditions. Also attached are tabulations showing traffic analysis for highway design for the 2020 to 2040 twenty year period and 2020 to 2050 thirty year period for the described limits of the route. Included are tabulations showing data for use in air and noise analysis.

Due to significant differences in traffic volumes for the frontage roads only the project was separated into two sections.

Section 1: From FM 972 to on and off ramps west of Ronald Reagan Blvd
Section 2: From on and off ramps west of Ronald Reagan Blvd to Bud Stockton Loop

Please refer to your original memorandum dated January 11, 2016.

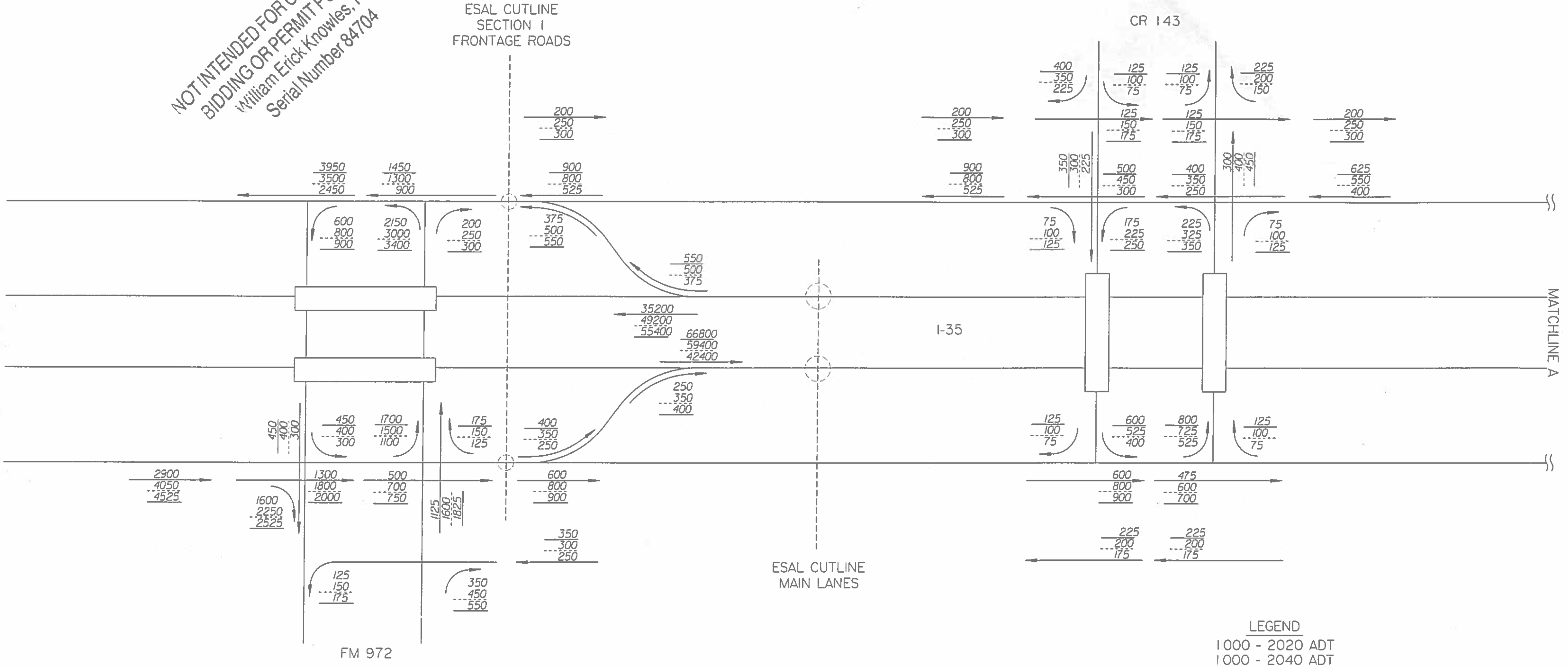
If you have any questions or need additional information, please contact Gabriel Contreras at (512) 486-5180.

Attachments

CC: Carmen Ramos, Planner, Austin District
Design Division

EXISTING CONDITIONS

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E
Serial Number 84704



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

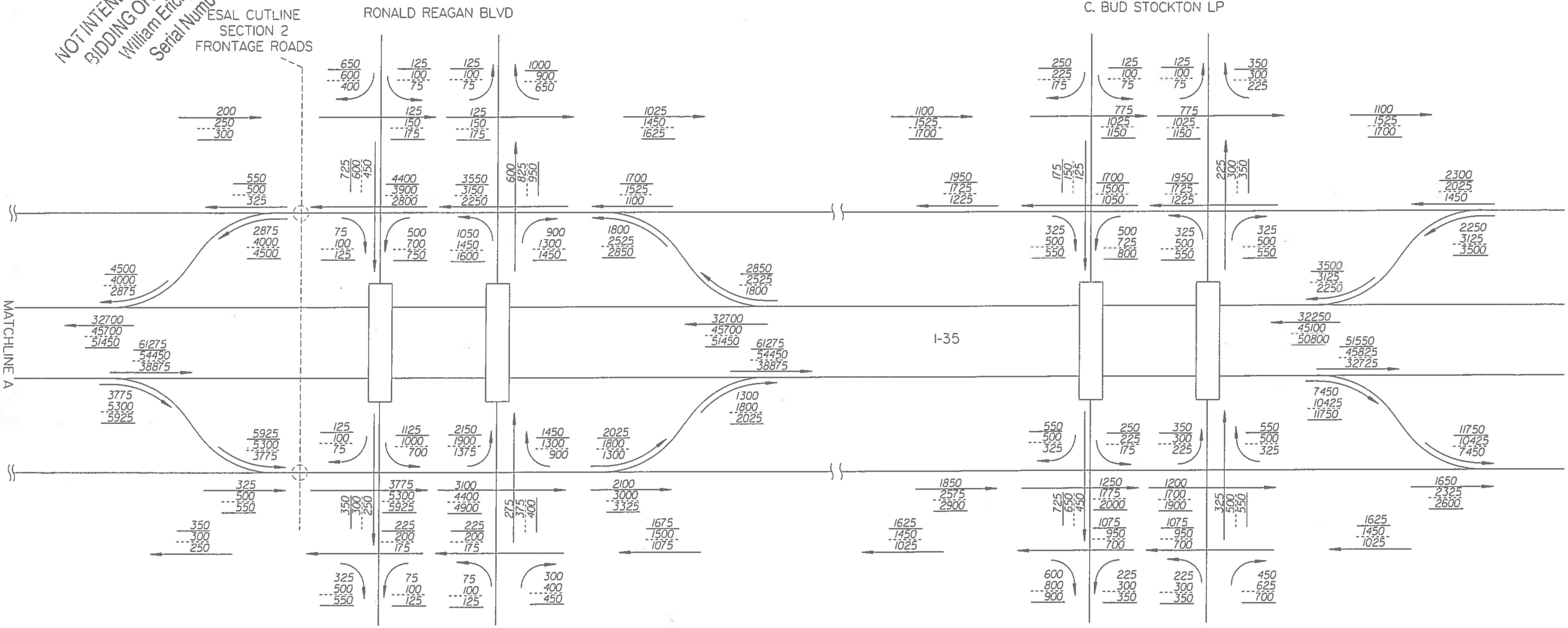
2020, 2040 AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG I-35 FROM FM 972 TO BUD STOCKTON LOOP. WILLIAMSON COUNTY

TRANSPORTATION PLANNING AND PROGRAMMING DIVISION
JUNE 6, 2016

SHEET 1 OF 2

NOT INTENDED FOR CONSTRUCTION BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84704

EXISTING CONDITIONS



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

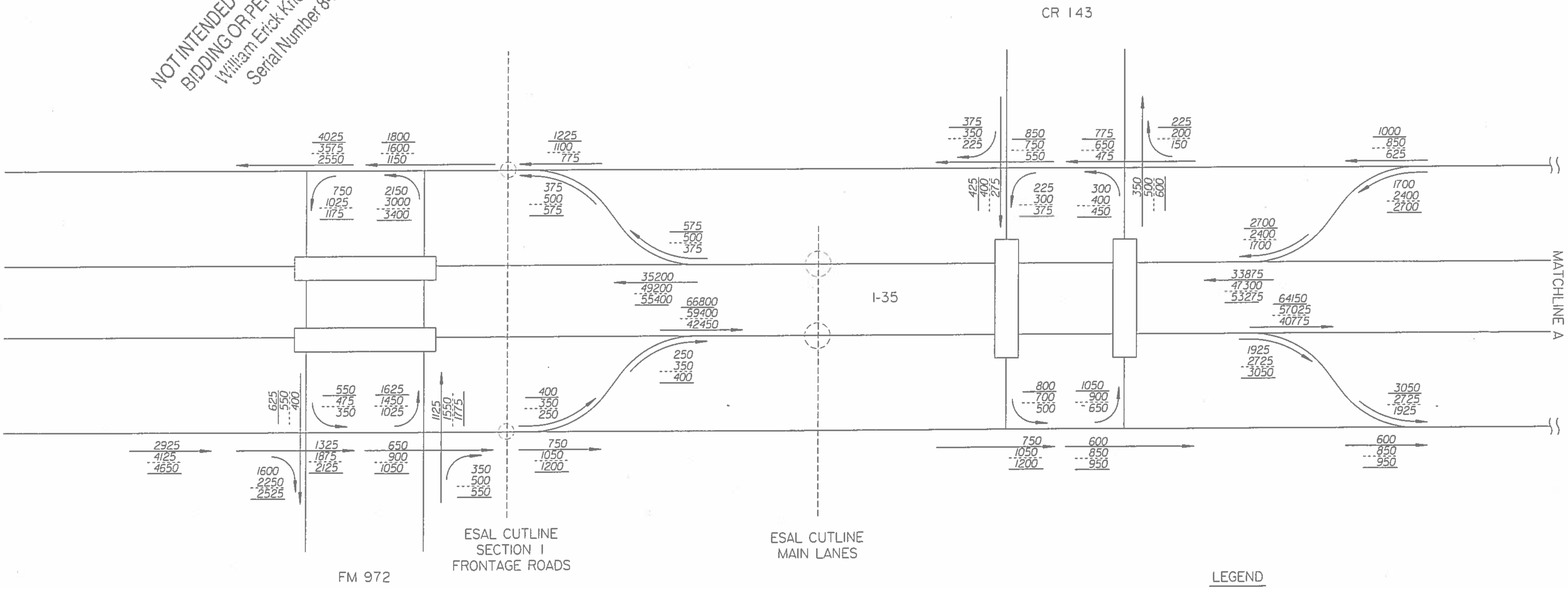
2020, 2040 AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG I-35 FROM FM 972 TO BUD STOCKTON LOOP.
WILLIAMSON COUNTY

TRANSPORTATION PLANNING AND PROGRAMMING DIVISION
JUNE 6, 2016

SHEET 2 OF 2

PROPOSED CONDITIONS

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E
Serial Number 84704



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040 AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG I-35 FROM FM 972 TO BUD STOCKTON LOOP.
WILLIAMSON COUNTY

TRANSPORTATION PLANNING AND PROGRAMMING DIVISION
JUNE 6, 2016

SHEET 1 OF 2

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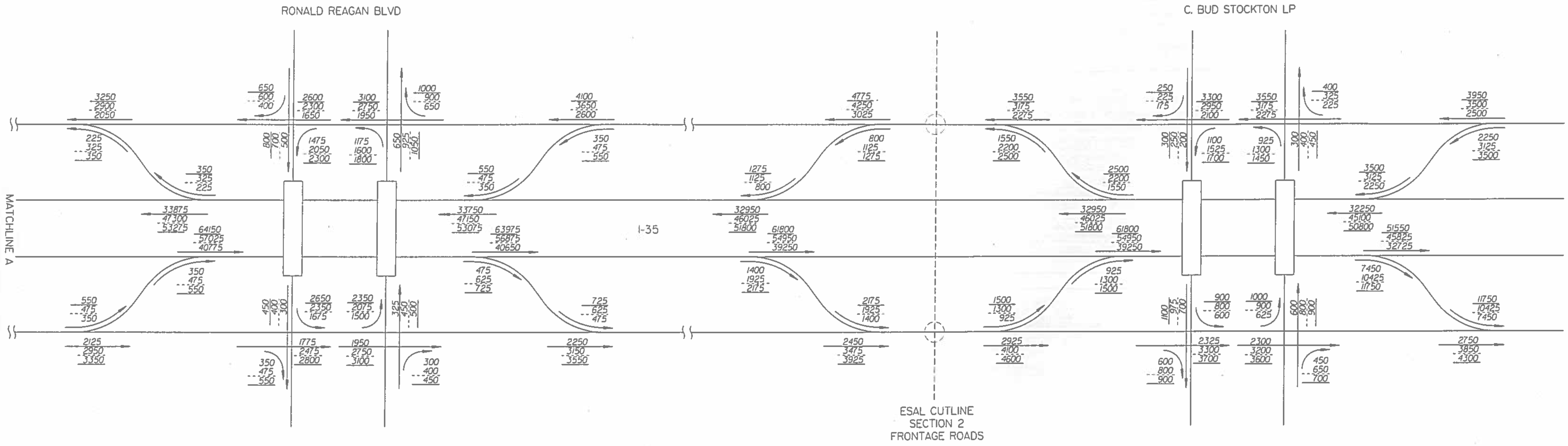
William Erick Knowles, P.E.
Serial Number 84704

PROPOSED CONDITIONS



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040 AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG I-35 FROM FM 972 TO BUD STOCKTON LOOP.
WILLIAMSON COUNTY

TRANSPORTATION PLANNING AND PROGRAMMING DIVISION
JUNE 6, 2016

SHEET 2 OF 2

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

June 3, 2016

	Base Year								Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
Description of Location	Average Daily Traffic		Dir Dist %	K Factor	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2040			ADT	DHV						
I-35 Main Lanes Only (Existing) From FM 972 To Bud Stockton Loop Williamson County	78,225	109,450	52 - 48	9.8	17.0	12.8	13,200	30	60,091,000	3	86,014,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year	
	% of ADT	**% of DHV**
Light Duty	83.0	87.2
Medium Duty	2.9	2.2
Heavy Duty	14.1	10.6

	Base Year								Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
Description of Location	Average Daily Traffic		Dir Dist %	K Factor	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2050			ADT	DHV						
I-35 Main Lanes Only (Existing) From FM 972 To Bud Stockton Loop Williamson County	78,225	123,150	52 - 48	9.8	17.0	12.8	13,300	30	96,711,000	3	138,433,000	8"

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84704

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

June 3, 2016

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
			Dir Dist %	K Factor	Percent Trucks				Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2040			ADT	DHV						
I-35 Frontage Roads Only (Existing) Section 1 From FM 972 To on and off ramps west of Ronald Reagan Blvd Williamson County	2,200	3,000	52 - 48	9.8	3.9	2.9	9,800	70	309,000	3	413,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year	
	% of ADT	% of DHV
Light Duty	96.1	97.1
Medium Duty	1.4	1.1
Heavy Duty	2.5	1.8

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
			Dir Dist %	K Factor	Percent Trucks				Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2050			ADT	DHV						
I-35 Frontage Roads Only (Existing) Section 1 From FM 972 To on and off ramps west of Ronald Reagan Blvd Williamson County	2,200	3,400	52 - 48	9.8	3.9	2.9	9,900	70	499,000	3	668,000	8"

OT INTENDED FOR CONSTRUCTIO
IDDING OR PERMIT PURPOSE
William Erick Knowles, P.E
Serial Number 84704

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

June 3, 2016

Austin District

									Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
			Base Year									
Description of Location	Average Daily Traffic		Dir Dist %	K Factor	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2040			ADT	DHV						
I-35 Frontage Roads Only (Existing) Section 2 From on and off ramps west of Ronald Reagan Blvd To Bud Stockton Loop Williamson County	7,750	10,850	52 - 48	9.8	4.3	3.2	10,800	60	1,217,000	3	1,629,000	8"

Data for Use in Air & Noise Analysis

	Base Year	
Vehicle Class	% of ADT	% of DHV
Light Duty	95.7	96.8
Medium Duty	1.6	1.2
Heavy Duty	2.7	2.0

									Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
			Base Year									
Description of Location	Average Daily Traffic		Dir Dist %	K Factor	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2050			ADT	DHV						
I-35 Frontage Roads Only (Existing) Section 2 From on and off ramps west of Ronald Reagan Blvd To Bud Stockton Loop Williamson County	7,750	12,175	52 - 48	9.8	4.3	3.2	10,800	60	1,955,000	3	2,618,000	8"

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84704

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District **June 3, 2016**

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
			Dir Dist	K	Percent Trucks				Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2040	%	Factor	ADT	DHV						
I-35 Main Lanes Only (Proposed) From FM 972 To Bud Stockton Loop Williamson County	78,275	109,450	52 - 48	9.8	17.0	12.8	13,200	30	60,104,000	3	86,033,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year	
	% of ADT	% of DHV
Light Duty	83.0	87.2
Medium Duty	2.9	2.2
Heavy Duty	14.1	10.6

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
			Dir Dist	K	Percent Trucks				Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2050	%	Factor	ADT	DHV						
I-35 Main Lanes Only (Proposed) From FM 972 To Bud Stockton Loop Williamson County	78,275	123,175	52 - 48	9.8	17.0	12.8	13,300	30	96,750,000	3	138,489,000	8"

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E
Serial Number 84704

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

June 3, 2016

			Base Year						Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
Description of Location	Average Daily Traffic		Dir Dist %	K Factor	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2040			ADT	DHV						
I-35 Frontage Roads Only (Proposed) Section 1 From FM 972 To on and off ramps east of CR 143 Williamson County	2,150	3,000	52 - 48	9.8	3.9	2.9	9,800	70	306,000	3	410,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year % of ADT	Base Year % of DHV
Light Duty	96.1	97.1
Medium Duty	1.4	1.1
Heavy Duty	2.5	1.8

			Base Year						Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
Description of Location	Average Daily Traffic		Dir Dist %	K Factor	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2050			ADT	DHV						
I-35 Frontage Roads Only (Proposed) Section 1 From FM 972 To on and off ramps east of CR 143 Williamson County	2,150	3,400	52 - 48	9.8	3.9	2.9	9,900	70	495,000	3	662,000	8"

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84704

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

June 3, 2016

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
	2020	2040	Dir Dist %	K Factor	Percent Trucks ADT	Percent Trucks DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
I-35 Frontage Roads Only (Proposed) Section 2 From on and off ramps east of CR 143 To Bud Stockton Loop Williamson County	7,675	10,775	52 - 48	9.8	4.3	3.2	10,800	60	1,207,000	3	1,616,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year % of ADT	Base Year % of DHV
Light Duty	95.7	96.8
Medium Duty	1.6	1.2
Heavy Duty	2.7	2.0

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
	2020	2050	Dir Dist %	K Factor	Percent Trucks ADT	Percent Trucks DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
I-35 Frontage Roads Only (Proposed) Section 2 From on and off ramps east of CR 143 To Bud Stockton Loop Williamson County	7,675	12,150	52 - 48	9.8	4.3	3.2	10,800	60	1,946,000	3	2,605,000	8"

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E
Serial Number 84704

Texas
Department
of Transportation

GC

MEMO

January 11, 2016

To: Bill Knowles, P.E.
Director, Transportation Analysis

From: CR Carmen Ramos
Austin District

Subject: Traffic Request

County: Williamson
CSJ: 0015-08-142
Highway: IH 35 (Mainlanes and Frontage Roads Separate)
Limits: FM 972 to Bud Stockton Loop

Attached please find our request for traffic data for IH 35 (Mainlanes and Frontage Roads Separate) from FM 972 to Bud Stockton Loop. This transmittal includes the following documents:

1. Completed TRAFFIC REQUEST FORM
2. Project Location Map
3. Line Diagram
4. District Priority List

Please feel free to contact Carmen Ramos at (512) 832-7075 if you have any questions.

CC: Janie Temple, TPP
Robert Williams, TPP
Gabe Contreras, TPP
Deena Salas, TPP
Marisabel Ramthum, P.E., Austin District

Texas Department of Transportation

Form 2124
(6/2004)
Page 1 of 1

REQUEST FOR TRAFFIC DATA

Date: 1/11/2016

District: Austin **County:** Williamson **CSJ:** 0015-08-142

Highway: Interstate Highway 35 (Mainlanes & Frontage Roads Separate)
Limits: FM 972 to Bud Stockton Loop

Texas Reference Marker System
From Marker: 268 From Displacement: 0.16 miles From DFO: 00.160
To Marker: 274 To Displacement: 0.13 miles To DFO: 06.130

Is it in the UTP? ☐ Yes ☒ No District Priority: 9 Est. Letting Date: 2016

Existing Number of Lanes: 6
Proposed Number of Lanes: 6

District Contact Person: Carmen Ramos
Phone Number: 512/832-7075

Please attach an 8-1/2" x 11" location map and make note of any existing or proposed development that will be a traffic generator.

The following to be completed (Please mark information to be provided):

☒ 1. Basic Highway Traffic Data for pavement design
(No line diagram analysis required)
- A. Base year/Beginning year: 2020
- B. Forecasted 20 year: 2040
- C. Forecasted 30 year: 2050
- D. Directional Distribution
- E. K-factor
- F. Percent Trucks ADT/DHV
- G. Average Ten Heaviest Wheel Loads (ATHWLD)
- H. Percent Tandem Axles in the ATHWLD
- I. One Directional cumulative 18 KSA at the end of the 20 years/30years
- J. Slab Thickness (8" unless otherwise specified): ______
- K. Structural Number (3 unless otherwise specified): ______

RECEIVED
JAN 11 2016
BY TPP

☒ 2. Vehicle classification for environmental studies (Air and Noise Analysis).

☒ 3. Line diagram analysis (straight line turning movements; please provide line diagram).

☐ 4. Complete Corridor Analysis (includes basic highway traffic data for pavement design, environmental studies and detailed schematic turning movements; *please provide detailed schematic*).

Note: If complete corridor analysis is requested, please attach a traffic schematic diagram.

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 Main Lanes Only (Existing)	Date for Memorandum	6/6/2016
Rd Type	FM	District	Austin
		County	Williamson
Project Limits	From FM 972	CSJ	0015-08-142
	To Bud Stockton Loop	Analyst	GAC

Date: Request	1/11/2016	Received	1/11/2016	Started		Completed	5/30/2016
District Contact	Carmen Ramos			Phone #	512-832-7075		

	Year	ADT's		% Trks ADT	% Trks DHV
Count	2014	68435		**17.0**	**12.8**
Base	2020	**78225**	# Trks	**13298**	
Forecast	2040	**109450**			
Forecast	2050	**123150**			

SPR Station	S-245	MC Stn	HP 877	% Trks	15.2
Year	2014	Dir	N&S	Num Trks	14782
Peak Hour	10.7	Year	2014	Axle Factor	2.82
DD	52	ADT	97326	% Single Axles	0.45
100-DD	**48**				
K-Factor	9.8				

Main Road Growth Rate	2.4	TDM Assignment	
Growth Rate after 20 Years	2.0		
20 Year Growth Factor	**1.996**		
30 Year Growth Factor	**1.914**	LOD	99999
Design Period 1	20		
Design Period 2	30		

				# Lanes	
Structural Number (SN)	3			Existing	6
Slab Thickness (ST)	8			Proposed	6

Past Projects	
Project	I-35
From	South of RM 2243
To	North of RM 2243
Date	3/11/2016
County	Williamson
CSJ	0015-09-185

	T. Log (2013)		
ADT	64722	61678	61841
% Growth Rate	2.00	2.80	4.50
K-Factor	10.1	10.1	10.1
DD	0.50	0.50	0.50
% Trucks ADT	23.6	23.8	24.4
% Trucks DHV	10.6	10.7	11.0
MC Station	MS-197	MS-197	MS-197
SPR Station	S-197	S-197	S-197

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	X
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet			

NOTES:

Project was revised on March 28, 2016. District requested additional ramps and schematics were revised from original request.

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

● FHWA Format

Light Duty Vehicles	Motorcycles	278
	Passenger	63382
	Pickup or Van	18884
Single Units	Buses	238
	Other 2 Axle	2269
	3 Axles	693
	4 Axles or more	152
Truck Combs.	3-4 Axles	117
	5 Axles	10823
	6 Axles or more	127
Semi-Trailer-Trailer	5 Axles or less	312
	6 Axles	49
	7 Axles or more	2

○ Texas 6 Format

Light Duty Vehicles	Passenger	
	Panel & Pickup	
Single Units	Buses	
	Other 2 Axle	
	3 Axle	
	4 Axle or More	
Truck Combs.	3 Axle	
	4 Axle	
	5 Axle	
	6 Axle or more	
Semi-Trailer-Trailer	5 Axle	
	6 Axle	
	7 Axle or more	

FHWA Format Data

	Number	%
Light	82544	84.8
Medium	2565	2.6
Heavy	12217	12.6
Trucks	14782	15.2

SECTION 1

FM

	ADT	DHV
Light	83.0	87.2
Medium	2.9	2.2
Heavy	14.1	10.6

Total Vehicles	97326
Total Trucks	14782
Total Singles	18863.5
Total Tandems	22856.5
AXLE FACTOR	2.82
SINGLE AX FACT	0.45

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	20	20				
Year 2	40	50				
ADT	78225	78225				
% Trks	17.0	17.0				
Growth Rate	1.996	1.914				
Years	20	30				
Facil Type	C	C				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.82	2.82				
Single Axle	0.45	0.45				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	13200	13300				
% T in ATHWLD	30	30				
FLEXIBLE	60091000	96711000				
RIGID	86014000	138433000				

Corridor Analysis Worksheet: 2 Sections, 2 Forecast Years, Air & Noise

Project	I-35 Frontage Roads Only (Existing)	Date for Memorandum	6/6/2016
Rd Type	FM	District	Austin
Limits	From FM 972 to Bud Stockton Loop	County	Williamson
Section 1	From FM 972	CSJ	0015-08-142
Limits	To on and off ramps west of Ronald Reagan Blvd	Analyst	GAC
Section 2	From on and off ramps west of Ronald Reagan Blvd		
Limits	To Bud Stockton Loop		

Date: Request 1/11/2016 Received 1/11/2016 Started Completed 5/30/2016

District Contact Carmen Ramos Phone # 512-832-7075

	Year	ADT's	
Count	2014	1855	6749
Base	2020	2200	7750
Forecast	2040	3000	10850
Forecast	2050	3400	12175

	% Trks ADT		% Trks DHV	
	3.9	4.3	2.9	3.2
# Trks	86	333		

SPR Station	S-245	MC Stn	MS-190FR	% Trks	3.80
Year	2014	Dir	N&S	Num Trks	1987
Peak Hour	10.7	Year	2014	Axle Factor	2.50
DD	52	ADT	52806	% Single Axles	0.58
100-DD	48				
K-Factor	9.8				

TDM Assignment N/A

Main Road Growth Rate		2.4				
Growth Rate after 20 Years		2.0			LOD	
20 Year G.F.	Sectn 1	1.818	Sectn 2	2.000	Design Period	20
30 Year G.F.	Sectn 1	1.818	Sectn 2	1.903	Design Period	30

	# Lanes
Existing	6
Proposed	6

Structural Number (SN)	3
Slab Thickness (ST)	8

Past Projects

Project	I-35
From	South of RM 2243
To	North of RM 2243
Date	3/11/2016
County	Williamson
CSJ	0015-09-185

T. Log

ADT	64722	61678	61841
% Growth Rate	2.00	2.80	4.50
K-Factor	10.1	10.1	10.1
DD	0.50	0.50	0.50
% Trucks ADT	23.6	23.8	24.4
% Trucks DHV	10.6	10.7	11.0
MC Station	MS-197	MS-197	MS-197
SPR Station	S-197	S-197	S-197

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	X
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet			

NOTES:

Project was revised on March 28, 2016. District requested additional ramps and schematics were revised from original request.

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8			
Section	Section 1		Section 2	
Des. Yr.	1st Yr	2nd Yr	1st Yr	2nd Yr
Year 1	20	20	20	20
Year 2	40	50	40	50
ADT	2200	2200	7750	7750
% Trks	3.9	3.9	4.3	4.3
GR	1.818	1.818	2.000	1.903
Years	20	30	20	30
FacilType	C	C	C	C
S.N.	3	3	3	3
SLAB	8	8	8	8
WeightSta	0	0	0	0
A.F.	2.50	2.50	2.50	2.50
S.A.	0.58	0.58	0.58	0.58

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

● FHWA Format			○ Texas 6 Format		
Light Duty Vehicles	Motorcycles	246	Light Duty Vehicles	Passenger	
	Passenger	42234		Panel & Pickup	
	Pickup or Van	8339	Single Units	Buses	
Single Units	Buses	64		Other 2 Axle	
	Other 2 Axle	629		3 Axle	
	3 Axles	288		4 Axle or More	
	4 Axles or more	45	Truck Combs.	3 Axle	
Truck Combs.	3-4 Axles	86		4 Axle	
	5 Axles	839		5 Axle	
	6 Axles or more	23		6 Axle or more	
Semi-Trailer-Trailer	5 Axles or less	8	Semi-Trailer-Trailer	5 Axle	
	6 Axles	4		6 Axle	
	7 Axles or more	1		7 Axle or more	

FHWA Format Data

	Number	%
Light	50819	96.2
Medium	736	1.4
Heavy	1251	2.4
Trucks	1987	3.8

SECTION 1

FM

	ADT	DHV
Light	96.1	97.1
Medium	1.4	1.1
Heavy	2.5	1.8

SECTION 2

FM

	ADT	DHV
Light	95.7	96.8
Medium	1.6	1.2
Heavy	2.7	2

Total Vehicles	52806
Total Trucks	1987
Total Singles	2855.0
Total Tandems	2106.0
AXLE FACTOR	2.5
SINGLE AX FACT	0.58

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST				
Section				
Design Year				
Year 1				
Year 2				
ADT				
% Trks				
Growth Rate				
Years				
Facil Type				
S.N.				
SLAB				
WeightSta				
Axle Factor				
Single Axle				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8							
Section	Section 1		Section 2					
Design Year	1st Yr	2nd Yr	1st Yr	2nd Yr				
ATHWLD	9800	9900	10800	10800				
%T in ATHWLD	70	70	60	60				
FLEXIBLE	309000	499000	1217000	1955000				
RIGID	413000	668000	1629000	2618000				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST				
Section				
Design Year				
ATHWLD				
% T in ATHWLD				
FLEXIBLE				
RIGID				

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 Main Lanes Only (Proposed)	Date for Memorandum	6/6/2016
Rd Type	FM	District	Austin
		County	Williamson
Project Limits	From FM 972	CSJ	0015-08-142
	To Bud Stockton Loop	Analyst	GAC

Date: Request 1/11/2016 Received 1/11/2016 Started Completed 5/30/2016

District Contact Carmen Ramos Phone # 512-832-7075

	Year	ADT's
Count	2014	68435
Base	2020	**78275**
Forecast	2040	**109450**
Forecast	2050	**123175**

% Trks ADT **17.0**

Trks **13307**

% Trks DHV **12.8**

SPR Station	S-245	MC Stn	HP 877	% Trks	15.2
Year	2014	Dir	N&S	Num Trks	14782
Peak Hour	10.7	Year	2014	Axle Factor	2.82
DD	52	ADT	97326	% Single Axles	0.45
100-DD	**48**				
K-Factor	9.8				

Main Road Growth Rate	2.4
Growth Rate after 20 Years	2.0
20 Year Growth Factor	**1.991**
30 Year Growth Factor	**1.912**
Design Period 1	20
Design Period 2	30

TDM Assignment

LOD 99999

	# Lanes
Existing	6
Proposed	6

Structural Number (SN)	3
Slab Thickness (ST)	8

	Past Projects
Project	I-35
From	South of RM 2243
To	North of RM 2243
Date	3/11/2016
County	Williamson
CSJ	0015-09-185

	T. Log (2013)		
ADT	64722	61678	61841
% Growth Rate	2.00	2.80	4.50
K-Factor	10.1	10.1	10.1
DD	0.50	0.50	0.50
% Trucks ADT	23.6	23.8	24.4
% Trucks DHV	10.6	10.7	11.0
MC Station	MS-197	MS-197	MS-197
SPR Station	S-197	S-197	S-197

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	X
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet			

NOTES:

Project was revised on March 28, 2016. District requested additional ramps and schematics were revised from original request.

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

● FHWA Format		
Light Duty Vehicles	Motorcycles	278
	Passenger	63382
	Pickup or Van	18884
Single Units	Buses	238
	Other 2 Axle	2269
	3 Axles	693
	4 Axles or more	152
Truck Combs.	3-4 Axles	117
	5 Axles	10823
	6 Axles or more	127
Semi-Trailer-Trailer	5 Axles or less	312
	6 Axles	49
	7 Axles or more	2

○ Texas 6 Format		
Light Duty Vehicles	Passenger	
	Panel & Pickup	
Single Units	Buses	
	Other 2 Axle	
	3 Axle	
	4 Axle or More	
Truck Combs.	3 Axle	
	4 Axle	
	5 Axle	
	6 Axle or more	
Semi-Trailer-Trailer	5 Axle	
	6 Axle	
	7 Axle or more	

FHWA Format Data

	Number	%
Light	82544	84.8
Medium	2565	2.6
Heavy	12217	12.6
Trucks	14782	15.2

SECTION 1

FM

	ADT	DHV
Light	83.0	87.2
Medium	2.9	2.2
Heavy	14.1	10.6

Total Vehicles	97326
Total Trucks	14782
Total Singles	18863.5
Total Tandems	22856.5
AXLE FACTOR	2.82
SINGLE AX FACT	0.45

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8					
Design Periods	1	2				
Year 1	20	20				
Year 2	40	50				
ADT	78275	78275				
% Trks	17.0	17.0				
Growth Rate	1.991	1.912				
Years	20	30				
Facil Type	C	C				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.82	2.82				
Single Axle	0.45	0.45				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	13200	13300				
% T in ATHWLD	30	30				
FLEXIBLE	60104000	96750000				
RIGID	86033000	138489000				

Corridor Analysis Worksheet: 2 Sections, 2 Forecast Years, Air & Noise

Project: I-35 Frontage Roads Only (Proposed)
Rd Type: FM
Limits: From FM 972 to Bud Stockton Loop
Section 1 Limits: From FM 972
To on and off ramps east of CR 143
Section 2 Limits: From on and off ramps east of CR 143
To Bud Stockton Loop

Date for Memorandum: 6/6/2016
District: Austin
County: Williamson
CSJ: 0015-08-142
Analyst: GAC

Date: Request: 1/11/2016 Received: 1/11/2016 Started: Completed: 5/30/2016
District Contact: Carmen Ramos Phone #: 512-832-7075

	Year	ADT's			% Trks ADT		% Trks DHV	
Count	2014	1855	6732		3.9	4.3	2.9	3.2
Base	2020	2150	7675	# Trks	84	330		
Forecast	2040	3000	10775					
Forecast	2050	3400	12150					

SPR Station	S-245	MC Stn	MS-190FR	% Trks	3.80
Year	2014	Dir	N&S	Num Trks	1987
Peak Hour	10.7	Year	2014	Axle Factor	2.50
DD	52	ADT	52806	% Single Axles	0.58
100-DD	48				
K-Factor	9.8				

TDM Assignment: N/A
LOD:

Main Road Growth Rate		2.4				
Growth Rate after 20 Years		2.0				
20 Year G.F.	Sectn 1	1.977	Sectn 2	2.020	Design Period	20
30 Year G.F.	Sectn 1	1.938	Sectn 2	1.944	Design Period	30

Structural Number (SN)	3				
Slab Thickness (ST)	8				

# Lanes	
Existing	6
Proposed	6

Past Projects

Project	I-35
From	South of RM 2243
To	North of RM 2243
Date	3/11/2016
County	Williamson
CSJ	0015-09-185

T. Log

ADT	64722	61678	61841
% Growth Rate	2.00	2.80	4.50
K-Factor	10.1	10.1	10.1
DD	0.50	0.50	0.50
% Trucks ADT	23.6	23.8	24.4
% Trucks DHV	10.6	10.7	11.0
MC Station	MS-197	MS-197	MS-197
SPR Station	S-197	S-197	S-197

Items Done on This Project

Straight Line Turning Movements		Detailed Schematic Turning Movements	X
Traffic Analysis for Highway Design	X	Field Trip	
Vehicle Mix	X	Travel Demand Model Used	
Manual Count Worksheet			

NOTES:

Project was revised on March 28, 2016. District requested additional ramps and schematics were revised from original request.

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8			
Section	Section 1		Section 2	
Des. Yr.	1st Yr	2nd Yr	1st Yr	2nd Yr
Year 1	20	20	20	20
Year 2	40	50	40	50
ADT	2150	2150	7675	7675
% Trks	3.9	3.9	4.3	4.3
GR	1.977	1.938	2.020	1.944
Years	20	30	20	30
FacilType	C	C	C	C
S.N.	3	3	3	3
SLAB	8	8	8	8
WeightSta	0	0	0	0
A.F.	2.50	2.50	2.50	2.50
S.A.	0.58	0.58	0.58	0.58

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

● FHWA Format			○ Texas 6 Format		
Light Duty Vehicles	Motorcycles	246	**Light Duty Vehicles**	Passenger	
	Passenger	42234		Panel & Pickup	
	Pickup or Van	8339	**Single Units**	Buses	
Single Units	Buses	64		Other 2 Axle	
	Other 2 Axle	629		3 Axle	
	3 Axles	288		4 Axle or More	
	4 Axles or more	45	**Truck Combs.**	3 Axle	
Truck Combs.	3-4 Axles	86		4 Axle	
	5 Axles	839		5 Axle	
	6 Axles or more	23		6 Axle or more	
Semi-Trailer-Trailer	5 Axles or less	8	**Semi-Trailer-Trailer**	5 Axle	
	6 Axles	4		6 Axle	
	7 Axles or more	1		7 Axle or more	

FHWA Format Data

	Number	%
Light	50819	96.2
Medium	736	1.4
Heavy	1251	2.4
Trucks	1987	3.8

SECTION 1

FM

	ADT	DHV
Light	96.1	97.1
Medium	1.4	1.1
Heavy	2.5	1.8

SECTION 2

FM

	ADT	DHV
Light	95.7	96.8
Medium	1.6	1.2
Heavy	2.7	2

Total Vehicles	52806
Total Trucks	1987
Total Singles	2855.0
Total Tandems	2106.0
AXLE FACTOR	2.5
SINGLE AX FACT	0.58

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST				
Section				
Design Year				
Year 1				
Year 2				
ADT				
% Trks				
Growth Rate				
Years				
Facil Type				
S.N.				
SLAB				
WeightSta				
Axle Factor				
Single Axle				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8							
Section	Section 1		Section 2					
Design Year	1st Yr	2nd Yr	1st Yr	2nd Yr				
ATHWLD	9800	9900	10800	10800				
%T in ATHWLD	70	70	60	60				
FLEXIBLE	306000	495000	1207000	1946000				
RIGID	410000	662000	1616000	2605000				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST				
Section				
Design Year				
ATHWLD				
% T in ATHWLD				
FLEXIBLE				
RIGID				

TRAFFIC VOLUME REGRESSION WORKSHEET

May 11, 2016

PROJECT: I35
LIMITS: From FM 972
To Bud Stockton Loop

District: Austin
County: Williamson
CSJ: 0015-08-142

ROUTE	I35	I35	I35	I35								
LOCATION	H3	H3A	SP245	H5								
1994	36000			33000								
1995	38000			36000								
1996	39000			38000								
1997	41000			39000								
1998	44000			42000								
1999	46000			44000								
2000	50000			47000								
2001	51000		49000	48000								
2002	54000		51000	50000								
2003	53000		50000	48000								
2004	54000		42000	40000								
2005	55020		43020	40330								
2006	54000		43000	40000								
2007	51000		54000	55000								
2008	59000		56000	57000								
2009	61000		58000	58000								
2010	62000		60000	59000								
2011	63000		57000	60000								
2012	63000	61000	61000	61000								
2013	64722	63465	61678	61841								
2014	73904	69760	68872	69918								
	Regr01	Regr02	Regr03	Regr04	Regr05	Regr06	Regr07	Regr08	Regr09	Regr10	Regr11	Regr12
Low Linear Annual Growth Rate	1.4%	-4.7%	1.0%	1.3%								
Forecast Lnr. An. Grwth Rate	2.3% ☐	6.3% ☐	2.4% ☑	2.3% ☐	☐	☐	☐	☐	☐	☐	☐	☐
High Linear Annual Growth Rate	3.1%	17.4%	3.9%	3.3%								
Estimated Standard Deviation	2597.98	1105.63	4582.07	4638.64								
B (Slope)	1641	4380	1564	1478								
A (Intercept)	37573	60362	43731	34129								
R=	0.965	0.970	0.819	0.892								
Confidence Interval	+/- 90% CI 501	+/- 90% CI 7616	+/- 90% CI [illegible]	+/- 90% CI [illegible]								
	Avg. of selected Forecast Linear Annual Growth Rates:					2.4%	Avg. of all Forecast Linear Annual Growth Rates:				3.3%	
GR's for Non-Regression vol's only												

PROJECTIONS OF ABOVE TRAFFIC VOLUME DATA TO FORECASTED YEARS

Use last Count Year from above. ☑

Do not use last Count Year from above. ☐
Enter any one of previous count years from above. 2012

Enter Base Year 2020

Pivot Growth Rate at 20 Years from Count Year (most commonly used). ☑

Pivot Growth Rate (GR) at other than 20 Years from Count Year. ☐
Enter years from Count Year for pivoting Growth Rate (e.g. for pivoting growth ten years from Count Year, enter 10) 10

Enter Model Year 2035

Optional Input: SPR Station, Yr
Optional Input: K-Factor
Optional Input: Dir. Dist.

Enter Earliest Variable Year 2040
Enter Latest Variable Year 2050

Pre-20/Pivot Yr Growth Rates Selection

Use Relative Low & Non-Regression GR's	○	
Use Relative Frcst & Non-Regression GR's	○	
Use Relative High & Non-Regression GR's	○	
Use Avg. of Selected Low Growth Rates	○	1.0%
Use Avg. of Selected Forecast Growth Rates	●	2.4%
Use Avg. of Selected High Growth Rates	○	3.9%
Use Avg. of All Low Growth Rates	○	-0.3%
Use Avg. of All Forecast Growth Rates	○	3.3%
Use Avg. of All High Growth Rates	○	6.9%
Use Highest Forecast Growth Rate	○	6.3%
Use Lowest Forecast Growth Rate	○	2.3%
Use Manually Selected Growth Rate	○	2.0%

Post-20/Pivot Year Growth Rate Note: If Pre-20/Pivot Yr GR is 2.0% or less, that rate is used in the projections, not the rate below.
Enter Growth Rate (2.0% most common) 2.0%

ROUTE	I35	I35	I35	I35								
LOCATION	H3	H3A	SP245	H5								
20/PIVOT YR AN. GROWTH RATE	2.4%	2.4%	2.4%	2.4%								
Count Year - 2014	73904	69760	68872	69918								
Base Year - 2020	84500	79800	78800	80000								
Ten Year Forecast - 2030	102300	96500	95300	96800								
Twenty Year Forecast - 2040	118200	111600	110200	111900								
Thirty Year Forecast - 2050	133000	125600	124000	125900								
Forty Year Forecast - 2060	147800	139500	137700	139800								
GR Pivot Year Forecast - 2034	109400	103200	101900	103500								
Earliest Var Yr Frcst - 2040	118200	111600	110200	111900								
Latest Var Yr Frcst - 2050	133000	125600	124000	125900								
Model Year Forecast - 2035												
Model Traffic Assignment												
Difference of Model Yr Forecast from Model Traffic Assignment												
Above Difference in DDHV												
% Difference of Model Yr Forecast from Model Traffic Assignment												

File

Texas
Department
of Transportation

MEMO

May 23, 2016

To: Greg Malatek, P.E., District Engineer
Lorena Echeverria De Misi, P.E., Director of TPD

Through: William E. Knowles, P.E.
Traffic Analysis Section Director, TPP

From: Robert C. Williams
Transportation Analyst, TPP

Subject: Traffic Data
CSJ: 0015-08-144
I-35 Proposed: (Mainlanes and Frontage Roads, separate)
From SH 29
To NE Inner Loop
Williamson County

Attached are copies of schematics depicting 2020, 2040 and 2050 anticipated average daily traffic volumes and turning movements along I-35. Also attached are tabulations showing traffic analysis for highway design for the 2020 to 2040 twenty year period and 2020 to 2050 thirty year period for the described limits of the route. Included are tabulations showing data for use in air and noise analysis.

Due to differences in traffic volumes this project was separated into two sections for both main lanes and frontage roads.

Section 1: From SH 29 to Williams Drive
Section 2: From Williams Drive to Northeast Inner Loop

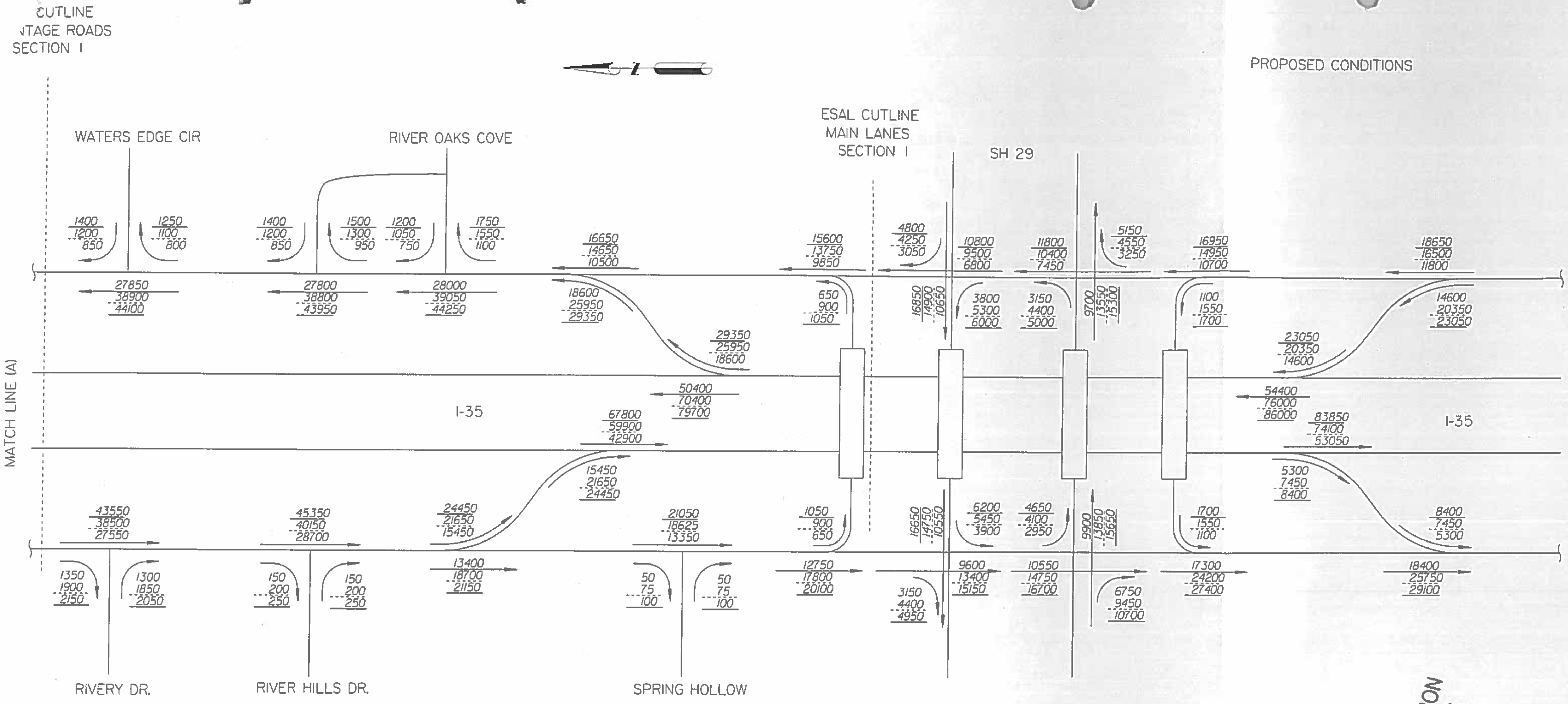
Please refer to your original memorandum dated September 29, 2015.

If you have any questions or need additional information, please contact Robert C. Williams at (512) 486-5145.

Attachments

CC: Carmen Ramos, Planner, Austin District
Design Division

PROPOSED CONDITIONS



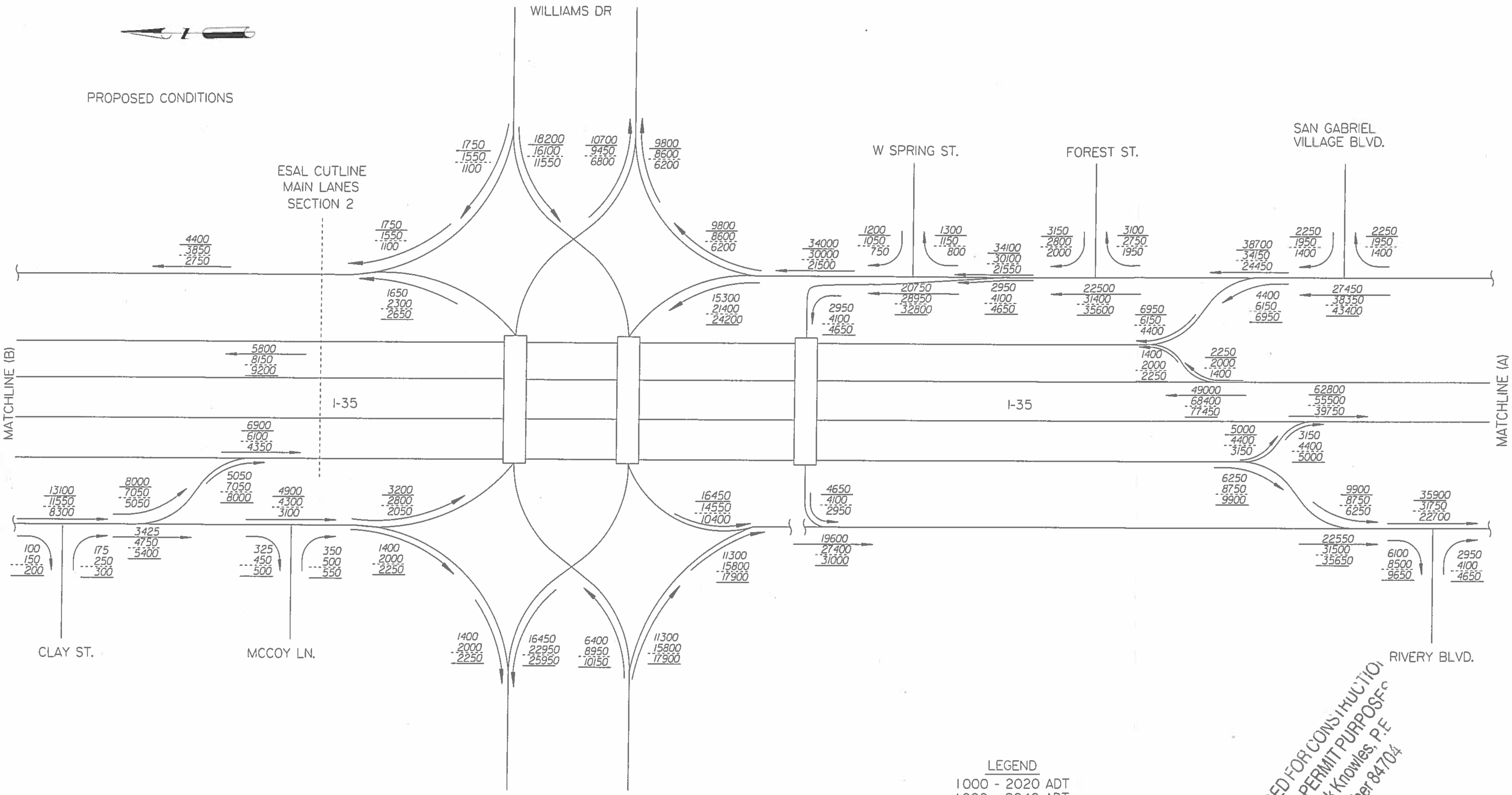
LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040 AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG I-35 FROM SH 29 TO NORTHEAST INNER LOOP
WILLIAMSON COUNTY

TRANSPORTATION PLANNING AND PROGRAMMING DIVISION
APRIL 23, 2016

OT INTENDED FOR CONSTRUCTION
IDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84704

SHEET 1 OF 4



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040 AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG I-35 FROM SH 29 TO NORTHEAST INNER LOOP
WILLIAMSON COUNTY

TRANSPORTATION PLANNING AND PROGRAMMING DIVISION
APRIL 23, 2016

NOT INTENDED FOR CONSTRUCTIO
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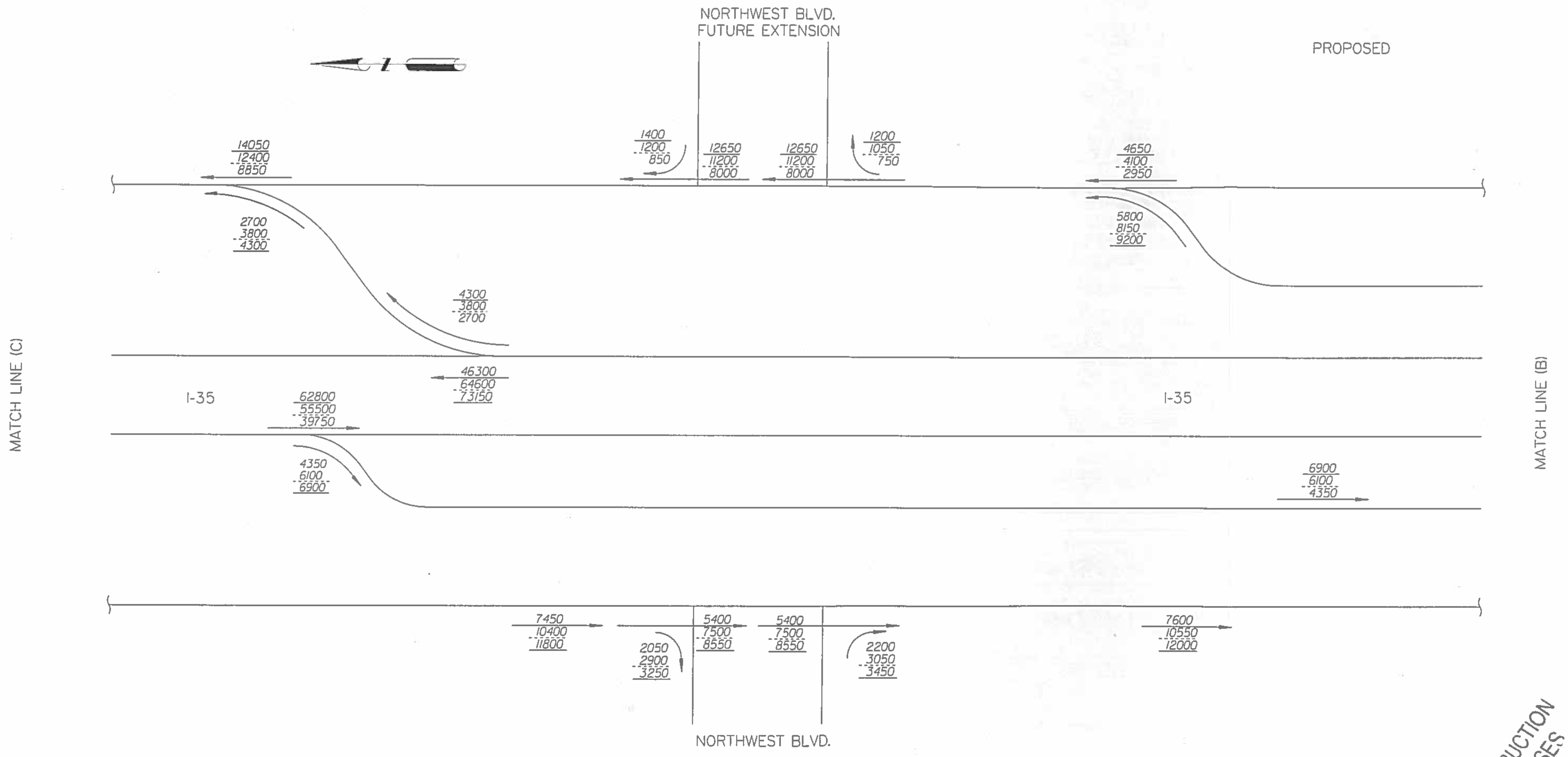

LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040 AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG I-35 FROM SH 29 TO NORTHEAST INNER LOOP
WILLIAMSON COUNTY

TRANSPORTATION PLANNING AND PROGRAMMING DIVISION
APRIL 23, 2016

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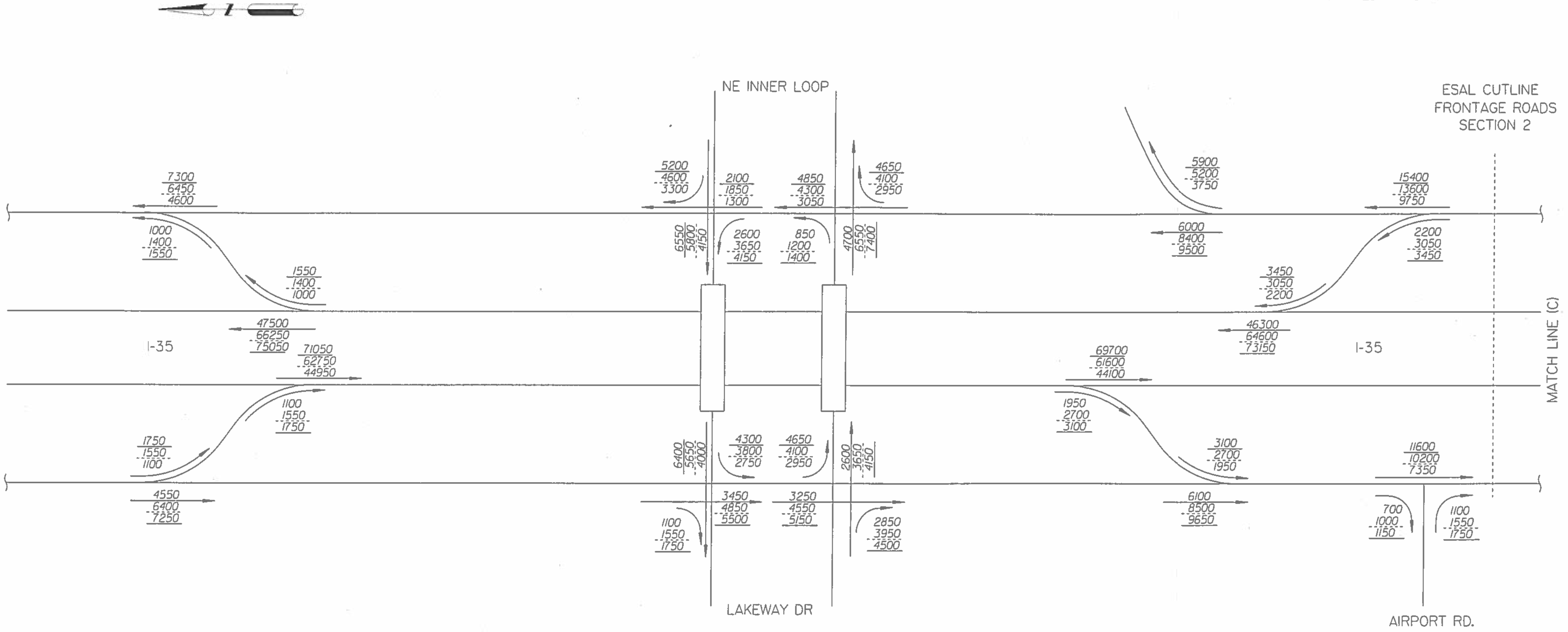
William Erick Knowles, P.E.
Serial Number 84704

SHEET 3 OF 4

PROPOSED CONDITIONS



LEGEND
1000 - 2020 ADT
1000 - 2040 ADT
1000 - 2050 ADT

2020, 2040 AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG I-35 FROM SH 29 TO NORTHEAST INNER LOOP
WILLIAMSON COUNTY

TRANSPORTATION PLANNING AND PROGRAMMING DIVISION
APRIL 23, 2016

NOT INTENDED FOR CONSTRUCTION
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William Erick Knowles, P.E.
Serial Number 84704

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District **May 20, 2016**

Description of Location	Average Daily Traffic 2020	Average Daily Traffic 2040	Base Year Dir Dist %	Base Year K Factor	Base Year Percent Trucks ADT	Base Year Percent Trucks DHV	ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040) Flexible Pavement	S N	Rigid Pavement	SLAB
I-35 Main Lanes Only Section 1 From SH 29 To Williams Drive Williamson County	127,350	177,900	56 - 44	10.0	12.8	5.8	13,400	30	75,238,000	3	107,634,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year % of ADT	Base Year % of DHV
Light Duty	87.2	94.2
Medium Duty	1.7	0.8
Heavy Duty	11.1	5.0

Description of Location	Average Daily Traffic 2020	Average Daily Traffic 2050	Base Year Dir Dist %	Base Year K Factor	Base Year Percent Trucks ADT	Base Year Percent Trucks DHV	ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050) Flexible Pavement	S N	Rigid Pavement	SLAB
I-35 Main Lanes Only Section 1 From SH 29 To Williams Drive Williamson County	127,350	201,300	56 - 44	10.0	12.8	5.8	13,500	30	121,511,000	3	173,831,000	8"

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E.
Serial Number 84704

[redacted]

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District **May 20, 2016**

	Base Year								Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
Description of Location	Average Daily Traffic 2020	Average Daily Traffic 2040	Dir Dist %	K Factor	Percent Trucks ADT	Percent Trucks DHV	ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	SN	Rigid Pavement	SLAB
I-35 Main Lanes Only Section 2 From Williams Drive To Northeast Inner Loop Williamson County	103,950	145,200	56 - 44	10.0	14.1	6.3	13,300	30	67,616,000	3	96,752,000	8"

Data for Use in Air & Noise Analysis

	Base Year	
Vehicle Class	**% of ADT**	**% of DHV**
Light Duty	85.9	93.7
Medium Duty	1.9	0.9
Heavy Duty	12.2	5.4

	Base Year								Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
Description of Location	Average Daily Traffic 2020	Average Daily Traffic 2050	Dir Dist %	K Factor	Percent Trucks ADT	Percent Trucks DHV	ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	SN	Rigid Pavement	SLAB
I-35 Main Lanes Only Section 2 From Williams Drive To Northeast Inner Loop Williamson County	103,950	164,350	56 - 44	10.0	14.1	6.3	13,400	30	109,223,000	3	156,288,000	8"

NOT INTENDED FOR CONSTRUCTIC
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William Erick Knowles, P.F
Serial Number 84704

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

May 20, 2016

			Base Year						Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
Description of Location	Average Daily Traffic		Dir Dist	K	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2040	%	Factor	ADT	DHV						
<u>I-35 Frontage Roads Only</u> <u>Section 1</u> From SH 29 To Williams Drive Williamson County	57,600	80,500	56 - 44	10.0	3.6	2.7	11,900	40	7,590,000	3	10,145,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year	
	% of ADT	% of DHV
Light Duty	96.4	97.3
Medium Duty	1.3	1.0
Heavy Duty	2.3	1.7

			Base Year						Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
Description of Location	Average Daily Traffic		Dir Dist	K	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2050	%	Factor	ADT	DHV						
<u>I-35 Frontage Roads Only</u> <u>Section 1</u> From SH 29 To Williams Drive Williamson County	57,600	91,200	56 - 44	10.0	3.6	2.7	12,000	40	12,267,000	3	16,396,000	8"

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E
Serial Number 84704

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

May 20, 2016

			Base Year						Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
Description of Location	Average Daily Traffic		Dir Dist	K	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2040	%	Factor	ADT	DHV						
I-35 Frontage Roads Only Section 2 From Williams Drive To Northeast Inner Loop Williamson County	20,400	28,400	56 - 44	10.0	5.2	3.9	11,400	50	3,849,000	3	5,162,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year % of ADT	Base Year % of DHV
Light Duty	94.8	96.1
Medium Duty	1.9	1.4
Heavy Duty	3.3	2.5

			Base Year						Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
Description of Location	Average Daily Traffic		Dir Dist	K	Percent Trucks		ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2050	%	Factor	ADT	DHV						
I-35 Frontage Roads Only Section 2 From Williams Drive To Northeast Inner Loop Williamson County	20,400	32,200	56 - 44	10.0	5.2	3.9	11,500	50	6,224,000	3	8,345,000	8"

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E
Serial Number 84704

Texas
Department
of Transportation

MEMO

December 22, 2015

To: James R. Williams, P.E.
Advanced Project Development

From: Carmen Ramos
Austin District

Subject: Traffic Request

County:	Williamson
CSJ:	0015-08-144
Highway:	I-35 (Mainlanes and Frontage Roads, separate)
Limits:	From SH 29 to NE Inner Loop

Attached please find the traffic analysis you requested on September 24, 2015, for the above referenced project.

Please feel free to contact me at (512) 832-7075 if you should have any questions or need additional information.

ATTACHMENTS

CC: Advanced Transportation Planning

Corridor Analysis Worksheet: 2 Sections, 2 Forecast Years, Air & Noise

Project	I-35 Main Lanes Only	Date for Memorandum	5/19/2016
Rd Type	IH	District	Austin
Limits	From SH 29 to Northeast Inner Loop	County	Williamson
Section 1	From SH 29	CSJ	0015-08-144
Limits	To Williams Drive	Analyst	RCW
Section 2	From Williams Drive		
Limits	To Northeast Inner Loop		

Date: Request	5/16/2016	Received	5/16/2016	Started	5/17/2016	Completed	5/17/2016
District Contact	Carmen Ramos			Phone #	512-832-7075		

	Year	ADT's			% Trks ADT		% Trks DHV	
Count	2016	117056	95580		12.8	14.1	5.8	6.3
Base	2020	127350	103950	# Trks	16301	14657		
Forecast	2040	177900	145200					
Forecast	2050	201300	164350					

SPR Station	S-245	MC Stn	Hp-877	% Trks	14.10
Year	2013	Dir	1&5	Num Trks	14554
Peak Hour	11.4	Year	2013	Axle Factor	2.88
DD	56	ADT	103014	% Single Axles	0.45
100-DD	44				
K-Factor	10.0			TDM Assignment	N/A

Main Road Growth Rate		2.2			
Growth Rate after 20 Years		2.0		LOD	99999
20 Year G.F.	Sectn 1	1.985	Sectn 2 1.984	Design Period	20
30 Year G.F.	Sectn 1	1.936	Sectn 2 1.937	Design Period	30

Structural Number (SN)	3	Existing # Lanes	6
Slab Thickness (ST)	8	Proposed # Lanes	6

Past Projects

Project	I-35
From	Williams Dr
To	Lakeway
Date	10/20/2013
County	Williamson
CSJ	914-05-0149

T. Log

ADT			
% Growth Rate			
K-Factor			
DD			
% Trucks ADT			
% Trucks DHV			
MC Station			
SPR Station			

Items Done on This Project

Straight Line Turning Movements	Yes	Detailed Schematic Turning Movements	No
Traffic Analysis for Highway Design	Yes	Field Trip	No
Vehicle Mix	Yes	Travel Demand Model Used	No
Manual Count Worksheet	Yes		

NOTES:

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8			
Section	Section 1		Section 2	
Des. Yr.	1st Yr	2nd Yr	1st Yr	2nd Yr
Year 1	20	20	20	20
Year 2	40	50	40	50
ADT	127350	127350	103950	103950
% Trks	12.8	12.8	14.1	14.1
GR	1.985	1.936	1.984	1.937
Years	20	30	20	30
FacilType	A	A	A	A
S.N.	3	3	3	3
SLAB	8	8	8	8
WeightSta	99999	99999	99999	99999
A.F.	2.88	2.88	2.88	2.88
S.A.	0.45	0.45	0.45	0.45

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

● FHWA Format			○ Texas 6 Format		
Light Duty Vehicles	Motorcycles	386	Light Duty Vehicles	Passenger	
	Passenger	70646		Panel & Pickup	
	Pickup or Van	17428	Single Units	Buses	
Single Units	Buses	199		Other 2 Axle	
	Other 2 Axle	1570		3 Axle	
	3 Axles	864		4 Axle or More	
	4 Axles or more	94	Truck Combs.	3 Axle	
Truck Combs.	3-4 Axles	392		4 Axle	
	5 Axles	10767		5 Axle	
	6 Axles or more	174		6 Axle or more	
Semi-Trailer-Trailer	5 Axles or less	290	Semi-Trailer-Trailer	5 Axle	
	6 Axles	204		6 Axle	
	7 Axles or more	0		7 Axle or more	

FHWA Format Data

	Number	%
Light	88460	85.9
Medium	1965	1.9
Heavy	12589	12.2
Trucks	14554	14.1

SECTION 1
IH

	ADT	DHV
Light	87.2	94.2
Medium	1.7	0.8
Heavy	11.1	5

SECTION 2
IH

	ADT	DHV
Light	85.9	93.7
Medium	1.9	0.9
Heavy	12.2	5.4

Total Vehicles	103014
Total Trucks	14554
Total Singles	18683.0
Total Tandems	23240.0
AXLE FACTOR	2.88
SINGLE AX FACT	0.45

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST				
Section				
Design Year				
Year 1				
Year 2				
ADT				
% Trks				
Growth Rate				
Years				
Facil Type				
S.N.				
SLAB				
WeightSta				
Axle Factor				
Single Axle				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8							
Section	Section 1		Section 2					
Design Year	1st Yr	2nd Yr	1st Yr	2nd Yr				
ATHWLD	13400	13500	13300	13400				
%T in ATHWLD	30	30	30	30				
FLEXIBLE	75238000	121511000	67616000	109223000				
RIGID	1.08E+08	173831000	96752000	156288000				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST				
Section				
Design Year				
ATHWLD				
% T in ATHWLD				
FLEXIBLE				
RIGID				

Corridor Analysis Worksheet: 2 Sections, 2 Forecast Years, Air & Noise

Project	I-35 Frontage Roads Only	Date for Memorandum	5/19/2016
Rd Type	FM	District	Austin
Limits	From SH 29 to Northeast Inner Loop	County	Williamson
Section 1	From SH 29	CSJ	0015-08-144
Limits	To Williams Drive	Analyst	RCW
Section 2	From Williams Drive		
Limits	To Northeast Inner Loop		

Date:	Request	5/16/2016	Received	5/16/2016	Started	5/17/2016	Completed 5/17/2016
	District Contact	Carmen Ramos			Phone #	512-832-7075	

	Year	ADT's			% Trks ADT		% Trks DHV	
					3.6	5.2	2.7	3.9
Count	2016	52981	18677	# Trks	2074	1061		
Base	2020	57600	20400					
Forecast	2040	80500	28400					
Forecast	2050	91200	32200					

SPR Station	S-245	MC Stn	MS-190	% Trks	3.80
Year	2013	Dir	1&5	Num Trks	1987
Peak Hour	11.4	Year	2014	Axle Factor	2.50
DD	56	ADT	52806	% Single Axles	0.58
100-DD	44				
K-Factor	10.0			TDM Assignment	N/A

Main Road Growth Rate		2.2			
Growth Rate after 20 Years		2.0		LOD	99999
20 Year G.F.	Sectn 1	1.988	Sectn 2 1.961	Design Period	20
30 Year G.F.	Sectn 1	1.944	Sectn 2 1.928	Design Period	30

	# Lanes
Existing	4
Proposed	4

Structural Number (SN)	3		
Slab Thickness (ST)	8		

T. Log			
ADT			
% Growth Rate			
K-Factor			
DD			
% Trucks ADT			
% Trucks DHV			
MC Station			
SPR Station			

Past Projects	
Project	I-35
From	Williams Dr
To	Lakeway
Date	10/20/2013
County	Williamson
CSJ	914-05-0149

Items Done on This Project

Straight Line Turning Movements	Yes	Detailed Schematic Turning Movements	No
Traffic Analysis for Highway Design	Yes	Field Trip	No
Vehicle Mix	Yes	Travel Demand Model Used	No
Manual Count Worksheet	Yes		

NOTES:

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST	3, 8			
Section	Section 1		Section 2	
Des. Yr.	1st Yr	2nd Yr	1st Yr	2nd Yr
Year 1	20	20	20	20
Year 2	40	50	40	50
ADT	57600	57600	20400	20400
% Trks	3.6	3.6	5.2	5.2
GR	1.988	1.944	1.961	1.928
Years	20	30	20	30
FacilType	C	C	C	C
S.N.	3	3	3	3
SLAB	8	8	8	8
WeightSta	99999	99999	99999	99999
A.F.	2.50	2.50	2.50	2.50
S.A.	0.58	0.58	0.58	0.58

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

	● FHWA Format			○ Texas 6 Format	
Light Duty Vehicles	Motorcycles	246	Light Duty Vehicles	Passenger	
	Passenger	42234		Panel & Pickup	
	Pickup or Van	8339	Single Units	Buses	
Single Units	Buses	64		Other 2 Axle	
	Other 2 Axle	629		3 Axle	
	3 Axles	288		4 Axle or More	
	4 Axles or more	45	Truck Combs.	3 Axle	
Truck Combs.	3-4 Axles	86		4 Axle	
	5 Axles	839		5 Axle	
	6 Axles or more	23		6 Axle or more	
Semi-Trailer-Trailer	5 Axles or less	8	Semi-Trailer-Trailer	5 Axle	
	6 Axles	4		6 Axle	
	7 Axles or more	1		7 Axle or more	

FHWA Format Data

	Number	%
Light	50819	96.2
Medium	736	1.4
Heavy	1251	2.4
Trucks	1987	3.8

SECTION 1

FM

	ADT	DHV
Light	96.4	97.3
Medium	1.3	1
Heavy	2.3	1.7

SECTION 2

FM

	ADT	DHV
Light	94.8	96.1
Medium	1.9	1.4
Heavy	3.3	2.5

Total Vehicles	52806
Total Trucks	1987
Total Singles	2855.0
Total Tandems	2106.0
AXLE FACTOR	2.5
SINGLE AX FACT	0.58

INPUT DATA FOR KIPS: AUTOMATIC

SN, ST				
Section				
Design Year				
Year 1				
Year 2				
ADT				
% Trks				
Growth Rate				
Years				
Facil Type				
S.N.				
SLAB				
WeightSta				
Axle Factor				
Single Axle				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8							
Section	Section 1		Section 2					
Design Year	1st Yr	2nd Yr	1st Yr	2nd Yr				
ATHWLD	11900	12000	11400	11500				
%T in ATHWLD	40	40	50	50				
FLEXIBLE	7590000	12267000	3849000	6224000				
RIGID	10145000	16396000	5162000	8345000				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST				
Section				
Design Year				
ATHWLD				
% T in ATHWLD				
FLEXIBLE				
RIGID				

— File

Texas
Department
of Transportation

MEMO

May 23, 2016

To: Greg Malatek, P.E., District Engineer
Lorena Echeverria De Misi, P.E., Director of TPD

Through: William E. Knowles, P.E.
Traffic Analysis Section Director, TPP

From: Robert C. Williams
Transportation Analyst, TPP

Subject: Traffic Data
CSJ: 0015-08-144
I-35: (Frontage Roads)
From SH 29
To NE Inner Loop
Williamson County

Attached are tabulations showing traffic analysis for highway design for the 2020 to 2040 twenty year period and 2020 to 2050 thirty year period for the described limits of the route. Included is a tabulation showing data for use in air and noise analysis.

This data supersedes the information from the project provided to your office on December 22, 2015.

Please refer to your original memorandum dated September 29, 2015.

If you have any questions or need additional information, please contact Robert C. Williams at (512) 486-5145.

Attachment

CC: Carmen Ramos, Planner, Austin District
Design Division

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

May 19, 2016

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
	2020	2040	Dir Dist %	K Factor	Percent Trucks ADT	Percent Trucks DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
I-35 Frontage Roads Only From SH 29 To Northeast Inner Loop Williamson County	57,100	79,700	56 - 44	10.0	3.6	2.7	11,900	40	7,519,000	3	10,049,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year % of ADT	Base Year % of DHV
Light Duty	96.4	97.3
Medium Duty	1.3	1.0
Heavy Duty	2.3	1.7

Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
	2020	2050	Dir Dist %	K Factor	Percent Trucks ADT	Percent Trucks DHV			Flexible Pavement	S N	Rigid Pavement	SLAB
I-35 Frontage Roads Only From SH 29 To Northeast Inner Loop Williamson County	57,100	89,400	56 - 44	10.0	3.6	2.7	12,000	40	12,078,000	3	16,144,000	8"

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E
Serial Number 84704

Corridor Analysis Worksheet: 1 Section, 2 Forecast Years, Air & Noise

Project	I-35 Frontage Roads Only	Date for Memorandum	12/22/2015
Rd Type	FM	District	Austin
		County	Williamson
Project Limits	From SH 29 To Northeast Inner Loop	CSJ	0015-09-181
		Analyst	RCW

Date:	Request	9/29/2015	Received	10/1/2015	Started	12/17/2015	Completed 12/18/2015
	District Contact	Carmen Ramos			Phone #	512-832-7075	

	Year	ADT's
Count	2013	48600
Base	2020	57100
Forecast	2040	79700
Forecast	2050	89400

	% Trks ADT	% Trks DHV
	3.6	2.7
# Trks	2056	

SPR Station	S-245	MC Stn	MS-190	% Trks	3.8
Year	2013	Dir	1&5	Num Trks	1987
Peak Hour	11.4	Year	2014	Axle Factor	2.50
DD	56	ADT	52806	% Single Axles	0.58
100-DD	44				
K-Factor	10.0				

Main Road Growth Rate	2.5
Growth Rate after 20 Years	2.0
20 Year Growth Factor	1.979
30 Year Growth Factor	1.886
Design Period 1	20
Design Period 2	30

TDM Assignment: N/A

LOD: 99999

Structural Number (SN)	3		
Slab Thickness (ST)	8		

	# Lanes
Existing	4
Proposed	4

Past Projects	
Project	I-35
From	Williams Dr
To	Lakeway Dr
Date	10/20/2013
County	Williamson
CSJ	914-05-149

T. Log			
ADT			
% Growth Rate			
K-Factor			
DD			
% Trucks ADT			
% Trucks DHV			
MC Station			
SPR Station			

Items Done on This Project

Straight Line Turning Movements	Yes	Detailed Schematic Turning Movements	No
Traffic Analysis for Highway Design	Yes	Field Trip	No
Vehicle Mix	Yes	Travel Demand Model Used	No
Manual Count Worksheet	Yes		

NOTES:

2.5 growth rate used to maintain 30 yr growth rate lower than 20 yr growth rate
2.5 growth rate used to maintain consistent with previous project submittal this corridor analysis is
mainlanes only MS-190 For Frtg only South of Project
~~MS-197 in for frtg rdsonly s-245 is located north of project~~ s-245 used on this analysis
HP-877 located directly on project HP-877 used on this analysis
This project was base off a 2012 Ramp Book that had most of the AADT. Their were ramps that had
been revese and new frontage road on south side now,but not in 2012 .

Used Professional Judgement on this project. Have any questions see me.

DATA CALCULATIONS FOR USE IN AIR & NOISE ANALYSIS

	● FHWA Format	
Light Duty Vehicles	Motorcycles	246
	Passenger	42234
	Pickup or Van	8339
Single Units	Buses	64
	Other 2 Axle	629
	3 Axles	288
	4 Axles or more	45
Truck Combs.	3-4 Axles	86
	5 Axles	839
	6 Axles or more	23
Semi-Trailer-Trailer	5 Axles or less	8
	6 Axles	4
	7 Axles or more	1

	○ Texas 6 Format	
Light Duty Vehicles	Passenger	
	Panel & Pickup	
Single Units	Buses	
	Other 2 Axle	
	3 Axle	
	4 Axle or More	
Truck Combs.	3 Axle	
	4 Axle	
	5 Axle	
	6 Axle or more	
Semi-Trailer-Trailer	5 Axle	
	6 Axle	
	7 Axle or more	

FHWA Format Data

	Number	%
Light	50819	96.2
Medium	736	1.4
Heavy	1251	2.4
Trucks	1987	3.8

SECTION 1

FM

	ADT	DHV
Light	96.4	97.3
Medium	1.3	1.0
Heavy	2.3	1.7

Total Vehicles	52806
Total Trucks	1987
Total Singles	2855.0
Total Tandems	2106.0
AXLE FACTOR	2.50
SINGLE AX FACT	0.58

INPUT DATA FOR KIPS: AUTOMATIC

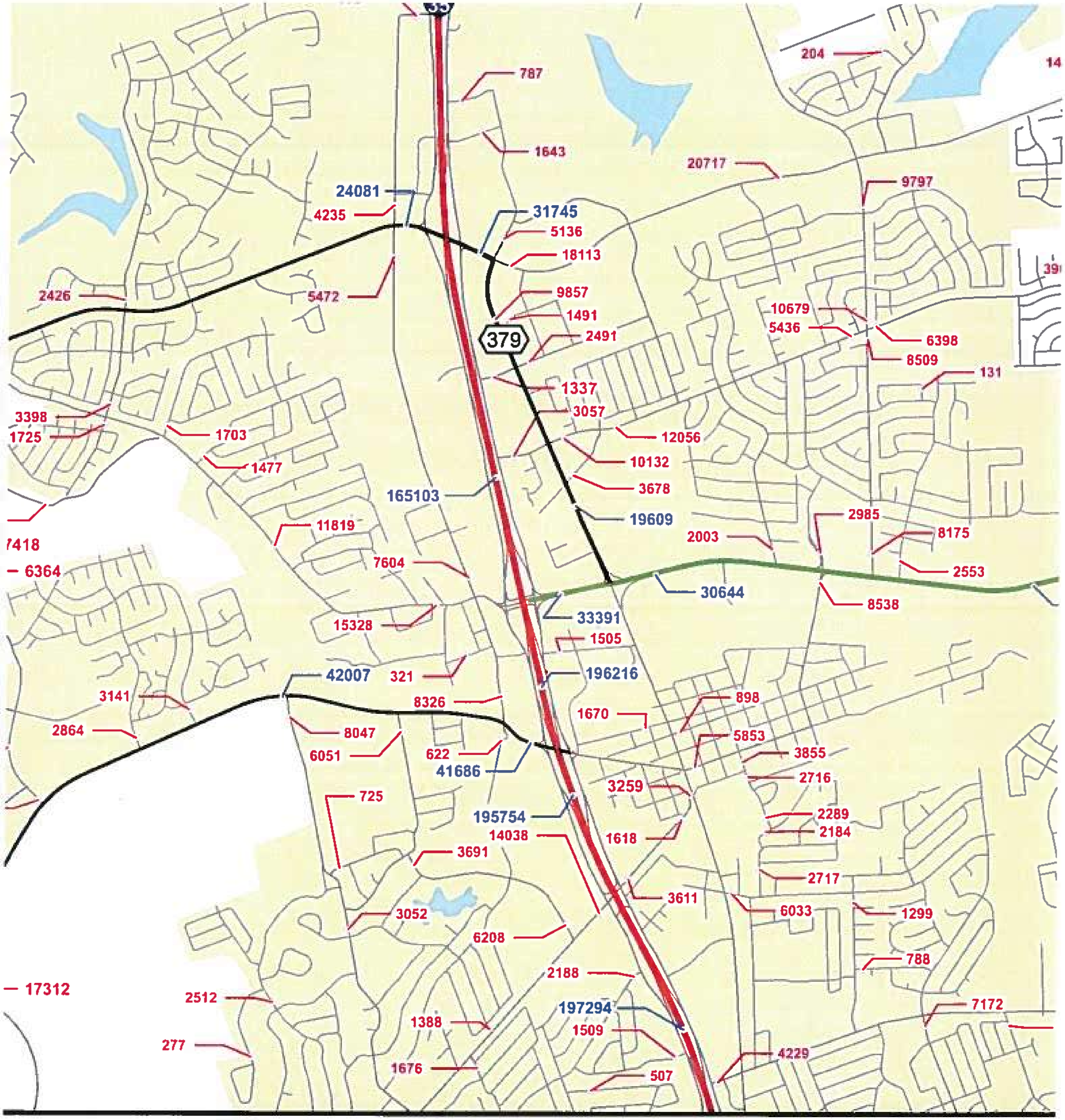
SN, ST	3, 8					
Design Periods	1	2				
Year 1	20	20				
Year 2	40	50				
ADT	57100	57100				
% Trks	3.6	3.6				
Growth Rate	1.979	1.886				
Years	20	30				
Facil Type	C	C				
S.N.	3	3				
SLAB	8	8				
Weight Sta	99999	99999				
Axle Factor	2.50	2.50				
Single Axle	0.58	0.58				

OUTPUT DATA FROM KIPS: ENTER FOR TAHD FORM

SN, ST	3, 8					
Design Periods	1	2				
ATHWLD	11900	12000				
% T in ATHWLD	40	40				
FLEXIBLE	7519000	12078000				
RIGID	10049000	16144000				

2015 Austin Urbans

Sheet 1 of 17



volumes set apart with an asterisk (*)
tolled mainlane volumes only.
volumes set apart with a double asterisk

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2015 AUSTIN URBAN

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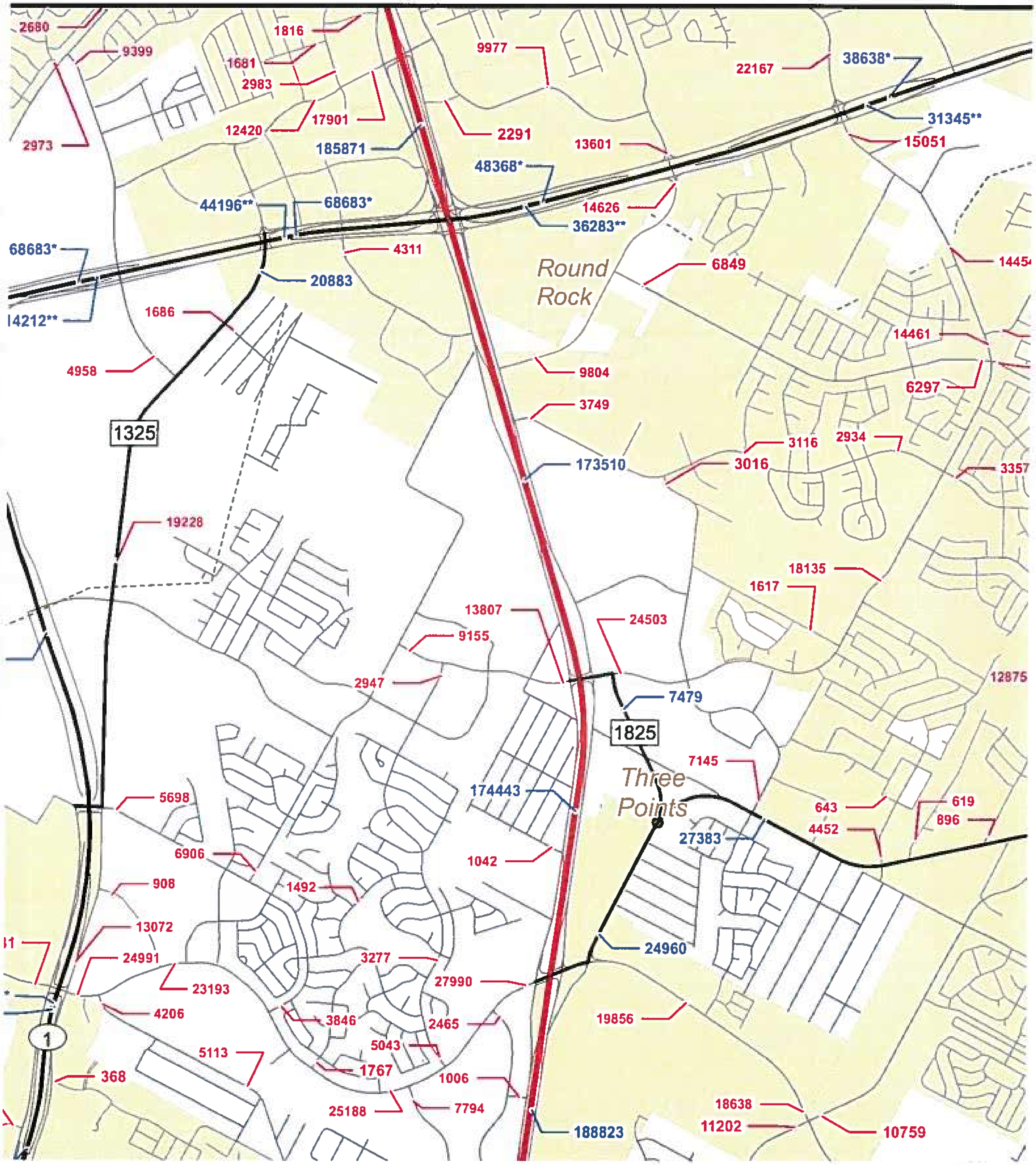
Texas Department of Tran

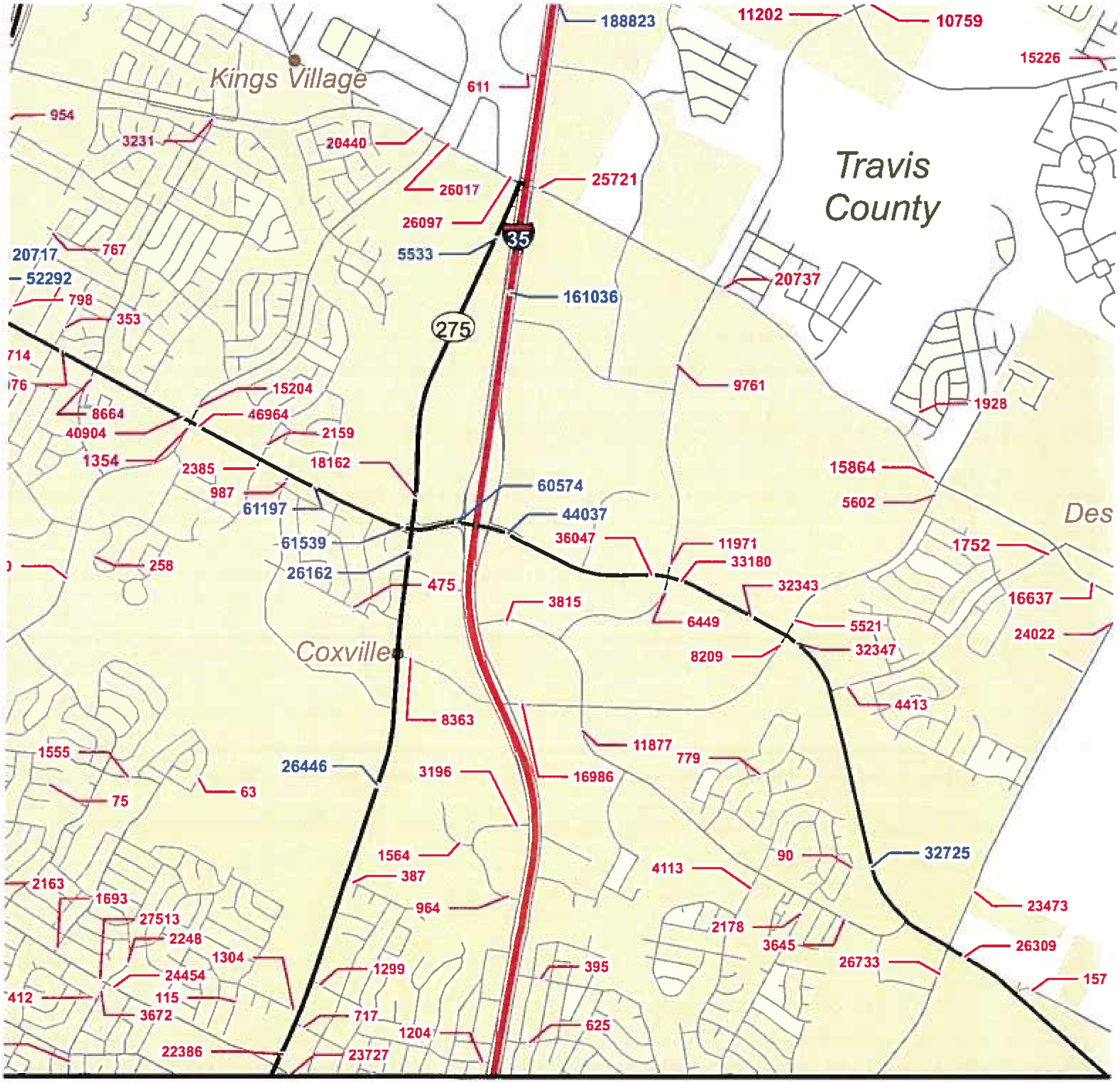
2015 Austin Urbans

Sheet 2 of 17



2015 Austin Urbans

Sheet 3 of 17



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2015 AUSTIN URBAN TRAFFIC MAP

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IN COOPERATION WITH THE

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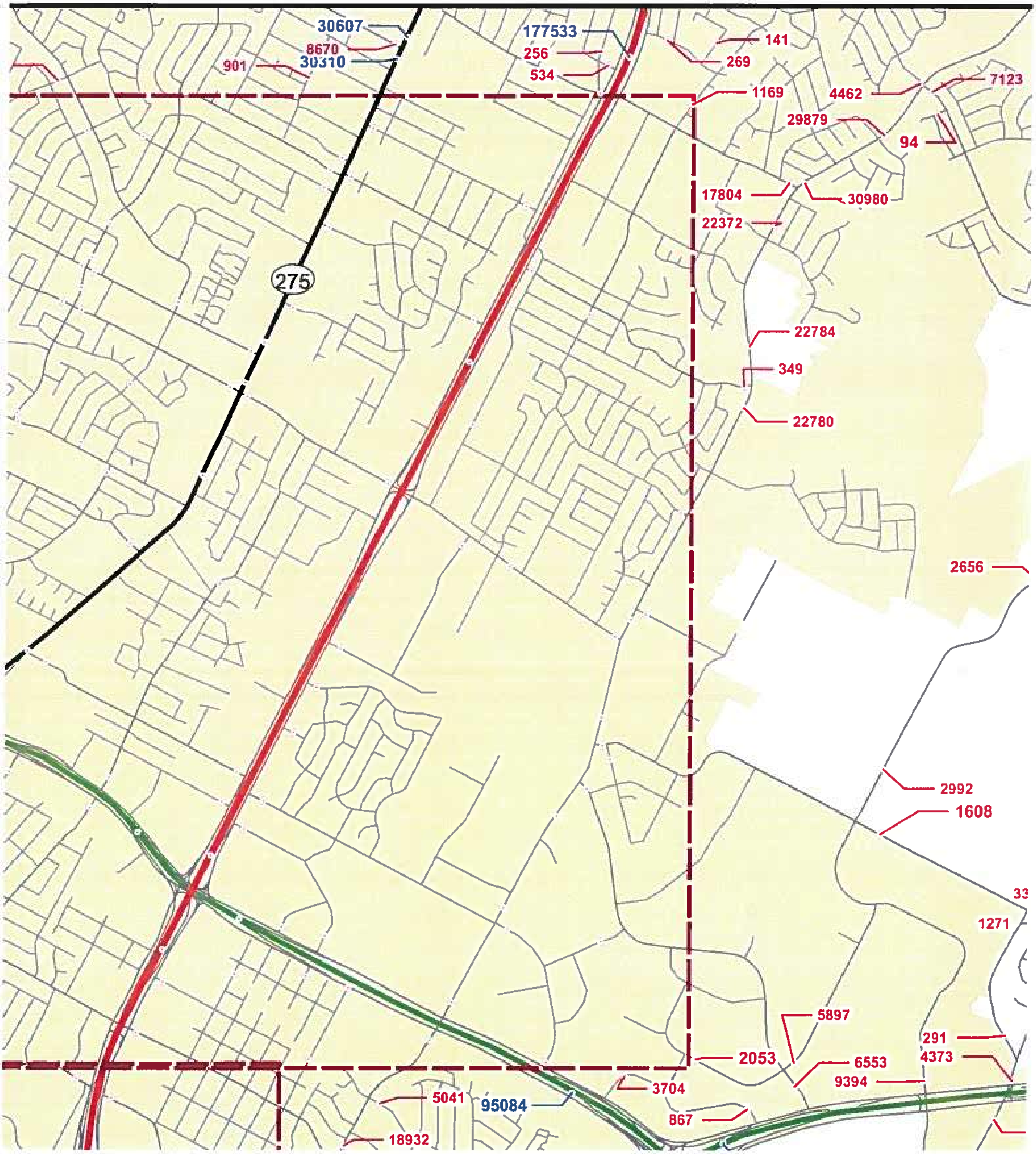
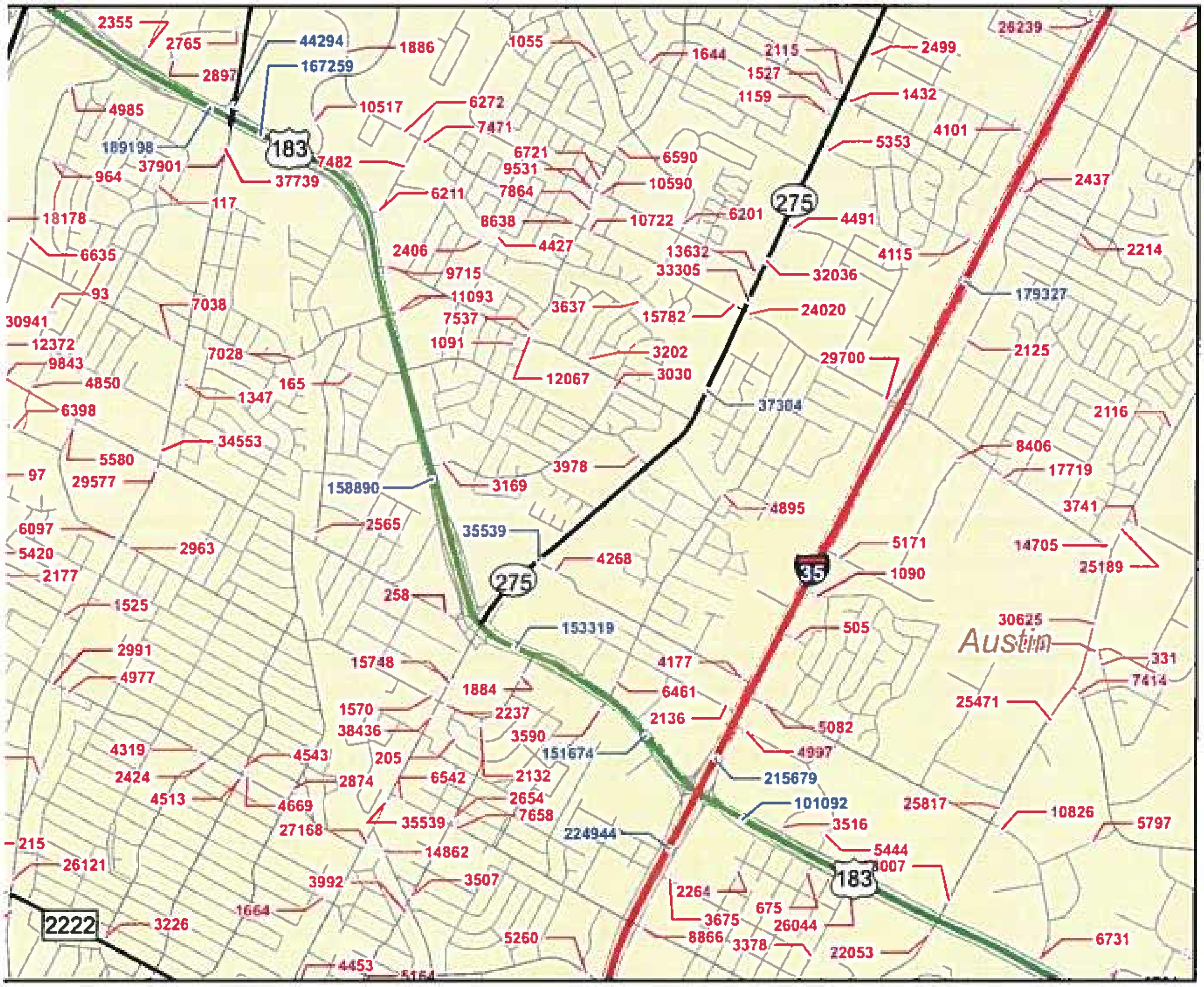
Sheet 4 of 17



2017 Austin Urbans

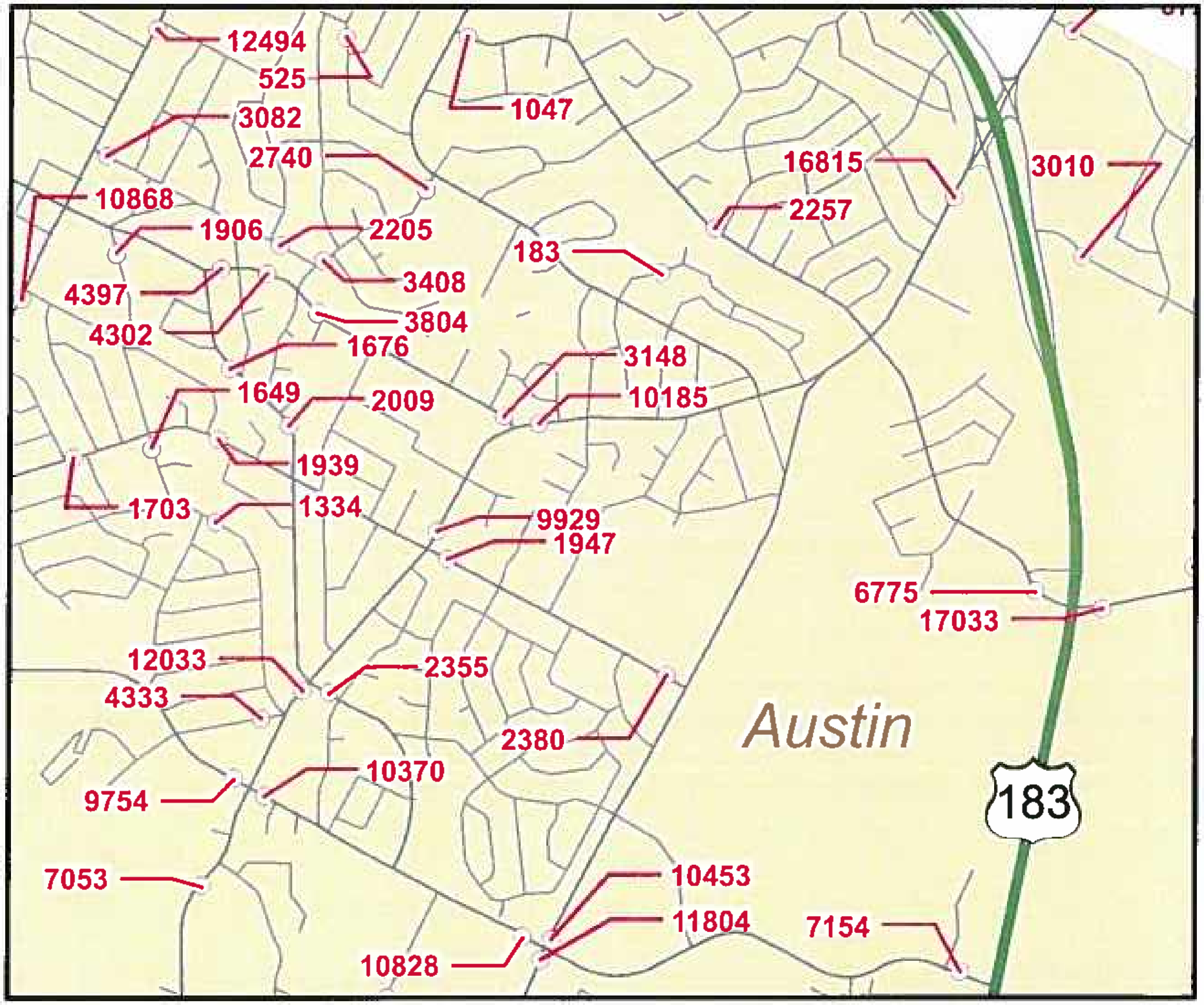
Sheet 5 of 17



North Austin (See Base Sheet 83)

2017 Austin Urbans

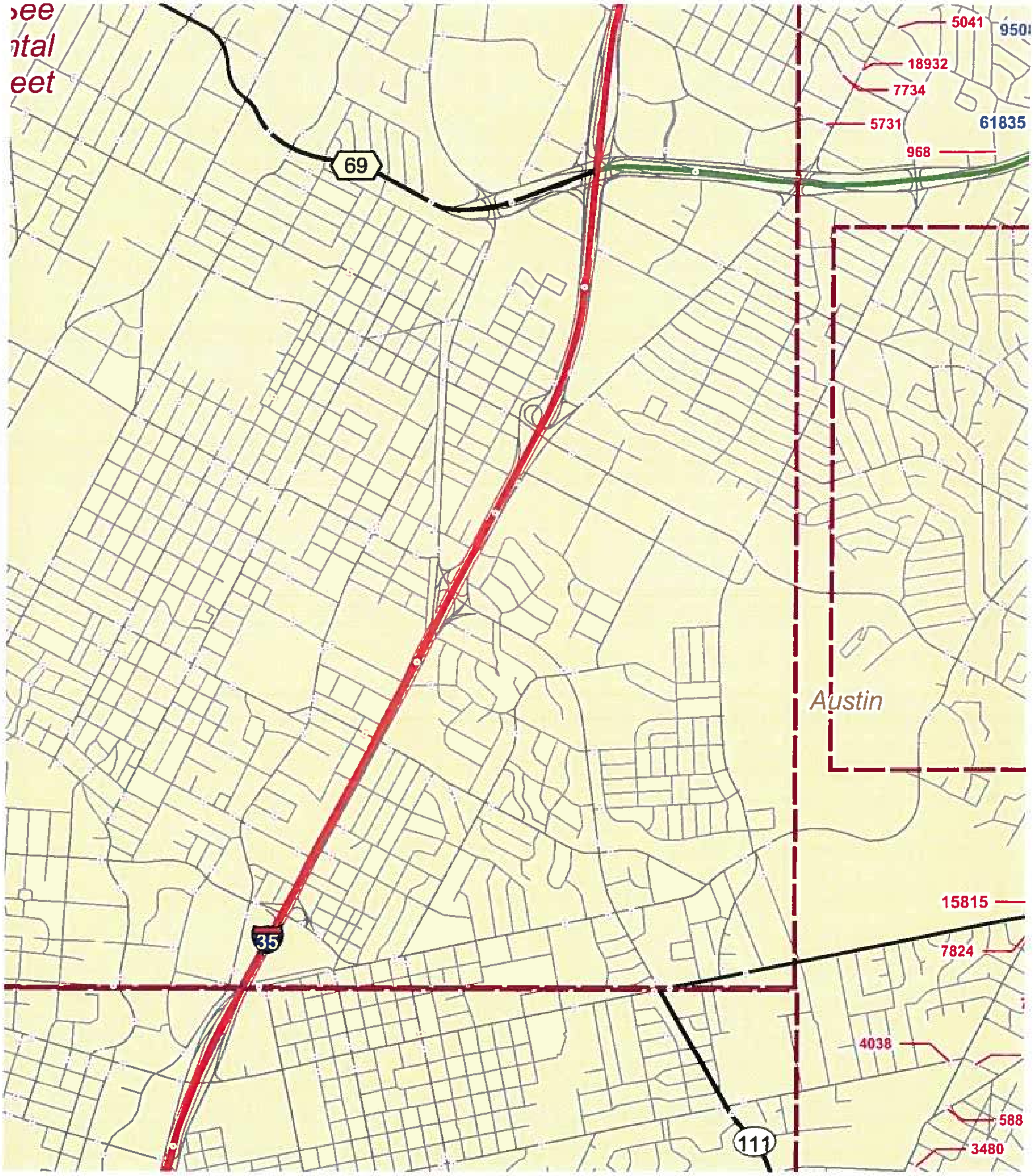
Sheet 6 of 17



Northeast Austin (See Base Sheet 83)

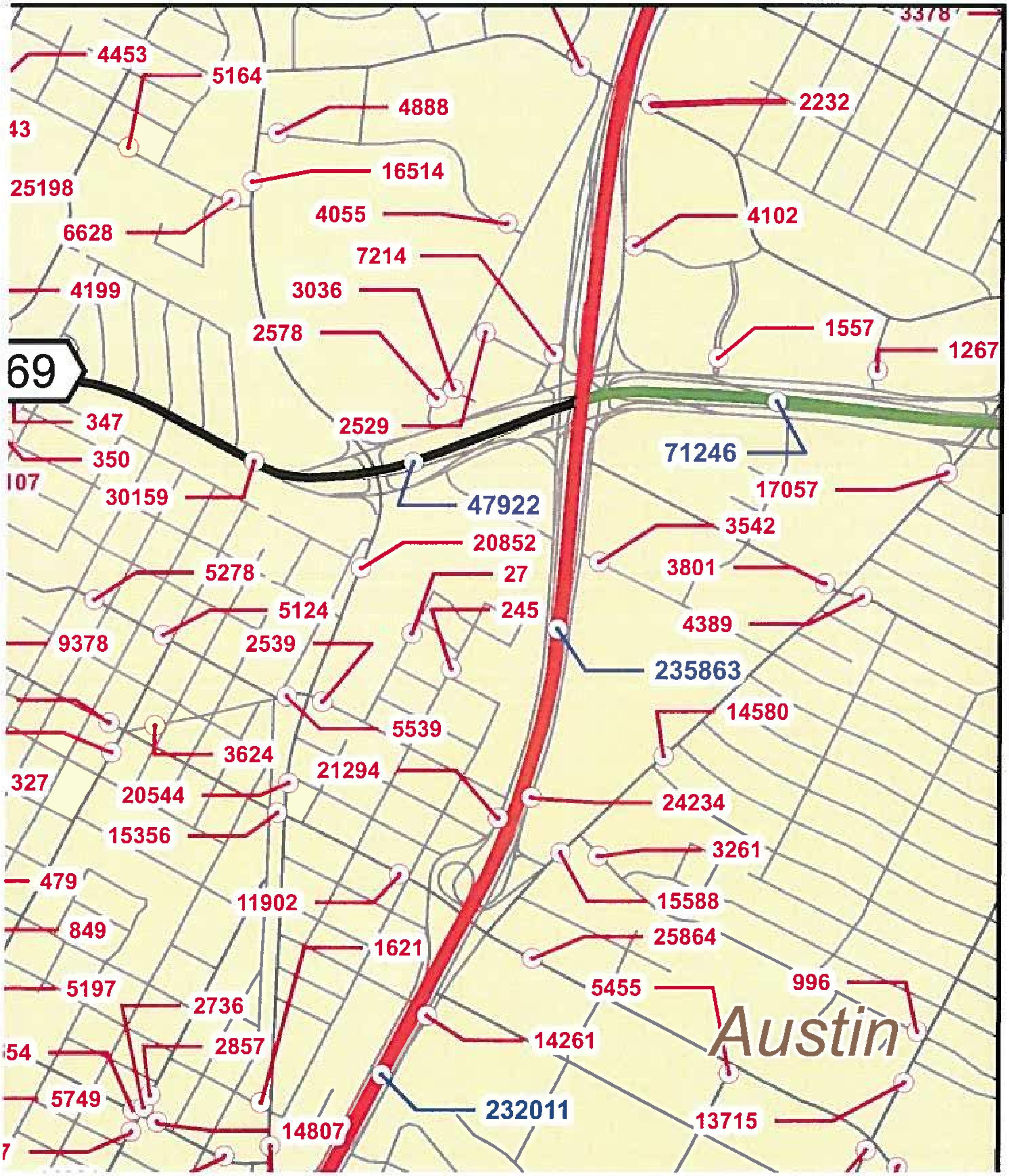
2015 Austin Urbans

Sheet 7 of 17

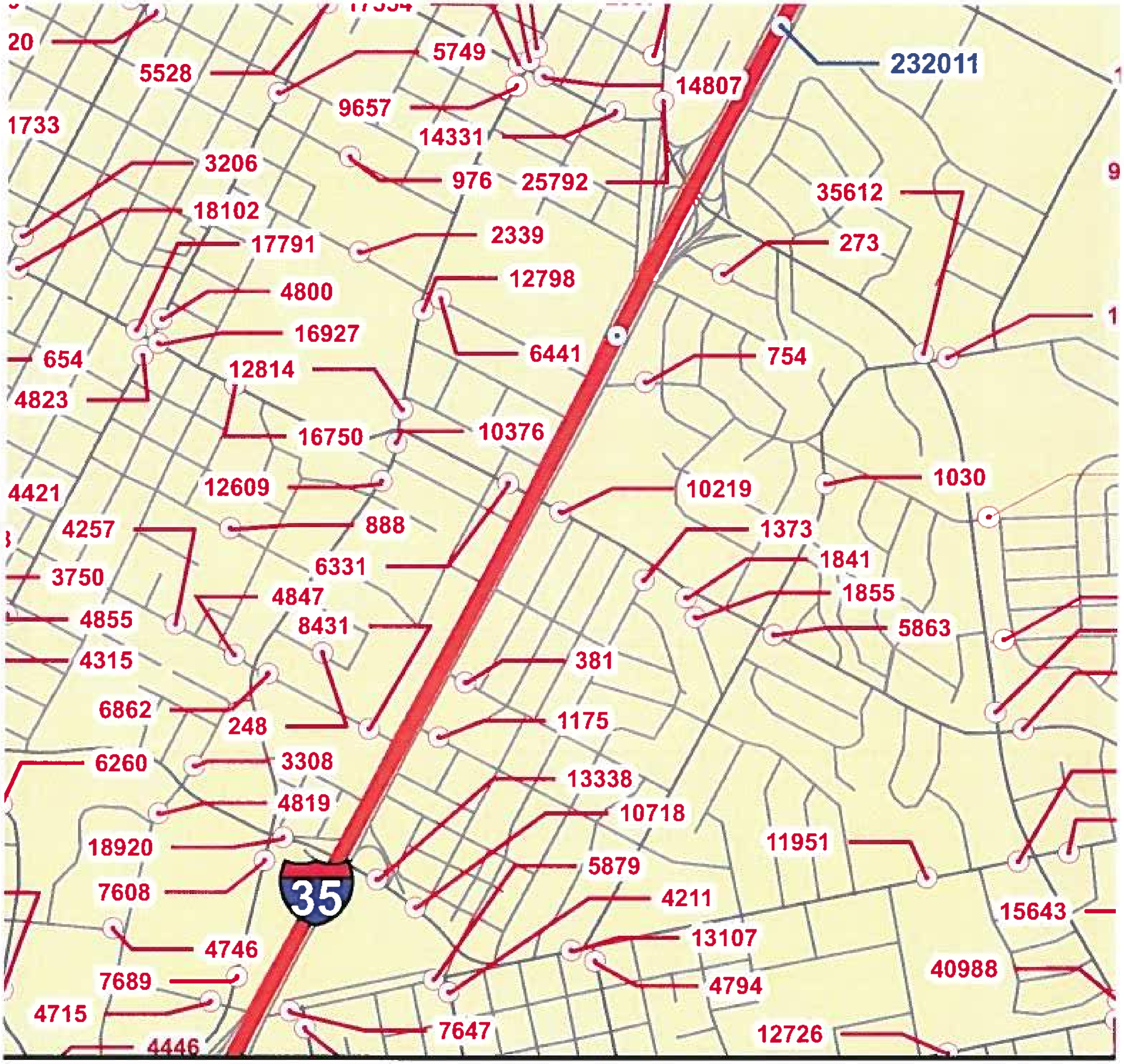


2015 Austin Urbans

Sheet 8 of 17



2015 Austin Urbans Sheet 9 of 17



ase Sheet 83)

TRAFFIC MAP

IE
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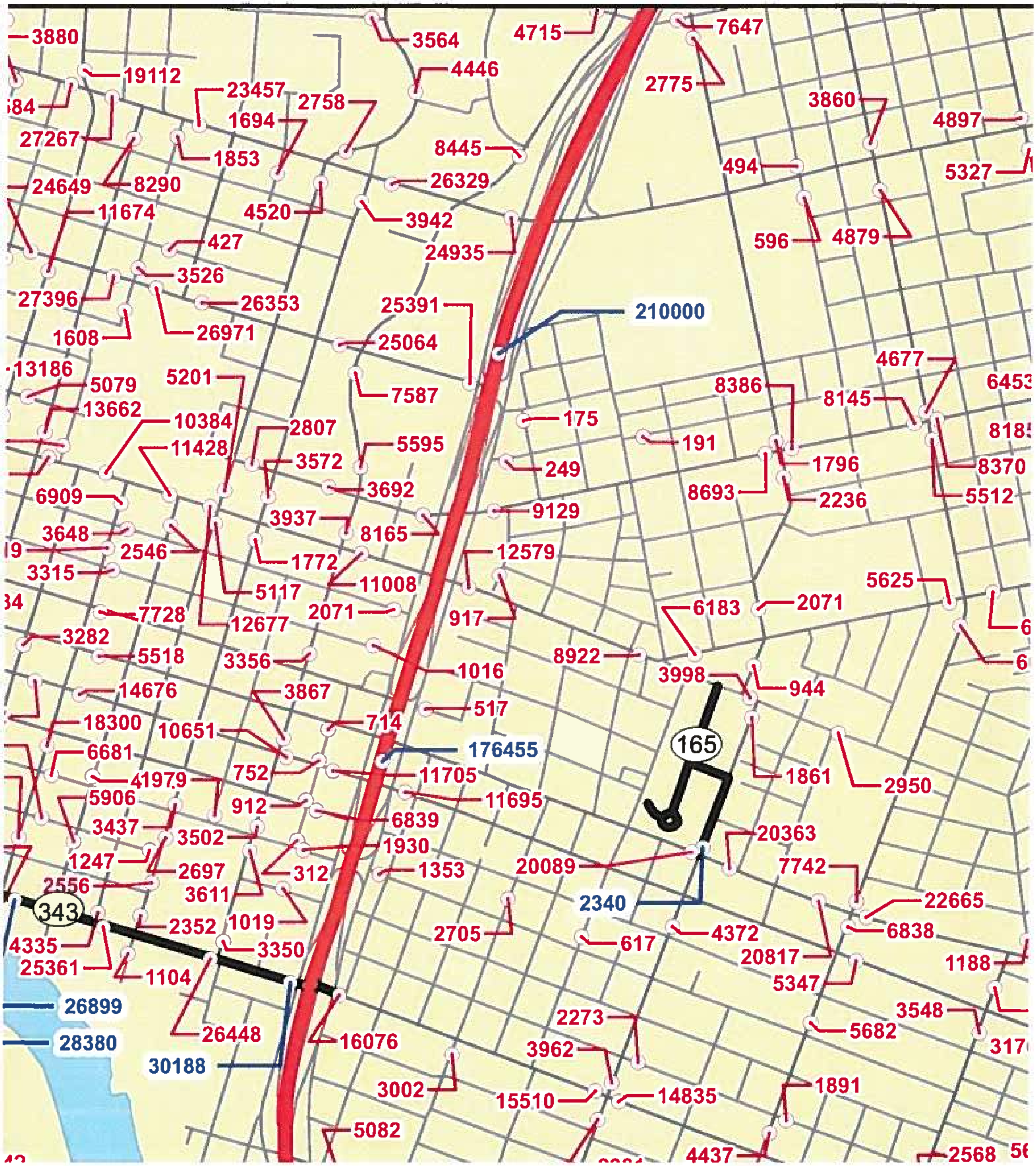
NOTICE: This map has been prepared for internal use within the Texas

2015 Austin Urbans

Sheet 10 of 17



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South Austin (See Base Sheet 83)

2015 AUSTIN URBAN TRAFFIC MAP

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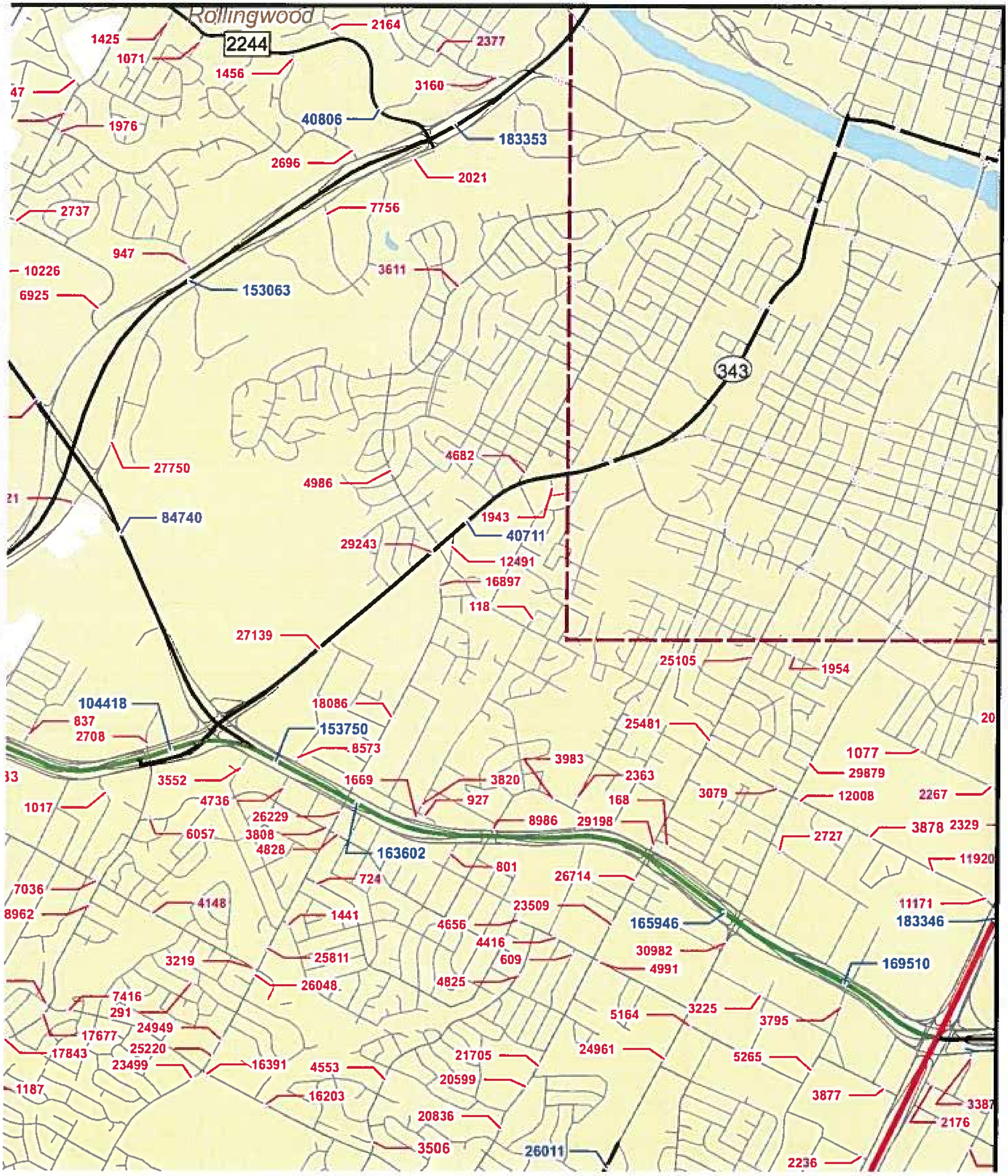

2015 Austin Urbans

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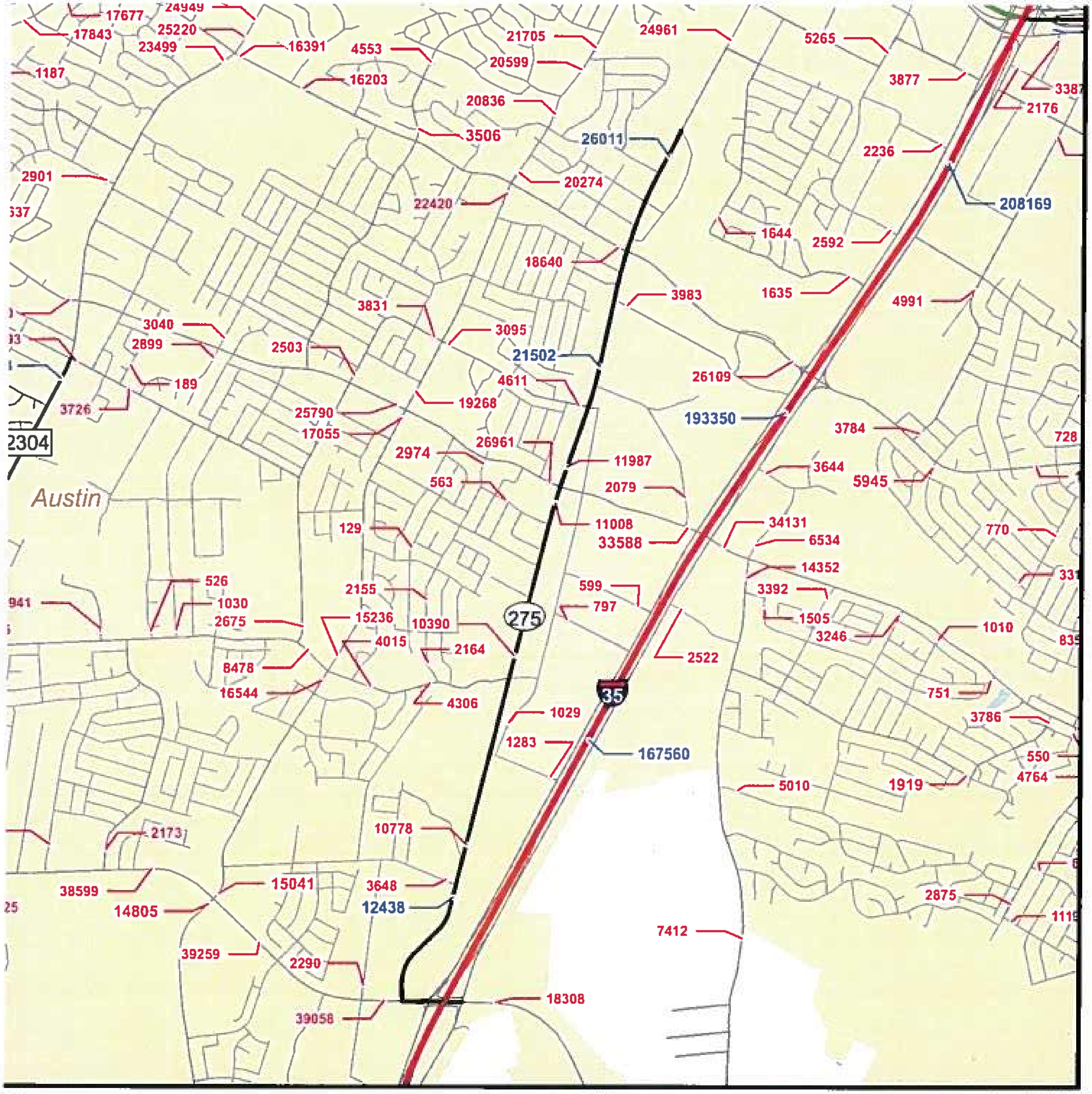

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NOTICE: This map has been prepared for internal use within the Texas Department of Transportation. Accuracy is limited to the validity of available data.

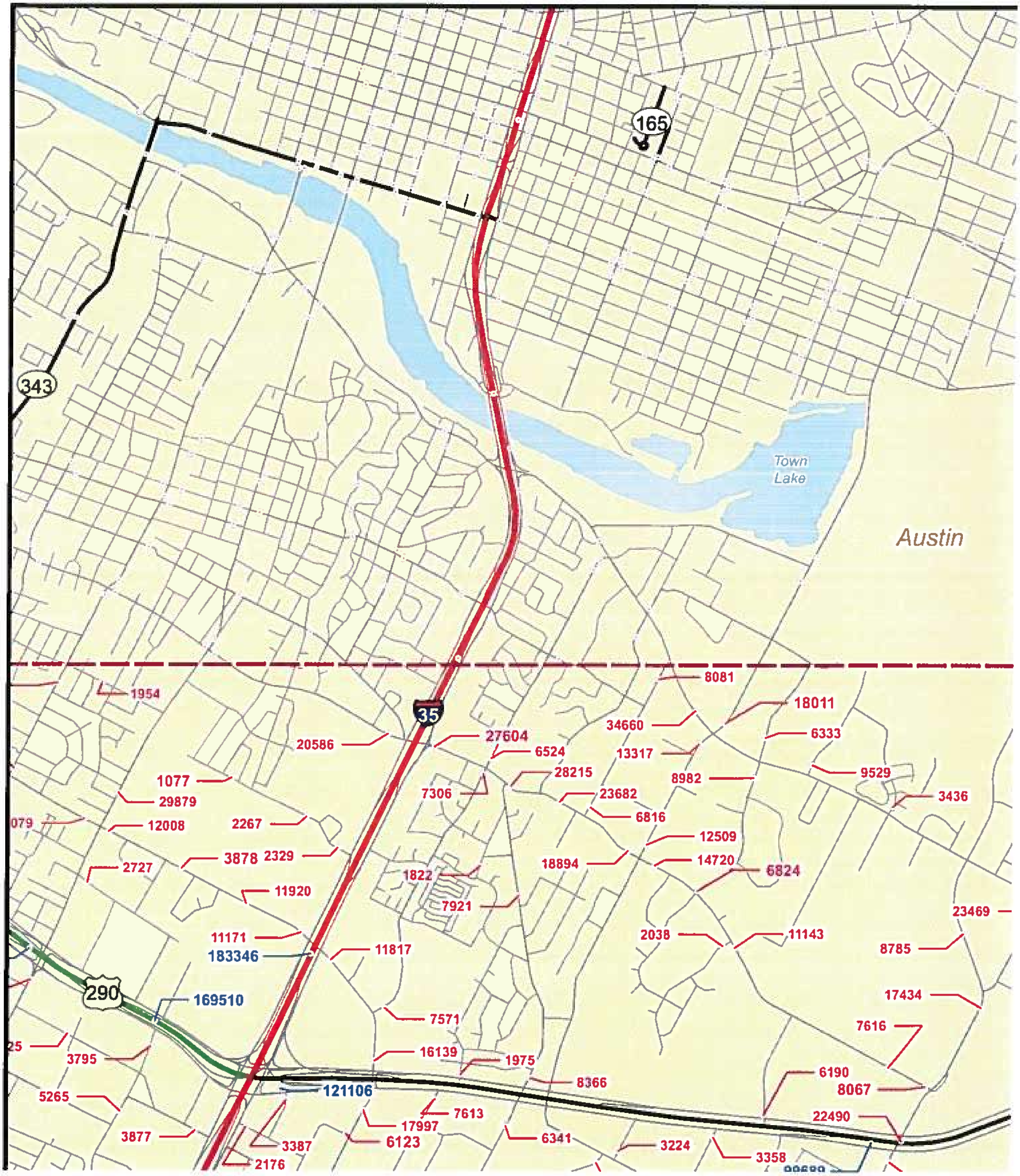
Toll road traffic counts are shown for context purposes only and may not represent On System traffic.

Publication Date: September 2016

Texas Department of Transportation

Sheet 97 of 139 Urban Sheets

2015 Austin Urbans Sheet 14 of 17



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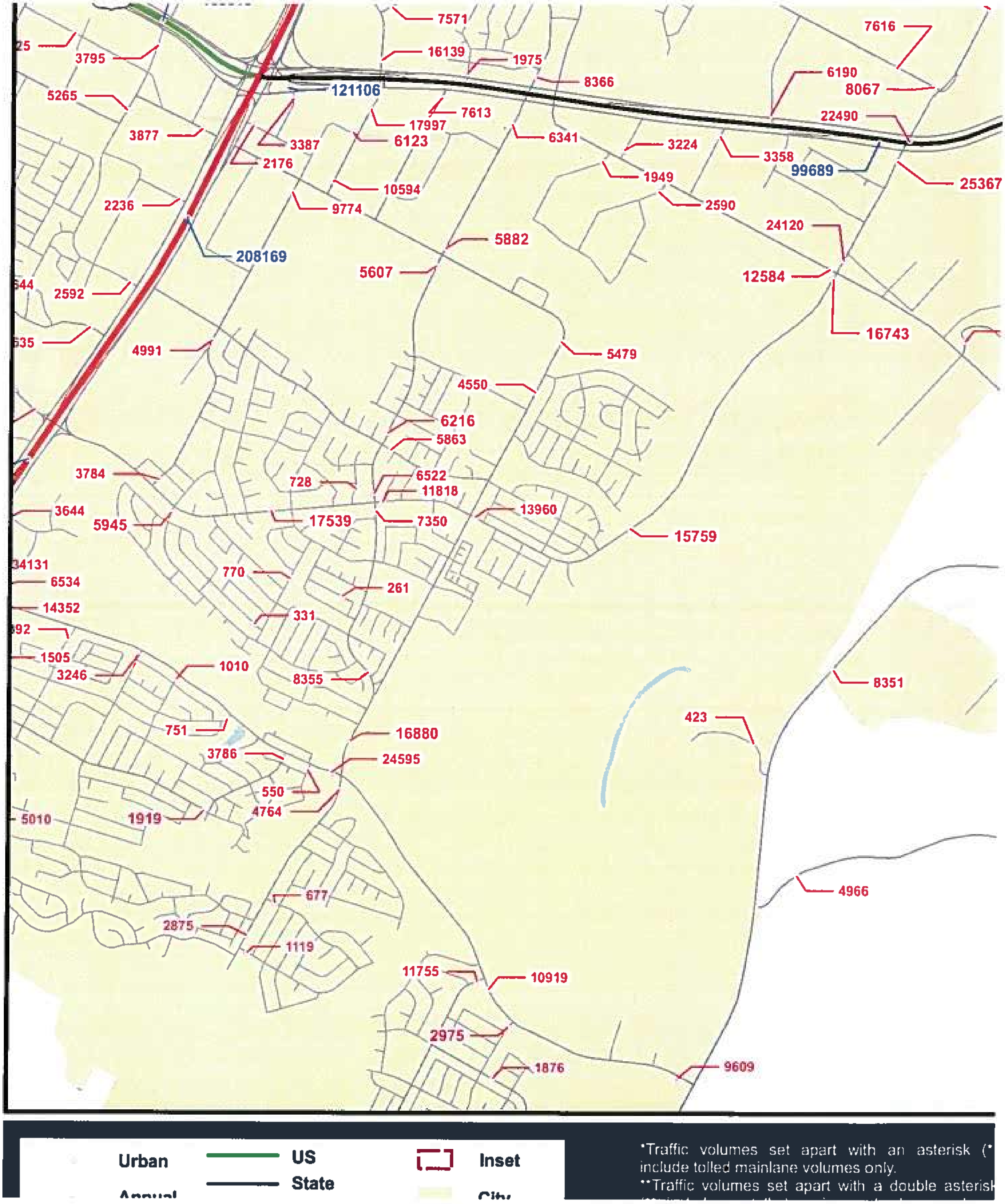
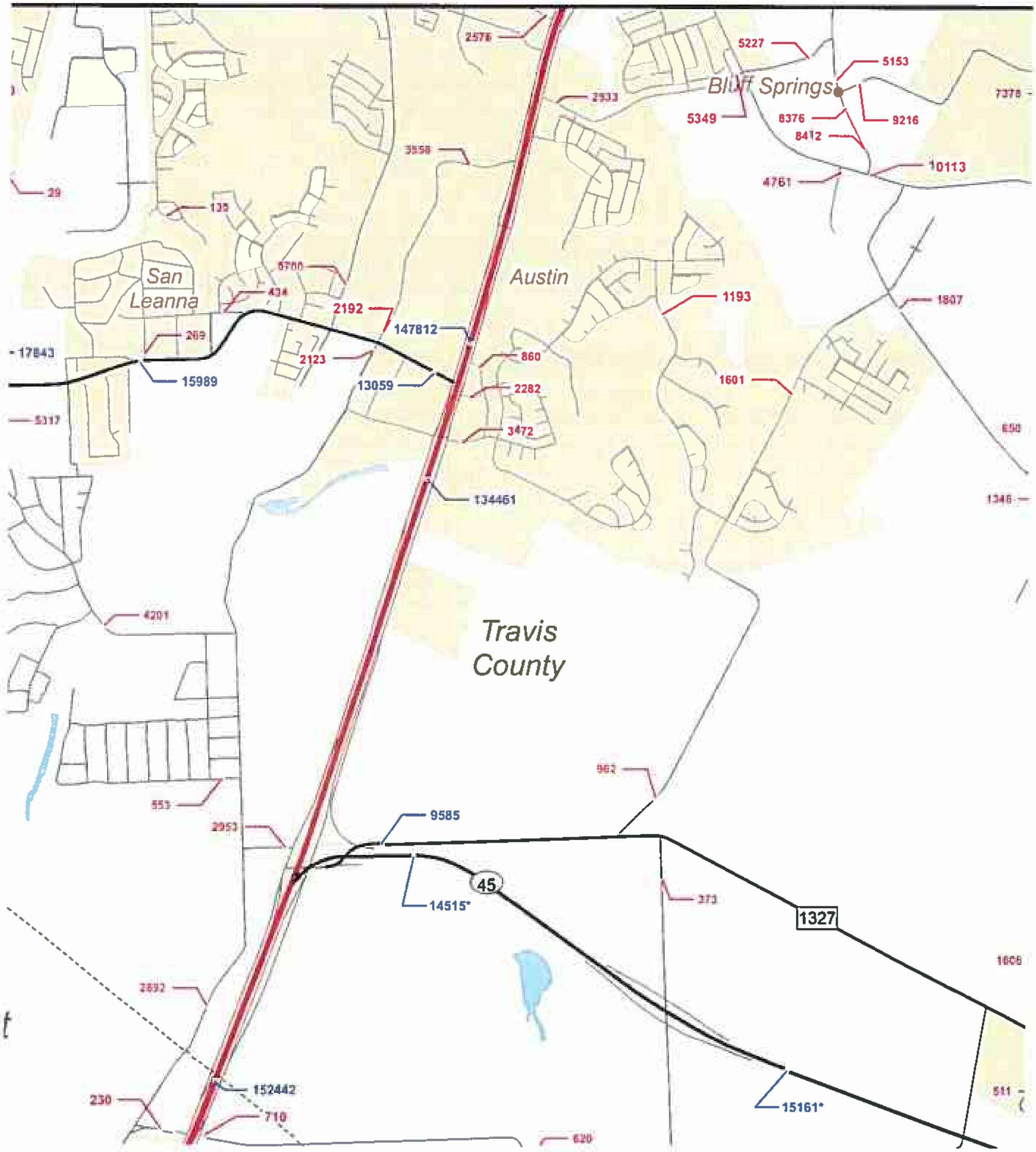


Traffic volumes set apart with an asterisk (
include tolled mainlane volumes only.
**Traffic volumes set apart with a double asterisk

2015 Austin Urbans   Sheet 16 of 17



2015 Austin Urbans

sheet 17 of 17

Appendix B

From: Spillar, Rob <Rob.Spillar@austintexas.gov>
Sent: Friday, February 25, 2022 1:37 PM
To: Tucker Ferguson; Heather Ashley-Nguyen
Cc: Bollich, Eric; Kitten, Cole
Subject: Downtown Arterials 7th and 8th Street

Tucker, Heather:

I needed to share a SHORT EMAIL with you to make sure I meet the deadline communicated to me regarding commitment on changing direction on these streets.

Your request was for us to commit by today to modifying the current directional management of 7th and 8th Street. What I need to communicate is that to achieve the modification of directional operation is a process. Making these changes is within the authority of the City Traffic Engineer here at the City of Austin. As Director, I currently serve in this capacity, but I have learned that making these type changes requires public engagement and political concurrence. The good news is we have a process and we are just starting it:

We are kicking off our ACT plan which will update the grid management concept for our entire downtown. It is an update to the Downtown Austin Plan (DAP) that serves as our current adopted policy for downtown street operations.

What I suggest is that you move forward with analysis of the current build alternatives. If to make one of those alternatives work (as I understand is the case) then make that a finding of the environmental review. The analysis and conclusions you come to will inform the ACT plan and inform the decision here at the City. We will jointly need to identify the perceived impacts. We are kicking off the ACT plan so it is likely that we can coordinate during your analysis and the development of the ACT plan. The loading zones for downtown hotels that are hard built to facilitate the existing directional operation has always been the biggest concern but not an impossible issue.

Intuitively, making the changes that you have requested represents good engineering judgement from my point of view and I am confident that the City can/will support, especially if the reasoning is for improved safety and improved accessibility to central Austin. We have discussed both 7th and 8th street changes before here at the City, but punted decision making till we had more definite information from the I-35 project.

I hope this gives you the confidence to move forward with the analysis of the alternatives with the identified street operations changes incorporated in your defined alternatives. Sorry we could not speak directly.

Robert Spillar
Director, Austin Transportation Department
City Traffic Engineer

Traffic and Safety Analysis Memos

MEMO

August 4, 2022

To: Tommy Abrego, P.E.
Mobility35 Program Manager, TxDOT Austin District

From: Matthew G. Best, P.E., PTOE
Traffic Project Manager, HDR

Subject: Mobility35 Capital Express Central: Build Alternative Options

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Background

As part of the Interstate 35 Capital Express Central project in Austin, Texas, Build Alternatives are being evaluated as part of a project Environmental Impact Statement. Through stakeholder engagement, the project environmental team identified a list of evaluation criteria, which compare the No Build and Build Alternatives—Alternative 2 and Modified Alternative 3—on areas ranging from traffic operations to right-of-way impacts.

As part of the Purpose and Need section of the evaluation criteria matrix, there are three subsections, one of which is “enhancing safety within the corridor.” Within that subsection, there are two quantitative criteria—“reduction in total crashes” and “reduction in fatalities and injury crashes.” This memorandum summarizes the analysis required and results of those two safety criteria.

Methodology

A predictive crash analysis was conducted for the No Build and Build Alternatives using *Interactive Highway Safety Design Model* (*IHSDM*) software to assess the potential safety benefits of recommended freeway capacity, frontage road, ramp, and intersection improvements compared to the current No Build Alternative. The *IHSDM* output results are attached to this memorandum. The analysis is “comparative” because it is based on the national Safety Performance Functions (SPF) published in the Highway Safety Manual (HSM). There are currently no approved and published calibration factors for predicting interstate and ramp crashes in Texas; therefore, the analysis results do not represent the actual expected number of crashes but rather provide an indication of whether crashes and crash rates will increase or decrease.

The predictive crash analysis was conducted within the limits of the Capital Express Central project, from US 290 East to US 290 West/State Highway 71. The current and proposed Alternative geometry and projected Year 2030 average daily traffic volume data within the project limits were entered into *IHSDM* for the freeway segments, ramps, frontage roads, and cross streets. The No Build geometry and proposed Build Alternative modifications are reflected in the *IHSDM* Build Alternative models to the fullest extent of the software's capabilities. For instance

- *IHSDM* cannot explicitly model upper and lower mainlane decks, such as exists currently between Airport Boulevard and Martin Luther King Jr. Boulevard, and the resulting merge and diverge points. As a result, the upper deck was modeled as each a collector-distributor and a freeway, with the results averaged to determine No Build results.
- *IHSDM* cannot explicitly model buffer-separated managed lanes. Separate models were constructed—one with only general purpose (GP) lanes, one with both GP and managed lanes (MLs) as a single facility—with each using combined GP and ML 2030 average daily traffic forecasts. To estimate the predicted crashes on the buffer-separated freeway portion of the study area, the outputs of the two separate models were averaged.

The projected Year 2030 daily traffic volumes are those approved by TxDOT in "Mobility35 Capital Express Central: Traffic Projections Methodology Memorandum," dated March 7, 2022.

Results

Table 1 provides a comparison of total crashes (all severities and types) in 2030 among the No Build and Build Alternatives within the study area. Crashes are separated by road type, which include GP and MLs (buffer- and barrier-separated). As shown, the Build Alternatives are projected to reduce crashes each by approximately 24 percent compared to the No Build Alternative.

Table 1: Predicted Crashes in 2030

Alternative	Road Type					Crashes	
	GP and Buffer-Separated ML	Barrier-Separated ML	Freeway Ramp	ML Ramp	Frontage Road Intersections	Total	% Change
No Build	759.8	n/a	44.1	n/a	242.2	1046.1	n/a
2	436.2	34.1	65.3	4.3	259.7	799.7	-24%
Modified 3	472.5	43.4	55.3	3.6	224.6	799.4	-24%

Note: Calibration factors were unavailable for the analysis. The analysis provides an indication of relative benefits/drawbacks of each Alternative.

Table 2 provides a comparison of the sum of fatal and injury crashes (no property damage only crashes) in 2030 among the No Build and Build Alternatives within the study area. As shown, Modified Build Alternative 3 is projected to reduce crashes by 29 percent compared to the No Build Alternative, while Build Alternative 2 is projected to reduce crashes further—by 34 percent compared to No Build. While the safety benefits of both build alternatives are evident, Build Alternative 2 does provide for a slightly greater decrease in predicted fatal and injury crashes, due in part to:

- Fewer conflict points, especially crossing conflicts that tend to lead to more severe crashes, at frontage road diamond intersections compared to boulevard standard four-way intersections
- Lower frontage road traffic volumes—and thus potential conflicts—at spot locations (e.g., Woodland Avenue)
- No ingress/egress allowed between managed and GP lanes (one location in each direction—near Riverside Drive—is provided under Modified Build Alternative 3)
- Less barrier separation between the managed and GP lanes

Table 2: Predicted Fatal & Injury Crashes in 2030

Alternative	Road Type					Crashes	
	GP and Buffer-Separated ML	Barrier-Separated ML	Freeway Ramp	ML Ramp	Frontage Road Intersections	Total	% Change
No Build	267.0		20.1		51.7	338.9	-
2	125.0	12.8	31.9	2.0	50.7	222.3	-34%
Modified 3	134.6	15.9	26.3	1.7	61.4	239.9	-29%

Note: Calibration factors were unavailable for the analysis. The analysis provides an indication of relative benefits/drawbacks of each Alternative.

Attachment

IHSDM Predictive Crash No-Build Model Outputs

- I-35 No-Build Model GP Lanes
  - At-Grade GP Lanes
  - Elevated GP Lanes as Freeway
  - Elevated GP Lanes as CD
- I-35 No-Build Model At-Grade Freeway Ramps
  - NB US 290 OFR
  - NB Koenig Ln OFR
  - NB Airport Blvd ONR
  - NB 51st St OFR
  - NB 41st St OFR
  - NB Dean Keeton St ONR
  - NB Dean Keeton St OFR
  - NB Manor Rd OFR
  - NB 12th St ONR
  - NB 15th St OFR
  - NB 7th St ONR
  - NB 7th St OFR
  - NB Cesar Chavez St ONR
  - NB Cesar Chavez St OFR
  - NB Riverside Dr ONR
  - NB Holly St OFR
  - NB Riverside Dr OFR
  - NB Oltorf St ONR
  - NB Woodland Ave OFR
  - NB Woodward St ONR
  - NB Oltorf St OFR
  - NB SH 71 ONR
  - SB US 290 ONR
  - SB Airport Blvd OFR

  - SB 51st St ONR
  - SB 38th ½ St OFR
  - SB 32nd St OFR
  - SB 32nd St ONR
  - SB Manor Rd OFR
  - SB Martin Luther King Jr Blvd OFR
  - SB 12th St OFR
  - SB 15th St ONR
  - SB 7th St OFR
  - SB 7th St ONR
  - SB Cesar Chavez St OFR
  - SB Cesar Chavez St ONR
  - SB Riverside Dr OFR
  - SB Woodland Ave OFR
  - SB Riverside Dr ONR
  - SB Woodland Ave ONR
  - SB Woodward St OFR
  - SB Oltorf St ONR
  - SB SH 71 OFR
- I-35 No-Build Model Elevated Freeway Ramps
  - NB Airport Blvd OFR
  - NB Martin Luther King Jr Blvd ONR
  - SB Airport Blvd ONR
  - SB Martin Luther King Jr Blvd OFR
- I-35 No-Build Model Frontage Road Intersections
  - 51st St & Cameron Rd
  - I-35 NBFR & Airport Blvd
  - I-35 NBFR & 38th ½ St
  - I-35 NBFR & 32nd St
  - I-35 NBFR & Manor Rd

- I-35 NBFR & Martin Luther King Jr Blvd
- I-35 NBFR & 15th St
- I-35 NBFR & 12th St
- I-35 NBFR & 11th St
- I-35 NBFR & 8th St
- I-35 NBFR & 7th St
- I-35 NBFR & 6th St
- I-35 NBFR & Cesar Chavez St
- I-35 NBFR & Holly St
- I-35 NBFR & Riverside Dr
- I-35 NBFR & Woodland Ave
- I-35 NBFR & Oltorf St
- I-35 NBFR & Woodward St
- I-35 SBFR & 51st St
- I-35 SBFR & Airport Blvd
- I-35 SBFR & 38th ½ St
- I-35 SBFR & 32nd St
- I-35 SBFR & Manor Rd
- I-35 SBFR & Martin Luther King Jr Blvd
- I-35 SBFR & 15th St
- I-35 SBFR & 12th St
- I-35 SBFR & 11th St
- I-35 SBFR & 8th St
- I-35 SBFR & 7th St
- I-35 SBFR & 6th St
- I-35 SBFR & Cesar Chavez St
- I-35 SBFR & Riverside Dr
- I-35 SBFR & Woodland Ave
- I-35 SBFR & Oltorf St
- I-35 SBFR & Woodward St

IHSDM Predictive Crash Build Alternative 2 Model Outputs

- I-35 Build Alternative 2 Model Buffer-Separated GP Lanes
    - Buffer-Separated GP Lanes without MLs
    - Buffer-Separated GP Lanes with MLs
- I-35 Build Alternative 2 Model Barrier-Separated GP Lanes
    - Barrier-Separated GP Lanes
    - Barrier-Separated MLs
- I-35 Build Alternative 2 Model Freeway Ramps
    - NB US 290 OFR
    - NB Barbara Jordan Blvd ONR
    - NB 41st St OFR
    - NB 38th ½ St OFR
    - NB Martin Luther King Jr Blvd Bypass ONR
    - NB Manor Rd OFR
    - NB Martin Luther King Jr Blvd Bypass OFR
    - NB 8th St ONR
    - NB 15th St OFR
    - NB Nash Hernandez Senior Rd ONR
    - NB Holly St OFR
    - NB Woodward St ONR
    - NB Oltorf St OFR
    - NB SH 71 ONR
    - SB US 290 ONR
    - SB 49th St OFR
    - SB 41st St ONR
    - SB Martin Luther King Jr Blvd OFR
    - SB 8th St OFR
    - SB 15th St ONR
    - SB Holly St OFR
    - SB Riverside Dr ONR

  - SB Woodward St OFR
  - SB Oltorf St ONR
  - SB SH 71 OFR
- I-35 Build Alternative 2 Model ML Ramps
  - NB OFR 1
  - NB ONR 1
  - NB ONR 2
  - NB OFR 2
  - SB ONR 1
  - SB OFR 1
  - SB OFR 2
  - SB ONR 2
- I-35 Build Alternative 2 Model Frontage Road Intersections
  - 51st St & Cameron Rd
  - I-35 NBFR & Airport Blvd
  - I-35 NBFR & 38th ½ St
  - I-35 NBFR & 32nd St
  - I-35 & Manor Rd
  - I-35 NBFR & Martin Luther King Jr Blvd
  - I-35 NBFR & 15th St
  - I-35 NBFR & 12th St
  - I-35 NBFR & 11th St
  - I-35 NBFR & 8th St
  - I-35 NBFR & 7th St
  - I-35 NBFR & 6th St
  - I-35 NBFR & Cesar Chavez St
  - I-35 NBFR & Holly St
  - I-35 NBFR & Riverside Dr
  - I-35 NBFR & Woodland Ave
  - I-35 NBFR & Oltorf St

- I-35 NBFR & Woodward St
- I-35 SBFR & 51st St
- I-35 SBFR & Airport Blvd
- I-35 SBFR & 38th ½ St
- I-35 SBFR & 32nd St
- I-35 SBFR & Martin Luther King Jr Blvd
- I-35 SBFR & 15th St
- I-35 SBFR & 12th St
- I-35 SBFR & 11th St
- I-35 SBFR & 8th St
- I-35 SBFR & 7th St
- I-35 SBFR & 6th St
- I-35 SBFR & Cesar Chavez St
- I-35 SBFR & Riverside Dr
- I-35 SBFR & Woodland Ave
- I-35 SBFR & Oltorf St
- I-35 SBFR & Woodward St

IHSDM Predictive Crash Modified Build Alternative 3 Model Outputs

- I-35 Modified Build Alternative 3 Model Buffer-Separated GP Lanes
    - Buffer-Separated GP Lanes without MLs
    - Buffer-Separated GP Lanes with MLs
- I-35 Modified Build Alternative 3 Model Barrier-Separated GP Lanes
    - Barrier-Separated GP Lanes
    - Barrier-Separated MLs
- I-35 Modified Build Alternative 3 Model Freeway Ramps
    - NB US 290 OFR
    - NB Barbara Jordan Blvd ONR
    - NB 41st St OFR
    - NB 38th ½ St OFR
    - NB Martin Luther King Jr Blvd ONR
    - NB ML OFR
    - NB 7th St ONR
    - NB 15th St OFR
    - NB Riverside Dr ONR
    - NB Holly St OFR
    - NB Woodland Ave OFR
    - NB Woodward St ONR
    - NB Oltorf St OFR
    - NB SH 71 ONR
    - SB US 290 ONR
    - SB 49th St OFR
    - SB 41st St ONR
    - SB Martin Luther King Jr Blvd OFR
    - SB 8th St OFR
    - SB 15th St ONR
    - SB Nash Hernandez Senior Rd OFR

  - SB 5th St ONR
  - SB Riverside Dr ONR
  - SB Woodward St OFR
  - SB Oltorf St ONR
  - SB SH 71 OFR
- I-35 Modified Build Alternative 3 Model ML Ramps
  - NB OFR 1
  - NB ONR 1
  - NB OFR 2
  - SB ONR 1
  - SB OFR 1
  - SB OFR 2
  - SB ONR 2
- I-35 Modified Build Alternative 3 Model Frontage Road Intersections
  - 51st St & Cameron Rd
  - I-35 NBFR & Airport Blvd
  - I-35 NBFR & 38th ½ St
  - I-35 NBFR & 32nd St
  - I-35 & Manor Rd
  - I-35 NBFR & Martin Luther King Jr Blvd
  - I-35 FR & 15th St
  - I-35 FR & 12th St
  - I-35 FR & 11th St
  - I-35 FR & 8th St
  - I-35 FR & 7th St
  - I-35 FR & 6th St
  - I-35 FR & Cesar Chavez St
  - I-35 NBFR & Holly St
  - I-35 NBFR & Riverside Dr
  - I-35 NBFR & Woodland Ave

- I-35 NBFR & Oltorf St
- I-35 NBFR & Woodward St
- I-35 SBFR & 51st St
- I-35 SBFR & Airport Blvd
- I-35 SBFR & 38th ½ St
- I-35 SBFR & 32nd St
- I-35 SB OFR & Martin Luther King Jr Blvd
- I-35 SBFR & Riverside Dr
- I-35 SBFR & Woodland Ave
- I-35 SBFR & Oltorf St
- I-35 SBFR & Woodward St

I-35 No-Build Model GP Lanes

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:02 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:02:04 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRALEX
Highway Comment: Imported from CENTRALEX.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:01:24 CDT 2021

Minimum Location: 3058+00.000
Maximum Location: 3477+00.000
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 3058+00.000
Evaluation End Location: 3477+00.000
Functional Class: Freeway

Type of Alignment: Divided, Multilane

Model Category: Freeway Segment

Calibration Factor: FI_EN=1.0; FI_EX=1.0; FI_MV=1.0; FI_SV=1.0; PDO_EN=1.0; PDO_EX=1.0; PDO_MV=1.0; PDO_SV=1.0;

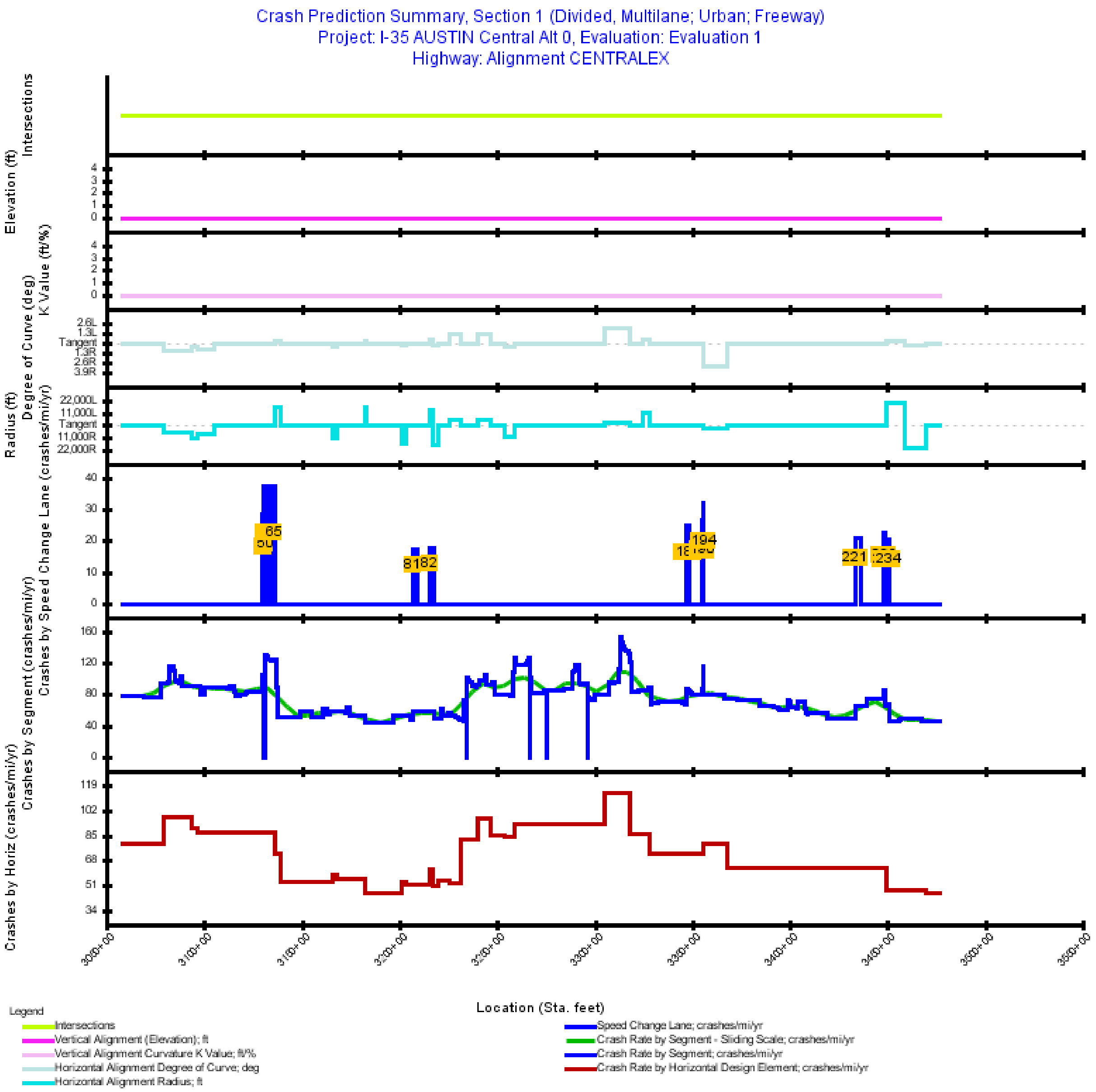

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Eight-lane Freeway	Urban	3058+00.000	3065+13.000	713.00	0.1350	2030: 203,900	18.00	Non-Traversable Median	26.49
2	Eight-lane Freeway	Urban	3065+13.000	3065+38.000	25.00	0.0047	2030: 203,900	14.65	Non-Traversable Median	24.65
3	Eight-lane Freeway	Urban	3065+38.000	3067+33.000	195.00	0.0369	2030: 203,900	11.72	Non-Traversable Median	21.72
4	Eight-lane Freeway	Urban	3067+33.000	3068+88.000	155.00	0.0294	2030: 203,900	7.05	Non-Traversable Median	17.05
5	Eight-lane Freeway	Urban	3068+88.000	3077+84.000	896.00	0.1697	2030: 203,900	2.00	Non-Traversable Median	13.49
6	Eight-lane Freeway	Urban	3077+84.000	3079+00.000	116.00	0.0220	2030: 216,750	2.00	Non-Traversable Median	12.00
7	Eight-lane Freeway	Urban	3079+00.000	3081+51.000	251.00	0.0475	2030: 216,750	2.00	Non-Traversable Median	12.50
8	Eight-lane Freeway	Urban	3081+51.000	3082+31.000	80.00	0.0152	2030: 216,750	2.00	Non-Traversable Median	13.16
9	Nine-lane Freeway	Urban	3082+31.000	3084+00.000	169.00	0.0320	2030: 234,800	2.00	Non-Traversable Median	13.66
10	Nine-lane Freeway	Urban	3084+00.000	3084+73.000	73.00	0.0138	2030: 234,800	2.00	Non-Traversable Median	14.00
11	Ten-lane Freeway	Urban	3084+73.000	3085+07.000	34.00	0.0064	2030: 234,800	2.00	Non-Traversable Median	14.00
12	Ten-lane Freeway	Urban	3085+07.000	3085+84.000	77.00	0.0146	2030: 234,800	2.00	Non-Traversable Median	14.00
13	Ten-lane Freeway	Urban	3085+84.000	3086+81.000	97.00	0.0184	2030: 234,800	2.00	Non-Traversable Median	14.00
14	Ten-lane Freeway	Urban	3086+81.000	3087+80.000	99.00	0.0187	2030: 234,800	2.00	Non-Traversable Median	14.00
15	Nine-lane Freeway	Urban	3087+80.000	3088+10.000	30.00	0.0057	2030: 234,800	2.00	Non-Traversable Median	14.00
16	Nine-lane Freeway	Urban	3088+10.000	3088+58.000	48.00	0.0091	2030: 234,800	2.00	Non-Traversable Median	14.00
17	Nine-lane Freeway	Urban	3088+58.000	3098+27.000	969.00	0.1835	2030: 234,800	2.00	Non-Traversable Median	14.00
18	Eight-lane Freeway	Urban	3098+27.000	3100+36.000	209.00	0.0396	2030: 216,050	2.00	Non-Traversable Median	14.00
19	Nine-lane Freeway	Urban	3100+36.000	3112+00.000	1,164.00	0.2205	2030: 225,550	4.00	Non-Traversable Median	14.00
20	Nine-lane Freeway	Urban	3112+00.000	3113+01.000	101.00	0.0191	2030: 225,550	2.00	Non-Traversable Median	13.50
21	Nine-lane Freeway	Urban	3113+01.000	3115+01.000	200.00	0.0379	2030: 225,550	2.00	Non-Traversable Median	11.99
22	Nine-lane Freeway	Urban	3115+01.000	3116+09.000	108.00	0.0205	2030: 225,550	2.00	Non-Traversable Median	10.23
23	Eight-lane Freeway	Urban	3116+09.000	3116+43.000	34.00	0.0064	2030: 204,200	2.00	Non-Traversable Median	9.24
24	Eight-lane Freeway	Urban	3116+43.000	3117+86.000	143.00	0.0271	2030: 204,200	2.00	Non-Traversable Median	8.00
25	Eight-lane Freeway	Urban	3117+86.000	3118+00.000	14.00	0.0027	2030: 204,200	2.00	Non-Traversable Median	6.90

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
26	Eight-lane Freeway	Urban	3118+00.000	3120+00.000	200.00	0.0379	2030: 204,200	2.00	Non-Traversable Median	6.40
27	Eight-lane Freeway	Urban	3120+00.000	3120+27.000	27.00	0.0051	2030: 204,200	2.00	Non-Traversable Median	6.00
28	Eight-lane Freeway	Urban	3120+27.000	3120+55.000	28.00	0.0053	2030: 204,200	2.00	Non-Traversable Median	6.00
29	Eight-lane Freeway	Urban	3120+55.000	3121+10.000	55.00	0.0104	2030: 204,200	2.00	Non-Traversable Median	6.00
30	Eight-lane Freeway	Urban	3121+10.000	3121+64.000	54.00	0.0102	2030: 204,200	2.00	Non-Traversable Median	6.00
31	Eight-lane Freeway	Urban	3121+64.000	3123+42.000	178.00	0.0337	2030: 204,200	2.00	Non-Traversable Median	6.00
32	Eight-lane Freeway	Urban	3123+42.000	3123+89.000	47.00	0.0089	2030: 204,200	2.00	Non-Traversable Median	6.00
33	Eight-lane Freeway	Urban	3123+89.000	3124+36.000	47.00	0.0089	2030: 204,200	2.00	Non-Traversable Median	6.00
34	Eight-lane Freeway	Urban	3124+36.000	3129+76.000	540.00	0.1023	2030: 204,200	2.00	Non-Traversable Median	6.00
36	Eight-lane Freeway	Urban	3129+76.000	3130+00.000	24.00	0.0045	2030: 211,300	2.00	Non-Traversable Median	6.00
38	Eight-lane Freeway	Urban	3130+00.000	3130+49.000	49.00	0.0093	2030: 211,300	2.00	Non-Traversable Median	6.00
40	Eight-lane Freeway	Urban	3130+49.000	3130+56.000	7.00	0.0013	2030: 211,300	2.00	Non-Traversable Median	6.00
43	Eight-lane Freeway	Urban	3130+56.000	3130+98.000	42.00	0.0080	2030: 227,400	2.00	Non-Traversable Median	6.00
46	Eight-lane Freeway	Urban	3130+98.000	3131+47.000	49.00	0.0093	2030: 227,400	2.00	Non-Traversable Median	6.00
49	Eight-lane Freeway	Urban	3131+47.000	3132+20.000	73.00	0.0138	2030: 227,400	2.00	Non-Traversable Median	6.00
52	Eight-lane Freeway	Urban	3132+20.000	3132+54.000	34.00	0.0064	2030: 227,400	2.00	Non-Traversable Median	6.00
54	Eight-lane Freeway	Urban	3132+54.000	3132+82.000	28.00	0.0053	2030: 227,400	2.00	Non-Traversable Median	6.00
56	Eight-lane Freeway	Urban	3132+82.000	3133+55.000	73.00	0.0138	2030: 227,400	2.00	Non-Traversable Median	6.00
58	Eight-lane Freeway	Urban	3133+55.000	3134+21.000	66.00	0.0125	2030: 227,400	2.00	Non-Traversable Median	6.00
60	Eight-lane Freeway	Urban	3134+21.000	3134+87.000	66.00	0.0125	2030: 227,400	2.00	Non-Traversable Median	6.00
62	Eight-lane Freeway	Urban	3134+87.000	3135+53.000	66.00	0.0125	2030: 227,400	2.00	Non-Traversable Median	6.00
64	Eight-lane Freeway	Urban	3135+53.000	3137+16.960	163.96	0.0311	2030: 227,400	2.00	Non-Traversable Median	6.00
66	Six-lane Freeway	Urban	3137+16.960	3137+43.660	26.70	0.0051	2030: 177,350	2.00	Non-Traversable Median	6.00
67	Four-lane Freeway	Urban	3137+43.660	3144+71.000	727.34	0.1378	2030: 125,800	2.00	Non-Traversable Median	6.00
68	Five-lane Freeway	Urban	3144+71.000	3148+95.000	424.00	0.0803	2030: 125,800	2.00	Non-Traversable Median	6.00
69	Four-lane Freeway	Urban	3148+95.000	3155+00.820	605.82	0.1147	2030: 125,800	2.00	Non-Traversable Median	6.00

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
70	Four-lane Freeway	Urban	3155+00.820	3160+76.980	576.16	0.1091	2030: 122,800	2.00	Non-Traversable Median	6.00
71	Four-lane Freeway	Urban	3160+76.980	3162+67.000	190.02	0.0360	2030: 126,900	2.00	Non-Traversable Median	6.00
72	Five-lane Freeway	Urban	3162+67.000	3164+27.000	160.00	0.0303	2030: 126,900	2.00	Non-Traversable Median	6.00
73	Four-lane Freeway	Urban	3164+27.000	3171+98.500	771.50	0.1461	2030: 126,900	2.00	Non-Traversable Median	6.00
74	Five-lane Freeway	Urban	3171+98.500	3173+37.000	138.50	0.0262	2030: 126,900	2.00	Non-Traversable Median	6.00
75	Four-lane Freeway	Urban	3173+37.000	3174+22.610	85.61	0.0162	2030: 126,900	2.00	Non-Traversable Median	6.00
76	Four-lane Freeway	Urban	3174+22.610	3182+41.770	819.16	0.1551	2030: 121,750	2.00	Non-Traversable Median	6.00
77	Four-lane Freeway	Urban	3182+41.770	3196+82.610	1,440.84	0.2729	2030: 110,750	2.00	Non-Traversable Median	6.00
78	Five-lane Freeway	Urban	3196+82.610	3205+27.280	844.67	0.1600	2030: 119,500	2.00	Non-Traversable Median	6.00
79	Four-lane Freeway	Urban	3205+27.280	3206+78.640	151.36	0.0287	2030: 117,050	2.00	Non-Traversable Median	6.00
80	Four-lane Freeway	Urban	3206+78.640	3217+52.990	1,074.35	0.2035	2030: 124,450	2.00	Non-Traversable Median	6.00
83	Four-lane Freeway	Urban	3217+52.990	3221+02.210	349.22	0.0661	2030: 121,100	2.00	Non-Traversable Median	6.00
84	Four-lane Freeway	Urban	3221+02.210	3222+09.000	106.79	0.0202	2030: 123,600	2.00	Non-Traversable Median	6.00
85	Five-lane Freeway	Urban	3222+09.000	3225+00.000	291.00	0.0551	2030: 123,600	2.00	Non-Traversable Median	6.00
86	Four-lane Freeway	Urban	3225+00.000	3226+26.000	126.00	0.0239	2030: 123,600	2.00	Non-Traversable Median	6.50
87	Four-lane Freeway	Urban	3226+26.000	3228+76.000	250.00	0.0473	2030: 123,600	2.00	Non-Traversable Median	8.01
88	Four-lane Freeway	Urban	3228+76.000	3230+00.000	124.00	0.0235	2030: 123,600	2.00	Non-Traversable Median	9.50
89	Four-lane Freeway	Urban	3230+00.000	3231+01.000	101.00	0.0191	2030: 123,600	2.00	Non-Traversable Median	10.50
90	Four-lane Freeway	Urban	3231+01.000	3233+01.000	200.00	0.0379	2030: 123,600	2.00	Non-Traversable Median	12.00
91	Four-lane Freeway	Urban	3233+01.000	3233+14.630	13.63	0.0026	2030: 123,600	2.00	Non-Traversable Median	12.92
92	Six-lane Freeway	Urban	3233+14.630	3234+00.000	85.37	0.0162	2030: 167,600	2.45	Non-Traversable Median	13.43
93	Six-lane Freeway	Urban	3234+00.000	3234+05.270	5.27	0.0010	2030: 167,600	4.00	Non-Traversable Median	14.00
94	Eight-lane Freeway	Urban	3234+05.270	3235+40.000	134.73	0.0255	2030: 213,900	4.00	Non-Traversable Median	14.00
95	Eight-lane Freeway	Urban	3235+40.000	3235+71.000	31.00	0.0059	2030: 213,900	3.51	Non-Traversable Median	14.01
96	Eight-lane Freeway	Urban	3235+71.000	3236+00.000	29.00	0.0055	2030: 213,900	2.49	Non-Traversable Median	14.01
97	Eight-lane Freeway	Urban	3236+00.000	3237+44.000	144.00	0.0273	2030: 213,900	2.00	Non-Traversable Median	14.00

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
98	Eight-lane Freeway	Urban	3237+44.000	3239+23.000	179.00	0.0339	2030: 213,900	2.00	Non-Traversable Median	13.50
99	Eight-lane Freeway	Urban	3239+23.000	3239+58.000	35.00	0.0066	2030: 213,900	2.00	Non-Traversable Median	12.90
100	Eight-lane Freeway	Urban	3239+58.000	3241+00.000	142.00	0.0269	2030: 213,900	2.00	Non-Traversable Median	12.40
101	Eight-lane Freeway	Urban	3241+00.000	3244+00.000	300.00	0.0568	2030: 213,900	2.00	Non-Traversable Median	12.00
102	Eight-lane Freeway	Urban	3244+00.000	3244+76.000	76.00	0.0144	2030: 213,900	2.00	Non-Traversable Median	11.49
103	Eight-lane Freeway	Urban	3244+76.000	3245+30.000	54.00	0.0102	2030: 213,900	2.00	Non-Traversable Median	10.63
104	Seven-lane Freeway	Urban	3245+30.000	3246+26.000	96.00	0.0182	2030: 203,400	2.00	Non-Traversable Median	9.63
105	Seven-lane Freeway	Urban	3246+26.000	3247+00.000	74.00	0.0140	2030: 203,400	2.00	Non-Traversable Median	8.49
106	Seven-lane Freeway	Urban	3247+00.000	3248+58.200	158.20	0.0300	2030: 203,400	2.00	Non-Traversable Median	8.00
107	Six-lane Freeway	Urban	3248+58.200	3257+00.000	841.80	0.1594	2030: 192,750	2.00	Non-Traversable Median	8.00
108	Six-lane Freeway	Urban	3257+00.000	3258+01.000	101.00	0.0191	2030: 192,750	2.00	Non-Traversable Median	8.50
109	Six-lane Freeway	Urban	3258+01.000	3258+41.000	40.00	0.0076	2030: 192,750	2.00	Non-Traversable Median	9.21
110	Seven-lane Freeway	Urban	3258+41.000	3258+71.000	30.00	0.0057	2030: 206,100	2.00	Non-Traversable Median	9.56
111	Seven-lane Freeway	Urban	3258+71.000	3259+00.000	29.00	0.0055	2030: 206,100	2.00	Non-Traversable Median	9.85
112	Seven-lane Freeway	Urban	3259+00.000	3259+07.000	7.00	0.0013	2030: 206,100	2.00	Non-Traversable Median	10.00
113	Eight-lane Freeway	Urban	3259+07.000	3259+51.000	44.00	0.0083	2030: 220,650	2.56	Non-Traversable Median	10.62
114	Eight-lane Freeway	Urban	3259+51.000	3264+55.000	504.00	0.0955	2030: 220,650	2.00	Non-Traversable Median	10.62
115	Eight-lane Freeway	Urban	3264+55.000	3264+85.000	30.00	0.0057	2030: 220,650	2.67	Non-Traversable Median	10.15
116	Eight-lane Freeway	Urban	3264+85.000	3265+00.000	15.00	0.0028	2030: 220,650	3.67	Non-Traversable Median	10.37
117	Eight-lane Freeway	Urban	3265+00.000	3265+13.000	13.00	0.0025	2030: 220,650	4.00	Non-Traversable Median	10.22
118	Eight-lane Freeway	Urban	3265+13.000	3265+51.000	38.00	0.0072	2030: 220,650	4.00	Non-Traversable Median	10.00
119	Eight-lane Freeway	Urban	3265+51.000	3265+87.000	36.00	0.0068	2030: 220,650	4.00	Non-Traversable Median	10.00
120	Eight-lane Freeway	Urban	3265+87.000	3266+44.000	57.00	0.0108	2030: 220,650	3.69	Non-Traversable Median	10.06
121	Eight-lane Freeway	Urban	3266+44.000	3267+00.000	56.00	0.0106	2030: 220,650	2.56	Non-Traversable Median	10.06
122	Eight-lane Freeway	Urban	3267+00.000	3267+04.000	4.00	0.0008	2030: 220,650	2.00	Non-Traversable Median	10.00
123	Seven-lane Freeway	Urban	3267+04.000	3267+28.700	24.70	0.0047	2030: 202,250	2.00	Non-Traversable Median	10.00

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
124	Six-lane Freeway	Urban	3267+28.700	3274+00.000	671.30	0.1271	2030: 191,000	2.00	Non-Traversable Median	10.00
125	Six-lane Freeway	Urban	3274+00.000	3274+68.000	68.00	0.0129	2030: 191,000	2.00	Non-Traversable Median	9.49
126	Six-lane Freeway	Urban	3274+68.000	3275+30.000	62.00	0.0117	2030: 191,000	2.00	Non-Traversable Median	8.52
127	Six-lane Freeway	Urban	3275+30.000	3275+34.000	4.00	0.0008	2030: 191,000	6.00	Non-Traversable Median	12.03
128	Six-lane Freeway	Urban	3275+34.000	3284+26.000	892.00	0.1689	2030: 191,000	6.00	Non-Traversable Median	12.00
129	Six-lane Freeway	Urban	3284+26.000	3288+39.000	413.00	0.0782	2030: 191,000	2.00	Non-Traversable Median	8.00
130	Seven-lane Freeway	Urban	3288+39.000	3289+10.000	71.00	0.0134	2030: 198,850	2.00	Non-Traversable Median	8.00
131	Seven-lane Freeway	Urban	3289+10.000	3289+67.480	57.48	0.0109	2030: 198,850	6.00	Non-Traversable Median	10.00
132	Eight-lane Freeway	Urban	3289+67.480	3292+04.000	236.52	0.0448	2030: 213,900	6.00	Non-Traversable Median	11.82
133	Seven-lane Freeway	Urban	3292+04.000	3292+84.000	80.00	0.0152	2030: 200,600	12.33	Non-Traversable Median	16.33
134	Seven-lane Freeway	Urban	3292+84.000	3294+33.000	149.00	0.0282	2030: 200,600	20.05	Non-Traversable Median	24.05
135	Seven-lane Freeway	Urban	3294+33.000	3295+81.000	148.00	0.0280	2030: 200,600	30.05	Non-Traversable Median	34.05
136	Seven-lane Freeway	Urban	3295+81.000	3296+00.000	19.00	0.0036	2030: 200,600	35.68	Non-Traversable Median	39.68
137	Seven-lane Freeway	Urban	3296+00.000	3296+20.000	20.00	0.0038	2030: 200,600	36.99	Non-Traversable Median	40.48
138	Seven-lane Freeway	Urban	3296+20.000	3296+55.670	35.67	0.0068	2030: 200,600	38.86	Non-Traversable Median	40.94
139	Six-lane Freeway	Urban	3296+55.670	3296+60.000	4.33	0.0008	2030: 192,300	40.21	Non-Traversable Median	41.28
140	Six-lane Freeway	Urban	3296+60.000	3296+65.000	5.00	0.0009	2030: 192,300	40.53	Non-Traversable Median	41.35
141	Six-lane Freeway	Urban	3296+65.000	3297+00.000	35.00	0.0066	2030: 192,300	41.87	Non-Traversable Median	42.22
142	Six-lane Freeway	Urban	3297+00.000	3297+29.000	29.00	0.0055	2030: 192,300	44.03	Non-Traversable Median	44.03
143	Six-lane Freeway	Urban	3297+29.000	3298+78.000	149.00	0.0282	2030: 192,300	50.03	Non-Traversable Median	50.03
144	Six-lane Freeway	Urban	3298+78.000	3300+26.000	148.00	0.0280	2030: 192,300	60.03	Non-Traversable Median	60.03
145	Six-lane Freeway	Urban	3300+26.000	3306+86.000	660.00	0.1250	2030: 192,300	70.00	Non-Traversable Median	64.99
146	Six-lane Freeway	Urban	3306+86.000	3308+57.000	171.00	0.0324	2030: 192,300	59.96	Non-Traversable Median	59.96
147	Six-lane Freeway	Urban	3308+57.000	3310+28.000	171.00	0.0324	2030: 192,300	49.96	Non-Traversable Median	49.96
148	Six-lane Freeway	Urban	3310+28.000	3311+93.000	165.00	0.0312	2030: 192,300	40.13	Non-Traversable Median	40.13
149	Six-lane Freeway	Urban	3311+93.000	3311+99.000	6.00	0.0011	2030: 192,300	35.12	Non-Traversable Median	35.12

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
150	Six-lane Freeway	Urban	3311+99.000	3312+75.000	76.00	0.0144	2030: 192,300	32.72	Non-Traversable Median	32.72
151	Seven-lane Freeway	Urban	3312+75.000	3312+83.000	8.00	0.0015	2030: 205,850	30.27	Non-Traversable Median	30.27
152	Eight-lane Freeway	Urban	3312+83.000	3313+69.000	86.00	0.0163	2030: 211,000	27.51	Non-Traversable Median	27.51
153	Eight-lane Freeway	Urban	3313+69.000	3314+42.000	73.00	0.0138	2030: 211,000	22.86	Non-Traversable Median	22.86
154	Eight-lane Freeway	Urban	3314+42.000	3314+55.000	13.00	0.0025	2030: 211,000	20.35	Non-Traversable Median	20.35
155	Eight-lane Freeway	Urban	3314+55.000	3315+40.000	85.00	0.0161	2030: 211,000	17.48	Non-Traversable Median	19.48
156	Eight-lane Freeway	Urban	3315+40.000	3316+18.000	78.00	0.0148	2030: 211,000	12.71	Non-Traversable Median	14.71
157	Eight-lane Freeway	Urban	3316+18.000	3316+64.000	46.00	0.0087	2030: 211,000	9.08	Non-Traversable Median	11.59
158	Eight-lane Freeway	Urban	3316+64.000	3317+11.000	47.00	0.0089	2030: 211,000	6.36	Non-Traversable Median	9.89
159	Eight-lane Freeway	Urban	3317+11.000	3317+55.000	44.00	0.0083	2030: 211,000	3.70	Non-Traversable Median	8.22
160	Eight-lane Freeway	Urban	3317+55.000	3317+67.000	12.00	0.0023	2030: 211,000	2.06	Non-Traversable Median	7.35
161	Eight-lane Freeway	Urban	3317+67.000	3318+00.000	33.00	0.0063	2030: 211,000	2.00	Non-Traversable Median	9.64
162	Eight-lane Freeway	Urban	3318+00.000	3318+51.000	51.00	0.0097	2030: 211,000	2.00	Non-Traversable Median	9.49
163	Eight-lane Freeway	Urban	3318+51.000	3318+81.330	30.33	0.0057	2030: 211,000	2.00	Non-Traversable Median	8.68
164	Seven-lane Freeway	Urban	3318+81.330	3319+00.000	18.67	0.0035	2030: 194,350	2.00	Non-Traversable Median	8.19
165	Seven-lane Freeway	Urban	3319+00.000	3322+27.000	327.00	0.0619	2030: 194,350	2.00	Non-Traversable Median	8.00
166	Seven-lane Freeway	Urban	3322+27.000	3327+28.000	501.00	0.0949	2030: 194,350	2.00	Non-Traversable Median	8.00
167	Seven-lane Freeway	Urban	3327+28.000	3328+81.000	153.00	0.0290	2030: 194,350	2.00	Non-Traversable Median	8.00
168	Seven-lane Freeway	Urban	3328+81.000	3328+89.000	8.00	0.0015	2030: 194,350	2.00	Non-Traversable Median	8.00
169	Six-lane Freeway	Urban	3328+89.000	3329+17.000	28.00	0.0053	2030: 173,300	2.00	Non-Traversable Median	8.00
170	Six-lane Freeway	Urban	3329+17.000	3332+62.000	345.00	0.0653	2030: 173,300	2.00	Non-Traversable Median	8.00
171	Six-lane Freeway	Urban	3332+62.000	3342+00.000	938.00	0.1777	2030: 173,300	2.00	Non-Traversable Median	8.00
172	Six-lane Freeway	Urban	3342+00.000	3344+51.000	251.00	0.0475	2030: 173,300	2.00	Non-Traversable Median	8.50
173	Six-lane Freeway	Urban	3344+51.000	3345+00.000	49.00	0.0093	2030: 173,300	2.00	Non-Traversable Median	9.10
174	Six-lane Freeway	Urban	3345+00.000	3346+24.000	124.00	0.0235	2030: 173,300	2.00	Non-Traversable Median	9.45
175	Six-lane Freeway	Urban	3346+24.000	3347+04.000	80.00	0.0152	2030: 173,300	2.00	Non-Traversable Median	9.85

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
177	Six-lane Freeway	Urban	3347+04.000	3347+47.000	43.00	0.0081	2030: 181,700	2.00	Non-Traversable Median	10.00
179	Six-lane Freeway	Urban	3347+47.000	3348+08.000	61.00	0.0116	2030: 181,700	2.00	Non-Traversable Median	10.00
181	Six-lane Freeway	Urban	3348+08.000	3349+00.000	92.00	0.0174	2030: 181,700	2.00	Non-Traversable Median	10.00
183	Six-lane Freeway	Urban	3349+00.000	3349+17.000	17.00	0.0032	2030: 181,700	2.00	Non-Traversable Median	10.00
184	Six-lane Freeway	Urban	3349+17.000	3349+51.000	34.00	0.0064	2030: 181,700	2.00	Non-Traversable Median	10.00
185	Six-lane Freeway	Urban	3349+51.000	3349+84.000	33.00	0.0063	2030: 181,700	2.00	Non-Traversable Median	10.00
186	Six-lane Freeway	Urban	3349+84.000	3354+66.000	482.00	0.0913	2030: 181,700	2.00	Non-Traversable Median	10.00
187	Six-lane Freeway	Urban	3354+66.000	3354+87.000	21.00	0.0040	2030: 181,700	2.00	Non-Traversable Median	10.00
189	Six-lane Freeway	Urban	3354+87.000	3355+27.000	40.00	0.0076	2030: 181,700	2.00	Non-Traversable Median	10.00
191	Six-lane Freeway	Urban	3355+27.000	3355+68.000	41.00	0.0078	2030: 181,700	2.00	Non-Traversable Median	10.00
193	Six-lane Freeway	Urban	3355+68.000	3355+88.000	20.00	0.0038	2030: 181,700	2.00	Non-Traversable Median	10.00
195	Six-lane Freeway	Urban	3355+88.000	3366+12.000	1,024.00	0.1939	2030: 160,900	2.00	Non-Traversable Median	10.00
196	Seven-lane Freeway	Urban	3366+12.000	3373+06.480	694.48	0.1315	2030: 171,700	2.00	Non-Traversable Median	10.00
197	Eight-lane Freeway	Urban	3373+06.480	3384+16.000	1,109.52	0.2101	2030: 188,850	2.00	Non-Traversable Median	10.00
198	Seven-lane Freeway	Urban	3384+16.000	3391+05.000	689.00	0.1305	2030: 171,450	2.00	Non-Traversable Median	10.00
199	Seven-lane Freeway	Urban	3391+05.000	3391+55.000	50.00	0.0095	2030: 171,450	2.00	Non-Traversable Median	10.51
200	Seven-lane Freeway	Urban	3391+55.000	3392+54.000	99.00	0.0187	2030: 171,450	2.00	Non-Traversable Median	12.02
201	Seven-lane Freeway	Urban	3392+54.000	3393+52.000	98.00	0.0186	2030: 171,450	2.00	Non-Traversable Median	14.01
202	Seven-lane Freeway	Urban	3393+52.000	3394+51.000	99.00	0.0187	2030: 171,450	2.00	Non-Traversable Median	16.01
203	Seven-lane Freeway	Urban	3394+51.000	3395+00.000	49.00	0.0093	2030: 171,450	2.00	Non-Traversable Median	17.50
204	Seven-lane Freeway	Urban	3395+00.000	3398+59.810	359.81	0.0681	2030: 171,450	2.00	Non-Traversable Median	18.00
205	Eight-lane Freeway	Urban	3398+59.810	3399+60.000	100.19	0.0190	2030: 179,850	2.00	Non-Traversable Median	18.00
206	Eight-lane Freeway	Urban	3399+60.000	3400+43.000	83.00	0.0157	2030: 179,850	22.00	Non-Traversable Median	38.00
207	Nine-lane Freeway	Urban	3400+43.000	3403+50.000	307.00	0.0581	2030: 179,850	22.00	Non-Traversable Median	38.00
208	Nine-lane Freeway	Urban	3403+50.000	3404+03.000	53.00	0.0100	2030: 179,850	3.51	Non-Traversable Median	19.51
209	Nine-lane Freeway	Urban	3404+03.000	3404+21.020	18.02	0.0034	2030: 179,850	5.54	Non-Traversable Median	21.54

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
210	Ten-lane Freeway	Urban	3404+21.020	3405+78.000	156.98	0.0297	2030: 189,500	10.54	Non-Traversable Median	26.54
211	Ten-lane Freeway	Urban	3405+78.000	3407+78.000	200.00	0.0379	2030: 189,500	20.74	Non-Traversable Median	36.02
212	Ten-lane Freeway	Urban	3407+78.000	3408+00.000	22.00	0.0042	2030: 189,500	25.44	Non-Traversable Median	41.44
213	Nine-lane Freeway	Urban	3408+00.000	3408+14.000	14.00	0.0027	2030: 177,100	26.14	Non-Traversable Median	42.66
214	Nine-lane Freeway	Urban	3408+14.000	3408+41.000	27.00	0.0051	2030: 177,100	26.93	Non-Traversable Median	44.98
215	Nine-lane Freeway	Urban	3408+41.000	3408+67.000	26.00	0.0049	2030: 177,100	27.95	Non-Traversable Median	47.99
216	Nine-lane Freeway	Urban	3408+67.000	3408+94.000	27.00	0.0051	2030: 177,100	28.98	Non-Traversable Median	50.99
217	Nine-lane Freeway	Urban	3408+94.000	3409+07.000	13.00	0.0025	2030: 177,100	29.75	Non-Traversable Median	53.26
218	Nine-lane Freeway	Urban	3409+07.000	3418+70.490	963.49	0.1825	2030: 177,100	30.00	Non-Traversable Median	54.00
219	Eight-lane Freeway	Urban	3418+70.490	3433+36.550	1,466.06	0.2777	2030: 163,000	30.00	Non-Traversable Median	54.00
220	Eight-lane Freeway	Urban	3433+36.550	3439+11.620	575.07	0.1089	2030: 187,050	30.00	Non-Traversable Median	54.00
222	Nine-lane Freeway	Urban	3439+11.620	3447+63.000	851.38	0.1612	2030: 202,950	30.00	Non-Traversable Median	53.98
223	Eight-lane Freeway	Urban	3447+63.000	3448+17.000	54.00	0.0102	2030: 202,950	29.68	Non-Traversable Median	54.18
225	Eight-lane Freeway	Urban	3448+17.000	3448+72.150	55.15	0.0104	2030: 202,950	29.09	Non-Traversable Median	54.60
227	Seven-lane Freeway	Urban	3448+72.150	3449+25.000	52.85	0.0100	2030: 181,950	28.50	Non-Traversable Median	55.03
229	Seven-lane Freeway	Urban	3449+25.000	3450+00.000	75.00	0.0142	2030: 181,950	27.81	Non-Traversable Median	55.53
231	Seven-lane Freeway	Urban	3450+00.000	3450+19.000	19.00	0.0036	2030: 181,950	27.30	Non-Traversable Median	56.02
233	Seven-lane Freeway	Urban	3450+19.000	3450+68.980	49.98	0.0095	2030: 181,950	26.93	Non-Traversable Median	56.75
235	Six-lane Freeway	Urban	3450+68.980	3450+81.000	12.02	0.0023	2030: 147,500	26.59	Non-Traversable Median	57.40
236	Six-lane Freeway	Urban	3450+81.000	3451+44.000	63.00	0.0119	2030: 147,500	26.19	Non-Traversable Median	58.20
237	Six-lane Freeway	Urban	3451+44.000	3452+07.000	63.00	0.0119	2030: 147,500	25.51	Non-Traversable Median	59.53
238	Six-lane Freeway	Urban	3452+07.000	3452+23.000	16.00	0.0030	2030: 147,500	25.08	Non-Traversable Median	60.36
239	Six-lane Freeway	Urban	3452+23.000	3452+69.000	46.00	0.0087	2030: 147,500	24.75	Non-Traversable Median	61.02
240	Six-lane Freeway	Urban	3452+69.000	3453+00.000	31.00	0.0059	2030: 147,500	24.33	Non-Traversable Median	61.83
241	Six-lane Freeway	Urban	3453+00.000	3453+51.000	51.00	0.0097	2030: 147,500	23.89	Non-Traversable Median	61.38
242	Six-lane Freeway	Urban	3453+51.000	3454+52.000	101.00	0.0191	2030: 147,500	23.06	Non-Traversable Median	59.05

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
243	Six-lane Freeway	Urban	3454+52.000	3455+52.000	100.00	0.0189	2030: 147,500	22.00	Non-Traversable Median	56.25
244	Six-lane Freeway	Urban	3455+52.000	3456+53.000	101.00	0.0191	2030: 147,500	22.00	Non-Traversable Median	54.00
245	Six-lane Freeway	Urban	3456+53.000	3457+03.000	50.00	0.0095	2030: 147,500	22.00	Non-Traversable Median	52.50
246	Six-lane Freeway	Urban	3457+03.000	3459+52.000	249.00	0.0472	2030: 147,500	23.22	Non-Traversable Median	53.50
247	Six-lane Freeway	Urban	3459+52.000	3466+51.000	699.00	0.1324	2030: 147,500	30.01	Non-Traversable Median	60.01
248	Six-lane Freeway	Urban	3466+51.000	3467+74.000	123.00	0.0233	2030: 147,500	35.89	Non-Traversable Median	65.89
249	Seven-lane Freeway	Urban	3467+74.000	3477+00.000	926.00	0.1754	2030: 147,500	40.00	Non-Traversable Median	68.38

Table 2. Evaluation Freeway - Speed Change Lanes (Speed Change)

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
35	Eight-lane Freeway Speed Change	Exit	3129+75.190	3129+76.000	0.81	0.0002	2030: 211,300	2.00	Non-Traversable Median	6.00
37	Eight-lane Freeway Speed Change	Exit	3129+76.000	3130+00.000	24.00	0.0045	2030: 211,300	2.00	Non-Traversable Median	6.00
39	Eight-lane Freeway Speed Change	Exit	3130+00.000	3130+49.000	49.00	0.0093	2030: 211,300	2.00	Non-Traversable Median	6.00
41	Eight-lane Freeway Speed Change	Exit	3130+49.000	3130+56.000	7.00	0.0013	2030: 211,300	2.00	Non-Traversable Median	6.00
42	Eight-lane Freeway Speed Change	Entrance	3130+55.620	3130+56.000	0.38	0.0001	2030: 227,400	2.00	Non-Traversable Median	6.00
44	Eight-lane Freeway Speed Change	Exit	3130+56.000	3130+98.000	42.00	0.0080	2030: 227,400	2.00	Non-Traversable Median	6.00
45	Eight-lane Freeway Speed Change	Entrance	3130+56.000	3130+98.000	42.00	0.0080	2030: 227,400	2.00	Non-Traversable Median	6.00
47	Eight-lane Freeway Speed Change	Exit	3130+98.000	3131+47.000	49.00	0.0093	2030: 227,400	2.00	Non-Traversable Median	6.00
48	Eight-lane Freeway Speed Change	Entrance	3130+98.000	3131+47.000	49.00	0.0093	2030: 227,400	2.00	Non-Traversable Median	6.00
50	Eight-lane Freeway Speed Change	Exit	3131+47.000	3131+95.190	48.19	0.0091	2030: 227,400	2.00	Non-Traversable Median	6.00
51	Eight-lane Freeway Speed Change	Entrance	3131+47.000	3132+20.000	73.00	0.0138	2030: 227,400	2.00	Non-Traversable Median	6.00
53	Eight-lane Freeway Speed Change	Entrance	3132+20.000	3132+54.000	34.00	0.0064	2030: 227,400	2.00	Non-Traversable Median	6.00
55	Eight-lane Freeway Speed Change	Entrance	3132+54.000	3132+82.000	28.00	0.0053	2030: 227,400	2.00	Non-Traversable Median	6.00
57	Eight-lane Freeway Speed Change	Entrance	3132+82.000	3133+55.000	73.00	0.0138	2030: 227,400	2.00	Non-Traversable Median	6.00
59	Eight-lane Freeway Speed Change	Entrance	3133+55.000	3134+21.000	66.00	0.0125	2030: 227,400	2.00	Non-Traversable Median	6.00
61	Eight-lane Freeway Speed Change	Entrance	3134+21.000	3134+87.000	66.00	0.0125	2030: 227,400	2.00	Non-Traversable Median	6.00
63	Eight-lane Freeway Speed Change	Entrance	3134+87.000	3135+53.000	66.00	0.0125	2030: 227,400	2.00	Non-Traversable Median	6.00
65	Eight-lane Freeway Speed Change	Entrance	3135+53.000	3136+20.620	67.62	0.0128	2030: 227,400	2.00	Non-Traversable Median	6.00
81	Four-lane Freeway Speed Change	Exit	3206+78.640	3209+38.640	260.00	0.0492	2030: 124,450	2.00	Non-Traversable Median	6.00
82	Four-lane Freeway Speed Change	Exit	3215+47.990	3217+52.990	205.00	0.0388	2030: 124,450	2.00	Non-Traversable Median	6.00
176	Six-lane Freeway Speed Change	Exit	3347+03.140	3347+04.000	0.86	0.0002	2030: 181,700	2.00	Non-Traversable Median	10.00
178	Six-lane Freeway Speed Change	Exit	3347+04.000	3347+47.000	43.00	0.0081	2030: 181,700	2.00	Non-Traversable Median	10.00
180	Six-lane Freeway Speed Change	Exit	3347+47.000	3348+08.000	61.00	0.0116	2030: 181,700	2.00	Non-Traversable Median	10.00
182	Six-lane Freeway Speed Change	Exit	3348+08.000	3348+58.140	50.14	0.0095	2030: 181,700	2.00	Non-Traversable Median	10.00
188	Six-lane Freeway Speed Change	Exit	3354+67.260	3354+87.000	19.74	0.0037	2030: 181,700	2.00	Non-Traversable Median	10.00
190	Six-lane Freeway Speed Change	Exit	3354+87.000	3355+27.000	40.00	0.0076	2030: 181,700	2.00	Non-Traversable Median	10.00
192	Six-lane Freeway Speed Change	Exit	3355+27.000	3355+68.000	41.00	0.0078	2030: 181,700	2.00	Non-Traversable Median	10.00
194	Six-lane Freeway Speed Change	Exit	3355+68.000	3355+87.260	19.26	0.0036	2030: 181,700	2.00	Non-Traversable Median	10.00
221	Eight-lane Freeway Speed Change	Exit	3433+36.550	3436+61.550	325.00	0.0616	2030: 187,050	30.00	Non-Traversable Median	54.00

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
224	Eight-lane Freeway Speed Change	Exit	3447+63.980	3448+17.000	53.02	0.0100	2030: 202,950	29.67	Non-Traversable Median	54.18
226	Eight-lane Freeway Speed Change	Exit	3448+17.000	3448+72.150	55.15	0.0104	2030: 202,950	29.09	Non-Traversable Median	54.60
228	Seven-lane Freeway Speed Change	Exit	3448+72.150	3449+25.000	52.85	0.0100	2030: 181,950	28.50	Non-Traversable Median	55.03
230	Seven-lane Freeway Speed Change	Exit	3449+25.000	3450+00.000	75.00	0.0142	2030: 181,950	27.81	Non-Traversable Median	55.53
232	Seven-lane Freeway Speed Change	Exit	3450+00.000	3450+19.000	19.00	0.0036	2030: 181,950	27.30	Non-Traversable Median	56.02
234	Seven-lane Freeway Speed Change	Exit	3450+19.000	3450+68.980	49.98	0.0095	2030: 181,950	26.93	Non-Traversable Median	56.75

Table 3. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**7.7266**
Average Future Road AADT (vpd)	**175,065**
Predicted Crashes	
Total Crashes	**563.47**
Fatal and Injury Crashes	**145.90**
Property-Damage-Only Crashes	**417.57**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**26**
Percent Property-Damage-Only Crashes (%)	**74**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**72.9257**
FI Crash Rate (crashes/mi/yr)	**18.8832**
PDO Crash Rate (crashes/mi/yr)	**54.0425**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**493.72**
Travel Crash Rate (crashes/million veh-mi)	**1.14**
Travel FI Crash Rate (crashes/million veh-mi)	**0.30**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.85**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Table 4. Predicted Freeway Speed Change Lane Crash Rates and Frequencies Summary (Speed Change)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Length (mi)	**0.4081**
Average Future Road AADT (vpd)	**93,643**
Predicted Crashes	
Total Crashes	**10.71**
Fatal and Injury Crashes	**3.47**
Property-Damage-Only Crashes	**7.25**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**32**
Percent Property-Damage-Only Crashes (%)	**68**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**26.2514**
FI Crash Rate (crashes/mi/yr)	**8.5007**
PDO Crash Rate (crashes/mi/yr)	**17.7507**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**13.95**
Travel Crash Rate (crashes/million veh-mi)	**0.77**
Travel FI Crash Rate (crashes/million veh-mi)	**0.25**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.52**

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 5. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	3058+00.000	3065+13.000	0.1350	10.632	10.6322	2.7398	7.8924	78.7347	1.06
2	3065+13.000	3065+38.000	0.0047	0.373	0.3728	0.0961	0.2767	78.7347	1.06
3	3065+38.000	3067+33.000	0.0369	2.904	2.9040	0.7455	2.1585	78.6318	1.06
4	3067+33.000	3068+88.000	0.0294	2.303	2.3030	0.5873	1.7157	78.4512	1.05
5	3068+88.000	3077+84.000	0.1697	13.021	13.0215	3.3846	9.6370	76.7341	1.03
6	3077+84.000	3079+00.000	0.0220	2.081	2.0814	0.5455	1.5359	94.7380	1.20

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
7	3079+00.000	3081+51.000	0.0475	4.457	4.4573	1.1546	3.3027	93.7634	1.19
8	3081+51.000	3082+31.000	0.0152	1.457	1.4566	0.3771	1.0795	96.1332	1.22
9	3082+31.000	3084+00.000	0.0320	3.693	3.6933	0.9633	2.7300	115.3881	1.35
10	3084+00.000	3084+73.000	0.0138	1.536	1.5364	0.4012	1.1351	111.1251	1.30
11	3084+73.000	3085+07.000	0.0064	0.648	0.6480	0.1748	0.4731	100.6237	1.17
12	3085+07.000	3085+84.000	0.0146	1.441	1.4408	0.3886	1.0522	98.7975	1.15
13	3085+84.000	3086+81.000	0.0184	1.781	1.7808	0.4776	1.3032	96.9353	1.13
14	3086+81.000	3087+80.000	0.0187	1.778	1.7780	0.4731	1.3049	94.8282	1.11
15	3087+80.000	3088+10.000	0.0057	0.589	0.5890	0.1505	0.4385	103.6682	1.21
16	3088+10.000	3088+58.000	0.0091	0.938	0.9378	0.2391	0.6987	103.1579	1.20
17	3088+58.000	3098+27.000	0.1835	16.531	16.5314	4.2267	12.3047	90.0784	1.05
18	3098+27.000	3100+36.000	0.0396	3.175	3.1746	0.8183	2.3563	80.2001	1.02
19	3100+36.000	3112+00.000	0.2205	19.672	19.6721	5.0989	14.5732	89.2344	1.08
20	3112+00.000	3113+01.000	0.0191	1.661	1.6607	0.4332	1.2275	86.8160	1.05
21	3113+01.000	3115+01.000	0.0379	3.408	3.4077	0.8895	2.5182	89.9625	1.09
22	3115+01.000	3116+09.000	0.0205	1.702	1.7018	0.4370	1.2647	83.1972	1.01
23	3116+09.000	3116+43.000	0.0064	0.502	0.5020	0.1277	0.3742	77.9525	1.05
24	3116+43.000	3117+86.000	0.0271	2.131	2.1312	0.5427	1.5885	78.6892	1.06
25	3117+86.000	3118+00.000	0.0027	0.210	0.2104	0.0536	0.1568	79.3592	1.06
26	3118+00.000	3120+00.000	0.0379	3.018	3.0181	0.7694	2.2486	79.6771	1.07
27	3120+00.000	3120+27.000	0.0051	0.409	0.4089	0.1043	0.3046	79.9538	1.07
28	3120+27.000	3120+55.000	0.0053	0.424	0.4245	0.1086	0.3159	80.0553	1.07
29	3120+55.000	3121+10.000	0.0104	0.837	0.8370	0.2163	0.6207	80.3522	1.08
30	3121+10.000	3121+64.000	0.0102	0.838	0.8384	0.2185	0.6200	81.9816	1.10
31	3121+64.000	3123+42.000	0.0337	2.813	2.8128	0.7405	2.0723	83.4365	1.12
32	3123+42.000	3123+89.000	0.0089	0.751	0.7507	0.2007	0.5500	84.3344	1.13
33	3123+89.000	3124+36.000	0.0089	0.737	0.7372	0.2017	0.5355	82.8166	1.11
34	3124+36.000	3129+76.000	0.1022	8.542	8.5424	2.4596	6.0828	83.5884	1.12
36	3129+76.000	3130+00.000	0.0023	0.239	0.2395	0.0675	0.1720	105.3798	1.37
38	3130+00.000	3130+49.000	0.0046	0.484	0.4836	0.1365	0.3472	104.2290	1.35
40	3130+49.000	3130+56.000	0.0000	0.000	0.0000	0.0000	0.0000	0.0000	0.00
43	3130+56.000	3130+98.000	0.0000	0.000	0.0000	0.0000	0.0000	0.0000	0.00
46	3130+98.000	3131+47.000	0.0000	0.000	0.0000	0.0000	0.0000	0.0000	0.00
49	3131+47.000	3132+20.000	0.0023	0.305	0.3050	0.0807	0.2243	129.8042	1.56
52	3132+20.000	3132+54.000	0.0032	0.411	0.4112	0.1090	0.3022	127.7113	1.54
54	3132+54.000	3132+82.000	0.0027	0.337	0.3369	0.0899	0.2469	127.0544	1.53
56	3132+82.000	3133+55.000	0.0069	0.870	0.8699	0.2324	0.6375	125.8313	1.52
58	3133+55.000	3134+21.000	0.0063	0.777	0.7769	0.2057	0.5712	124.2989	1.50
60	3134+21.000	3134+87.000	0.0063	0.771	0.7711	0.2016	0.5695	123.3746	1.49
62	3134+87.000	3135+53.000	0.0063	0.769	0.7695	0.1988	0.5707	123.1172	1.48
64	3135+53.000	3137+16.960	0.0246	3.099	3.0995	0.7908	2.3087	125.7437	1.51
66	3137+16.960	3137+43.660	0.0051	0.454	0.4543	0.1119	0.3425	89.8463	1.39
67	3137+43.660	3144+71.000	0.1378	6.985	6.9852	1.7494	5.2358	50.7077	1.10
68	3144+71.000	3148+95.000	0.0803	4.051	4.0508	1.0355	3.0153	50.4436	1.10
69	3148+95.000	3155+00.820	0.1147	6.728	6.7278	1.6471	5.0807	58.6358	1.28
70	3155+00.820	3160+76.980	0.1091	5.518	5.5175	1.3512	4.1663	50.5627	1.13
71	3160+76.980	3162+67.000	0.0360	2.252	2.2519	0.5508	1.7012	62.5737	1.35
72	3162+67.000	3164+27.000	0.0303	1.678	1.6778	0.4296	1.2481	55.3658	1.20
73	3164+27.000	3171+98.500	0.1461	8.504	8.5043	2.0824	6.4219	58.2017	1.26

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
74	3171+98.500	3173+37.000	0.0262	1.500	1.5000	0.3846	1.1154	57.1831	1.24
75	3173+37.000	3174+22.610	0.0162	1.039	1.0388	0.2545	0.7843	64.0659	1.38
76	3174+22.610	3182+41.770	0.1551	8.282	8.2816	2.0432	6.2384	53.3803	1.20
77	3182+41.770	3196+82.610	0.2729	11.923	11.9233	3.0001	8.9232	43.6932	1.08
78	3196+82.610	3205+27.280	0.1600	8.623	8.6227	2.2505	6.3721	53.8999	1.24
79	3205+27.280	3206+78.640	0.0287	1.387	1.3868	0.3454	1.0414	48.3764	1.13
80	3206+78.640	3217+52.990	0.1594	9.419	9.4187	2.3210	7.0977	59.0730	1.30
83	3217+52.990	3221+02.210	0.0661	3.303	3.3025	0.8120	2.4905	49.9312	1.13
84	3221+02.210	3222+09.000	0.0202	1.253	1.2534	0.3083	0.9452	61.9722	1.37
85	3222+09.000	3225+00.000	0.0551	2.960	2.9598	0.7619	2.1980	53.7043	1.19
86	3225+00.000	3226+26.000	0.0239	1.347	1.3473	0.3296	1.0177	56.4582	1.25
87	3226+26.000	3228+76.000	0.0473	2.539	2.5392	0.6276	1.9116	53.6288	1.19
88	3228+76.000	3230+00.000	0.0235	1.197	1.1974	0.2978	0.8995	50.9846	1.13
89	3230+00.000	3231+01.000	0.0191	0.962	0.9616	0.2390	0.7226	50.2686	1.11
90	3231+01.000	3233+01.000	0.0379	1.778	1.7781	0.4451	1.3331	46.9430	1.04
91	3233+01.000	3233+14.630	0.0026	0.119	0.1191	0.0298	0.0893	46.1333	1.02
92	3233+14.630	3234+00.000	0.0162	1.177	1.1772	0.2939	0.8833	72.8098	1.19
93	3234+00.000	3234+05.270	0.0000	0.000	0.0000	0.0000	0.0000	0.0000	0.00
94	3234+05.270	3235+40.000	0.0255	2.597	2.5972	0.6684	1.9288	101.7840	1.30
95	3235+40.000	3235+71.000	0.0059	0.580	0.5802	0.1493	0.4308	98.8128	1.27
96	3235+71.000	3236+00.000	0.0055	0.534	0.5344	0.1375	0.3969	97.2995	1.25
97	3236+00.000	3237+44.000	0.0273	2.599	2.5987	0.6684	1.9302	95.2856	1.22
98	3237+44.000	3239+23.000	0.0339	3.077	3.0769	0.8001	2.2768	90.7589	1.16
99	3239+23.000	3239+58.000	0.0066	0.591	0.5905	0.1542	0.4362	89.0737	1.14
100	3239+58.000	3241+00.000	0.0269	2.485	2.4851	0.6460	1.8390	92.4031	1.18
101	3241+00.000	3244+00.000	0.0568	5.614	5.6135	1.4462	4.1673	98.7974	1.26
102	3244+00.000	3244+76.000	0.0144	1.514	1.5141	0.3887	1.1253	105.1872	1.35
103	3244+76.000	3245+30.000	0.0102	0.949	0.9491	0.2431	0.7059	92.7968	1.19
104	3245+30.000	3246+26.000	0.0182	1.674	1.6741	0.4132	1.2609	92.0780	1.24
105	3246+26.000	3247+00.000	0.0140	1.309	1.3094	0.3211	0.9883	93.4303	1.26
106	3247+00.000	3248+58.200	0.0300	2.877	2.8769	0.7030	2.1739	96.0194	1.29
107	3248+58.200	3257+00.000	0.1594	12.888	12.8881	3.0549	9.8331	80.8374	1.15
108	3257+00.000	3258+01.000	0.0191	1.500	1.5003	0.3649	1.1354	78.4337	1.11
109	3258+01.000	3258+41.000	0.0076	0.619	0.6190	0.1509	0.4682	81.7086	1.16
110	3258+41.000	3258+71.000	0.0057	0.615	0.6152	0.1533	0.4619	108.2807	1.44
111	3258+71.000	3259+00.000	0.0055	0.596	0.5962	0.1487	0.4475	108.5558	1.44
112	3259+00.000	3259+07.000	0.0013	0.152	0.1519	0.0380	0.1140	114.6123	1.52
113	3259+07.000	3259+51.000	0.0083	1.055	1.0553	0.2890	0.7663	126.6314	1.57
114	3259+51.000	3264+55.000	0.0955	11.272	11.2724	3.1266	8.1458	118.0916	1.47
115	3264+55.000	3264+85.000	0.0057	0.672	0.6721	0.1865	0.4856	118.2876	1.47
116	3264+85.000	3265+00.000	0.0028	0.340	0.3397	0.0943	0.2454	119.5754	1.49
117	3265+00.000	3265+13.000	0.0025	0.296	0.2965	0.0823	0.2142	120.4226	1.50
118	3265+13.000	3265+51.000	0.0072	0.874	0.8740	0.2424	0.6316	121.4338	1.51
119	3265+51.000	3265+87.000	0.0068	0.837	0.8370	0.2318	0.6051	122.7575	1.52
120	3265+87.000	3266+44.000	0.0108	1.341	1.3415	0.3708	0.9707	124.2621	1.54
121	3266+44.000	3267+00.000	0.0106	1.338	1.3383	0.3687	0.9696	126.1788	1.57
122	3267+00.000	3267+04.000	0.0000	0.000	0.0000	0.0000	0.0000	0.0000	0.00
123	3267+04.000	3267+28.700	0.0047	0.479	0.4791	0.1295	0.3496	102.4228	1.39
124	3267+28.700	3274+00.000	0.1271	10.482	10.4824	2.7765	7.7058	82.4472	1.18

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
125	3274+00.000	3274+68.000	0.0129	1.088	1.0882	0.2875	0.8008	84.4977	1.21
126	3274+68.000	3275+30.000	0.0117	1.001	1.0011	0.2646	0.7365	85.2546	1.22
127	3275+30.000	3275+34.000	0.0000	0.000	0.0000	0.0000	0.0000	0.0000	0.00
128	3275+34.000	3284+26.000	0.1689	14.550	14.5496	3.8470	10.7027	86.1232	1.24
129	3284+26.000	3288+39.000	0.0782	6.842	6.8416	1.8110	5.0307	87.4666	1.25
130	3288+39.000	3289+10.000	0.0134	1.468	1.4675	0.3983	1.0692	109.1329	1.50
131	3289+10.000	3289+67.480	0.0109	1.199	1.1988	0.3262	0.8726	110.1222	1.52
132	3289+67.480	3292+04.000	0.0448	5.262	5.2621	1.4728	3.7893	117.4696	1.50
133	3292+04.000	3292+84.000	0.0152	1.428	1.4277	0.3976	1.0301	94.2279	1.29
134	3292+84.000	3294+33.000	0.0282	2.606	2.6063	0.7286	1.8778	92.3592	1.26
135	3294+33.000	3295+81.000	0.0280	2.632	2.6325	0.7367	1.8958	93.9145	1.28
136	3295+81.000	3296+00.000	0.0036	0.340	0.3395	0.0950	0.2444	94.3394	1.29
137	3296+00.000	3296+20.000	0.0038	0.358	0.3584	0.1003	0.2581	94.6213	1.29
138	3296+20.000	3296+55.670	0.0068	0.643	0.6430	0.1798	0.4632	95.1760	1.30
139	3296+55.670	3296+60.000	0.0000	0.000	0.0000	0.0000	0.0000	0.0000	0.00
140	3296+60.000	3296+65.000	0.0000	0.000	0.0000	0.0000	0.0000	0.0000	0.00
141	3296+65.000	3297+00.000	0.0066	0.509	0.5090	0.1395	0.3694	76.7831	1.09
142	3297+00.000	3297+29.000	0.0055	0.419	0.4193	0.1151	0.3042	76.3409	1.09
143	3297+29.000	3298+78.000	0.0282	2.121	2.1211	0.5840	1.5370	75.1632	1.07
144	3298+78.000	3300+26.000	0.0280	2.060	2.0602	0.5703	1.4899	73.5001	1.05
145	3300+26.000	3306+86.000	0.1250	9.941	9.9407	2.6848	7.2559	79.5257	1.13
146	3306+86.000	3308+57.000	0.0324	3.138	3.1384	0.7949	2.3435	96.9042	1.38
147	3308+57.000	3310+28.000	0.0324	3.076	3.0762	0.7792	2.2970	94.9832	1.35
148	3310+28.000	3311+93.000	0.0312	3.022	3.0220	0.7609	2.2611	96.7033	1.38
149	3311+93.000	3311+99.000	0.0011	0.127	0.1273	0.0309	0.0965	112.0638	1.60
150	3311+99.000	3312+75.000	0.0144	1.617	1.6175	0.3921	1.2254	112.3758	1.60
151	3312+75.000	3312+83.000	0.0015	0.212	0.2117	0.0521	0.1596	139.7154	1.86
152	3312+83.000	3313+69.000	0.0163	2.491	2.4911	0.6327	1.8583	152.9413	1.99
153	3313+69.000	3314+42.000	0.0138	2.030	2.0303	0.5165	1.5138	146.8493	1.91
154	3314+42.000	3314+55.000	0.0025	0.355	0.3547	0.0903	0.2644	144.0706	1.87
155	3314+55.000	3315+40.000	0.0161	2.277	2.2770	0.5799	1.6971	141.4429	1.84
156	3315+40.000	3316+18.000	0.0148	2.039	2.0386	0.5194	1.5193	137.9996	1.79
157	3316+18.000	3316+64.000	0.0087	1.188	1.1881	0.3027	0.8854	136.3778	1.77
158	3316+64.000	3317+11.000	0.0089	1.209	1.2091	0.3081	0.9011	135.8341	1.76
159	3317+11.000	3317+55.000	0.0083	1.125	1.1254	0.2866	0.8388	135.0426	1.75
160	3317+55.000	3317+67.000	0.0023	0.305	0.3054	0.0777	0.2277	134.3857	1.75
161	3317+67.000	3318+00.000	0.0063	0.824	0.8241	0.2093	0.6148	131.8602	1.71
162	3318+00.000	3318+51.000	0.0097	1.173	1.1726	0.3054	0.8672	121.3940	1.58
163	3318+51.000	3318+81.330	0.0057	0.628	0.6276	0.1691	0.4585	109.2537	1.42
164	3318+81.330	3319+00.000	0.0035	0.305	0.3055	0.0808	0.2247	86.4039	1.22
165	3319+00.000	3322+27.000	0.0619	5.123	5.1228	1.3587	3.7641	82.7161	1.17
166	3322+27.000	3327+28.000	0.0949	8.033	8.0334	2.0825	5.9509	84.6630	1.19
167	3327+28.000	3328+81.000	0.0290	2.589	2.5892	0.6671	1.9221	89.3544	1.26
168	3328+81.000	3328+89.000	0.0015	0.116	0.1161	0.0304	0.0857	76.6091	1.08
169	3328+89.000	3329+17.000	0.0053	0.358	0.3583	0.0920	0.2663	67.5685	1.07
170	3329+17.000	3332+62.000	0.0653	4.474	4.4742	1.1382	3.3360	68.4745	1.08
171	3332+62.000	3342+00.000	0.1777	12.662	12.6616	3.1624	9.4992	71.2720	1.13
172	3342+00.000	3344+51.000	0.0475	3.392	3.3919	0.8474	2.5445	71.3508	1.13
173	3344+51.000	3345+00.000	0.0093	0.662	0.6623	0.1661	0.4962	71.3657	1.13

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
174	3345+00.000	3346+24.000	0.0235	1.604	1.6044	0.4126	1.1918	68.3169	1.08
175	3346+24.000	3347+04.000	0.0151	1.026	1.0264	0.2741	0.7523	68.1103	1.08
177	3347+04.000	3347+47.000	0.0041	0.355	0.3555	0.0948	0.2607	87.3069	1.32
179	3347+47.000	3348+08.000	0.0058	0.496	0.4960	0.1325	0.3635	85.8617	1.29
181	3348+08.000	3349+00.000	0.0127	1.052	1.0516	0.2708	0.7809	82.9619	1.25
183	3349+00.000	3349+17.000	0.0032	0.264	0.2636	0.0677	0.1959	81.8701	1.23
184	3349+17.000	3349+51.000	0.0064	0.523	0.5230	0.1331	0.3899	81.2195	1.23
185	3349+51.000	3349+84.000	0.0063	0.503	0.5028	0.1265	0.3762	80.4413	1.21
186	3349+84.000	3354+66.000	0.0913	7.245	7.2449	1.8083	5.4366	79.3628	1.20
187	3354+66.000	3354+87.000	0.0021	0.171	0.1706	0.0425	0.1281	80.9491	1.22
189	3354+87.000	3355+27.000	0.0038	0.328	0.3275	0.0814	0.2461	86.4675	1.30
191	3355+27.000	3355+68.000	0.0039	0.450	0.4501	0.1068	0.3433	115.9402	1.75
193	3355+68.000	3355+88.000	0.0020	0.198	0.1984	0.0471	0.1513	101.0130	1.52
195	3355+88.000	3366+12.000	0.1939	15.515	15.5149	3.7694	11.7455	79.9988	1.36
196	3366+12.000	3373+06.480	0.1315	9.870	9.8705	2.4709	7.3996	75.0437	1.20
197	3373+06.480	3384+16.000	0.2101	15.473	15.4729	4.0649	11.4080	73.6325	1.07
198	3384+16.000	3391+05.000	0.1305	8.464	8.4642	2.1929	6.2713	64.8637	1.04
199	3391+05.000	3391+55.000	0.0095	0.619	0.6186	0.1593	0.4593	65.3238	1.04
200	3391+55.000	3392+54.000	0.0187	1.211	1.2108	0.3115	0.8993	64.5764	1.03
201	3392+54.000	3393+52.000	0.0186	1.180	1.1803	0.3033	0.8770	63.5900	1.02
202	3393+52.000	3394+51.000	0.0187	1.175	1.1748	0.3015	0.8733	62.6544	1.00
203	3394+51.000	3395+00.000	0.0093	0.565	0.5646	0.1458	0.4188	60.8436	0.97
204	3395+00.000	3398+59.810	0.0681	4.095	4.0949	1.0630	3.0319	60.0895	0.96
205	3398+59.810	3399+60.000	0.0190	1.375	1.3755	0.3574	1.0181	72.4865	1.10
206	3399+60.000	3400+43.000	0.0157	1.113	1.1130	0.2895	0.8235	70.8041	1.08
207	3400+43.000	3403+50.000	0.0581	3.686	3.6855	1.0213	2.6642	63.3866	0.97
208	3403+50.000	3404+03.000	0.0100	0.626	0.6262	0.1741	0.4521	62.3836	0.95
209	3404+03.000	3404+21.020	0.0034	0.213	0.2132	0.0593	0.1539	62.4550	0.95
210	3404+21.020	3405+78.000	0.0297	2.136	2.1363	0.5966	1.5397	71.8557	1.04
211	3405+78.000	3407+78.000	0.0379	2.687	2.6868	0.7504	1.9363	70.9303	1.02
212	3407+78.000	3408+00.000	0.0042	0.260	0.2599	0.0724	0.1875	62.3829	0.90
213	3408+00.000	3408+14.000	0.0027	0.158	0.1578	0.0440	0.1138	59.5269	0.92
214	3408+14.000	3408+41.000	0.0051	0.300	0.2998	0.0835	0.2163	58.6219	0.91
215	3408+41.000	3408+67.000	0.0049	0.283	0.2831	0.0787	0.2044	57.4886	0.89
216	3408+67.000	3408+94.000	0.0051	0.288	0.2884	0.0801	0.2083	56.3959	0.87
217	3408+94.000	3409+07.000	0.0025	0.137	0.1369	0.0380	0.0989	55.5960	0.86
218	3409+07.000	3418+70.490	0.1825	10.356	10.3558	2.8471	7.5086	56.7505	0.88
219	3418+70.490	3433+36.550	0.2777	13.949	13.9491	3.7961	10.1530	50.2376	0.84
220	3433+36.550	3439+11.620	0.0781	5.069	5.0688	1.3513	3.7176	64.8701	0.95
222	3439+11.620	3447+63.000	0.1612	11.977	11.9774	3.1741	8.8032	74.2801	1.00
223	3447+63.000	3448+17.000	0.0052	0.439	0.4393	0.1136	0.3257	84.3722	1.14
225	3448+17.000	3448+72.150	0.0052	0.449	0.4493	0.1162	0.3331	86.0277	1.16
227	3448+72.150	3449+25.000	0.0050	0.327	0.3270	0.0843	0.2427	65.3426	0.98
229	3449+25.000	3450+00.000	0.0071	0.471	0.4708	0.1212	0.3496	66.2892	1.00
231	3450+00.000	3450+19.000	0.0018	0.120	0.1204	0.0310	0.0894	66.9379	1.01
233	3450+19.000	3450+68.980	0.0047	0.319	0.3194	0.0822	0.2372	67.4872	1.02
235	3450+68.980	3450+81.000	0.0023	0.104	0.1045	0.0272	0.0773	45.8820	0.85
236	3450+81.000	3451+44.000	0.0119	0.547	0.5470	0.1422	0.4047	45.8404	0.85
237	3451+44.000	3452+07.000	0.0119	0.546	0.5462	0.1420	0.4042	45.7780	0.85

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
238	3452+07.000	3452+23.000	0.0030	0.139	0.1386	0.0360	0.1026	45.7434	0.85
239	3452+23.000	3452+69.000	0.0087	0.398	0.3983	0.1035	0.2948	45.7188	0.85
240	3452+69.000	3453+00.000	0.0059	0.268	0.2683	0.0697	0.1985	45.6906	0.85
241	3453+00.000	3453+51.000	0.0097	0.441	0.4411	0.1146	0.3265	45.6637	0.85
242	3453+51.000	3454+52.000	0.0191	0.873	0.8727	0.2267	0.6459	45.6206	0.85
243	3454+52.000	3455+52.000	0.0189	0.863	0.8632	0.2242	0.6389	45.5744	0.85
244	3455+52.000	3456+53.000	0.0191	0.908	0.9085	0.2323	0.6762	47.4945	0.88
245	3456+53.000	3457+03.000	0.0095	0.462	0.4616	0.1168	0.3448	48.7417	0.91
246	3457+03.000	3459+52.000	0.0472	2.297	2.2971	0.5811	1.7160	48.7103	0.91
247	3459+52.000	3466+51.000	0.1324	6.442	6.4422	1.6292	4.8130	48.6622	0.90
248	3466+51.000	3467+74.000	0.0233	1.133	1.1330	0.2865	0.8465	48.6372	0.90
249	3467+74.000	3477+00.000	0.1754	8.114	8.1137	2.1462	5.9675	46.2637	0.86
Total			7.7266	563.470	563.4695	145.9034	417.5661	72.9257	1.14

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 6. Predicted Crash Frequencies and Rates by Freeway Speed Change Lane (Speed Change)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
35	3129+75.190	3129+76.000	0.0002	0.004	0.0044	0.0014	0.0030	28.3830	0.74
37	3129+76.000	3130+00.000	0.0045	0.129	0.1290	0.0407	0.0883	28.3830	0.74
39	3130+00.000	3130+49.000	0.0093	0.263	0.2634	0.0830	0.1804	28.3830	0.74
41	3130+49.000	3130+56.000	0.0013	0.038	0.0376	0.0119	0.0258	28.3830	0.74
42	3130+55.620	3130+56.000	0.0001	0.003	0.0027	0.0009	0.0018	37.5489	0.91
44	3130+56.000	3130+98.000	0.0080	0.242	0.2416	0.0761	0.1655	30.3731	0.73
45	3130+56.000	3130+98.000	0.0080	0.299	0.2987	0.1018	0.1968	37.5489	0.91
47	3130+98.000	3131+47.000	0.0093	0.282	0.2819	0.0887	0.1931	30.3731	0.73
48	3130+98.000	3131+47.000	0.0093	0.348	0.3485	0.1188	0.2296	37.5489	0.91
50	3131+47.000	3131+95.190	0.0091	0.277	0.2772	0.0873	0.1899	30.3731	0.73
51	3131+47.000	3132+20.000	0.0138	0.519	0.5191	0.1770	0.3421	37.5489	0.91
53	3132+20.000	3132+54.000	0.0064	0.242	0.2418	0.0824	0.1593	37.5489	0.91
55	3132+54.000	3132+82.000	0.0053	0.199	0.1991	0.0679	0.1312	37.5489	0.91
57	3132+82.000	3133+55.000	0.0138	0.519	0.5191	0.1770	0.3421	37.5489	0.91
59	3133+55.000	3134+21.000	0.0125	0.469	0.4694	0.1600	0.3093	37.5489	0.91
61	3134+21.000	3134+87.000	0.0125	0.469	0.4694	0.1600	0.3093	37.5489	0.91
63	3134+87.000	3135+53.000	0.0125	0.469	0.4694	0.1600	0.3093	37.5489	0.91
65	3135+53.000	3136+20.620	0.0128	0.481	0.4809	0.1640	0.3169	37.5501	0.91
81	3206+78.640	3209+38.640	0.0492	0.846	0.8461	0.2617	0.5843	17.1815	0.76
82	3215+47.990	3217+52.990	0.0388	0.684	0.6837	0.2204	0.4633	17.6091	0.78
176	3347+03.140	3347+04.000	0.0002	0.004	0.0040	0.0014	0.0027	24.8541	0.75
178	3347+04.000	3347+47.000	0.0081	0.202	0.2024	0.0690	0.1334	24.8541	0.75
180	3347+47.000	3348+08.000	0.0116	0.287	0.2871	0.0979	0.1892	24.8541	0.75
182	3348+08.000	3348+58.140	0.0095	0.236	0.2360	0.0805	0.1555	24.8541	0.75
188	3354+67.260	3354+87.000	0.0037	0.097	0.0968	0.0356	0.0612	25.8898	0.78
190	3354+87.000	3355+27.000	0.0076	0.204	0.2040	0.0739	0.1301	26.9287	0.81
192	3355+27.000	3355+68.000	0.0078	0.251	0.2511	0.0852	0.1659	32.3398	0.97
194	3355+68.000	3355+87.260	0.0036	0.118	0.1180	0.0400	0.0779	32.3398	0.97
221	3433+36.550	3436+61.550	0.0616	1.296	1.2960	0.3797	0.9163	21.0548	0.62
224	3447+63.980	3448+17.000	0.0100	0.229	0.2288	0.0675	0.1613	22.7850	0.61
226	3448+17.000	3448+72.150	0.0104	0.238	0.2380	0.0702	0.1678	22.7850	0.61
228	3448+72.150	3449+25.000	0.0100	0.206	0.2062	0.0610	0.1452	20.5989	0.62
230	3449+25.000	3450+00.000	0.0142	0.293	0.2933	0.0866	0.2066	20.6467	0.62
232	3450+00.000	3450+19.000	0.0036	0.074	0.0743	0.0219	0.0524	20.6480	0.62
234	3450+19.000	3450+68.980	0.0095	0.196	0.1955	0.0577	0.1377	20.6480	0.62
Total			0.4081	10.714	10.7144	3.4695	7.2448	26.2514	0.77

Note: *Travel Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment**

AADTs based on the assumption of 50/50 directional distribution.

Table 7. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	3058+00.000	3079+50.501	0.4073	32.212	32.2117	8.3310	23.8807	79.0875	1.06
Simple Curve 1	3079+50.501	3093+78.345	0.2704	26.298	26.2984	6.8373	19.4611	97.2485	1.15
Simple Curve 2	3093+78.345	3096+77.160	0.0566	5.098	5.0979	1.3034	3.7945	90.0784	1.05
Simple Curve 3	3096+77.160	3105+41.191	0.1636	14.269	14.2689	3.6848	10.5840	87.1955	1.06
Tangent	3105+41.191	3136+20.057	0.5831	50.598	50.5981	13.7925	36.8056	86.7716	1.34
Simple Curve 4	3136+20.057	3138+86.459	0.0505	3.662	3.6616	0.9241	2.7375	72.5721	1.28
Tangent	3138+86.459	3165+74.797	0.5092	27.469	27.4687	6.8191	20.6496	53.9495	1.18
Simple Curve 5	3165+74.797	3168+01.375	0.0429	2.498	2.4976	0.6116	1.8860	58.2017	1.26
Tangent	3168+01.375	3182+09.730	0.2667	14.874	14.8740	3.6744	11.1996	55.7633	1.23
Simple Curve 6	3182+09.730	3183+34.300	0.0236	1.090	1.0896	0.2726	0.8170	46.1847	1.11
Tangent	3183+34.300	3200+96.777	0.3338	15.386	15.3855	3.9109	11.4746	46.0917	1.12
Simple Curve 7	3200+96.777	3203+03.737	0.0392	2.113	2.1127	0.5514	1.5613	53.8999	1.24
Tangent	3203+03.737	3215+28.342	0.2319	11.964	11.9641	3.0384	8.9257	51.5842	1.43
Simple Curve 8	3215+28.342	3217+34.090	0.0390	2.424	2.4244	0.6446	1.7798	62.2165	2.00
Simple Curve 9	3217+34.090	3220+09.173	0.0521	2.651	2.6514	0.6568	1.9945	50.8908	1.20
Tangent	3220+09.173	3225+63.235	0.1049	5.769	5.7692	1.4519	4.3174	54.9786	1.22
Simple Curve 10	3225+63.235	3231+29.979	0.1073	5.627	5.6270	1.3931	4.2339	52.4229	1.16
Tangent	3231+29.979	3240+05.342	0.1658	13.623	13.6231	3.4977	10.1254	82.1718	1.17
Simple Curve 11	3240+05.342	3246+54.523	0.1230	11.912	11.9120	3.0457	8.8664	96.8845	1.25
Tangent	3246+54.523	3253+48.868	0.1315	11.194	11.1939	2.6810	8.5128	85.1213	1.19
Simple Curve 12	3253+48.868	3259+10.490	0.1064	8.942	8.9423	2.1530	6.7893	84.0699	1.18
Tangent	3259+10.490	3305+02.293	0.8697	80.604	80.6041	21.8671	58.7370	92.6846	1.27
Simple Curve 13	3305+02.293	3318+28.795	0.2512	28.466	28.4660	7.2530	21.2130	113.3058	1.54
Tangent	3318+28.795	3324+49.595	0.1176	10.136	10.1356	2.6668	7.4688	86.2051	1.20
Simple Curve 14	3324+49.595	3328+33.823	0.0728	6.255	6.2550	1.6187	4.6363	85.9551	1.21
Tangent	3328+33.823	3355+20.557	0.5089	36.974	36.9738	9.4198	27.5540	72.6614	1.21
Simple Curve 15	3355+20.557	3367+80.379	0.2386	19.011	19.0113	4.6728	14.3386	79.6777	1.41
Tangent	3367+80.379	3449+27.043	1.5429	98.077	98.0773	26.1261	71.9512	63.5656	1.02
Simple Curve 16	3449+27.043	3459+02.275	0.1847	8.841	8.8411	2.2954	6.5456	47.8663	0.98
Simple Curve 17	3459+02.275	3469+56.776	0.1997	9.636	9.6355	2.4553	7.1801	48.2458	0.90
Tangent	3469+56.776	3477+00.000	0.1408	6.512	6.5122	1.7225	4.7896	46.2637	0.86

Table 8. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	574.18	149.37	26.015	424.81	73.985
Total	574.18	149.37	26.015	424.81	73.985
Average	574.18	149.37	26.015	424.81	73.985

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 9. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0435	0.1151	0.8374	1.7438	7.8924
2	0.0015	0.0040	0.0294	0.0611	0.2767
3	0.0118	0.0313	0.2278	0.4745	2.1585
4	0.0093	0.0247	0.1795	0.3738	1.7157
5	0.0557	0.1463	1.0544	2.1281	9.6370
6	0.0099	0.0255	0.1791	0.3308	1.5359
7	0.0238	0.0628	0.4022	0.6658	3.3027
8	0.0080	0.0213	0.1332	0.2147	1.0795
9	0.0205	0.0543	0.3402	0.5484	2.7300
10	0.0085	0.0226	0.1417	0.2284	1.1351
11	0.0037	0.0099	0.0617	0.0995	0.4731
12	0.0083	0.0219	0.1372	0.2212	1.0522
13	0.0098	0.0263	0.1661	0.2753	1.3032
14	0.0094	0.0253	0.1614	0.2770	1.3049
15	0.0028	0.0077	0.0499	0.0901	0.4385
16	0.0044	0.0121	0.0787	0.1438	0.6987
17	0.0830	0.2244	1.4359	2.4833	12.3047
18	0.0174	0.0461	0.2889	0.4658	2.3563
19	0.0900	0.2396	1.6436	3.1257	14.5732
20	0.0074	0.0193	0.1375	0.2691	1.2275
21	0.0152	0.0395	0.2823	0.5524	2.5182
22	0.0075	0.0194	0.1387	0.2714	1.2647
23	0.0022	0.0057	0.0405	0.0793	0.3742
24	0.0093	0.0241	0.1723	0.3370	1.5885
25	0.0009	0.0024	0.0170	0.0333	0.1568
26	0.0131	0.0342	0.2442	0.4778	2.2486
27	0.0018	0.0046	0.0331	0.0648	0.3046
28	0.0019	0.0048	0.0345	0.0675	0.3159
29	0.0037	0.0096	0.0687	0.1343	0.6207
30	0.0036	0.0094	0.0680	0.1374	0.6200
31	0.0118	0.0311	0.2263	0.4713	2.0723
32	0.0032	0.0084	0.0614	0.1278	0.5500

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
33	0.0034	0.0089	0.0636	0.1258	0.5355
34	0.0433	0.1121	0.7937	1.5104	6.0828
36	0.0012	0.0032	0.0222	0.0408	0.1720
38	0.0025	0.0064	0.0449	0.0826	0.3472
40	0.0000	0.0000	0.0000	0.0000	0.0000
43	0.0000	0.0000	0.0000	0.0000	0.0000
46	0.0000	0.0000	0.0000	0.0000	0.0000
49	0.0013	0.0034	0.0247	0.0514	0.2243
52	0.0017	0.0046	0.0333	0.0694	0.3022
54	0.0014	0.0038	0.0275	0.0572	0.2469
56	0.0037	0.0098	0.0710	0.1479	0.6375
58	0.0033	0.0086	0.0629	0.1309	0.5712
60	0.0032	0.0085	0.0616	0.1283	0.5695
62	0.0032	0.0084	0.0607	0.1265	0.5707
64	0.0141	0.0382	0.2556	0.4830	2.3087
66	0.0022	0.0060	0.0382	0.0655	0.3425
67	0.0329	0.0850	0.5830	1.0486	5.2358
68	0.0164	0.0435	0.3165	0.6591	3.0153
69	0.0262	0.0692	0.5034	1.0484	5.0807
70	0.0215	0.0568	0.4130	0.8600	4.1663
71	0.0087	0.0231	0.1683	0.3506	1.7012
72	0.0068	0.0181	0.1313	0.2735	1.2481
73	0.0346	0.0925	0.6509	1.3044	6.4219
74	0.0061	0.0162	0.1175	0.2448	1.1154
75	0.0040	0.0107	0.0778	0.1620	0.7843
76	0.0326	0.0865	0.6264	1.2978	6.2384
77	0.0481	0.1276	0.9215	1.9029	8.9232
78	0.0371	0.0990	0.7009	1.4135	6.3721
79	0.0055	0.0145	0.1056	0.2198	1.0414
80	0.0377	0.1002	0.7173	1.4658	7.0977
83	0.0144	0.0391	0.2623	0.4962	2.4905
84	0.0049	0.0130	0.0942	0.1962	0.9452
85	0.0121	0.0320	0.2328	0.4849	2.1980
86	0.0056	0.0152	0.1046	0.2041	1.0177
87	0.0128	0.0342	0.2169	0.3637	1.9116
88	0.0063	0.0168	0.1052	0.1695	0.8995
89	0.0051	0.0135	0.0844	0.1360	0.7226
90	0.0083	0.0215	0.1481	0.2671	1.3331
91	0.0005	0.0014	0.0098	0.0181	0.0893
92	0.0052	0.0135	0.0952	0.1801	0.8833
93	0.0000	0.0000	0.0000	0.0000	0.0000
94	0.0106	0.0281	0.2043	0.4254	1.9288
95	0.0024	0.0063	0.0456	0.0950	0.4308
96	0.0022	0.0058	0.0420	0.0875	0.3969
97	0.0106	0.0281	0.2043	0.4255	1.9302
98	0.0140	0.0362	0.2568	0.4931	2.2768
99	0.0028	0.0072	0.0508	0.0934	0.4362
100	0.0131	0.0343	0.2230	0.3756	1.8390
101	0.0291	0.0783	0.4974	0.8414	4.1673
102	0.0077	0.0208	0.1326	0.2276	1.1253
103	0.0048	0.0130	0.0830	0.1424	0.7059

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
104	0.0082	0.0221	0.1410	0.2420	1.2609
105	0.0058	0.0153	0.1049	0.1951	0.9883
106	0.0120	0.0313	0.2232	0.4366	2.1739
107	0.0549	0.1455	0.9945	1.8599	9.8331
108	0.0077	0.0206	0.1289	0.2077	1.1354
109	0.0032	0.0085	0.0533	0.0859	0.4682
110	0.0030	0.0082	0.0523	0.0898	0.4619
111	0.0029	0.0080	0.0507	0.0871	0.4475
112	0.0008	0.0020	0.0129	0.0223	0.1140
113	0.0046	0.0123	0.0889	0.1831	0.7663
114	0.0496	0.1314	0.9556	1.9900	8.1458
115	0.0030	0.0078	0.0570	0.1187	0.4856
116	0.0015	0.0040	0.0288	0.0600	0.2454
117	0.0013	0.0035	0.0251	0.0524	0.2142
118	0.0038	0.0102	0.0741	0.1543	0.6316
119	0.0037	0.0097	0.0709	0.1476	0.6051
120	0.0059	0.0156	0.1133	0.2360	0.9707
121	0.0059	0.0155	0.1127	0.2346	0.9696
122	0.0000	0.0000	0.0000	0.0000	0.0000
123	0.0022	0.0058	0.0411	0.0804	0.3496
124	0.0477	0.1240	0.8841	1.7207	7.7058
125	0.0046	0.0121	0.0881	0.1827	0.8008
126	0.0042	0.0111	0.0809	0.1684	0.7365
127	0.0000	0.0000	0.0000	0.0000	0.0000
128	0.0611	0.1616	1.1757	2.4485	10.7027
129	0.0302	0.0790	0.5676	1.1342	5.0307
130	0.0068	0.0177	0.1264	0.2473	1.0692
131	0.0056	0.0145	0.1036	0.2026	0.8726
132	0.0234	0.0619	0.4505	0.9370	3.7893
133	0.0073	0.0187	0.1309	0.2406	1.0301
134	0.0133	0.0342	0.2396	0.4415	1.8778
135	0.0126	0.0328	0.2338	0.4575	1.8958
136	0.0016	0.0042	0.0302	0.0590	0.2444
137	0.0017	0.0045	0.0318	0.0623	0.2581
138	0.0031	0.0080	0.0571	0.1117	0.4632
139	0.0000	0.0000	0.0000	0.0000	0.0000
140	0.0000	0.0000	0.0000	0.0000	0.0000
141	0.0026	0.0066	0.0460	0.0845	0.3694
142	0.0021	0.0054	0.0379	0.0697	0.3042
143	0.0107	0.0275	0.1924	0.3535	1.5370
144	0.0105	0.0268	0.1878	0.3452	1.4899
145	0.0502	0.1306	0.8921	1.6120	7.2559
146	0.0171	0.0453	0.2828	0.4496	2.3435
147	0.0177	0.0463	0.2844	0.4308	2.2970
148	0.0173	0.0452	0.2778	0.4207	2.2611
149	0.0007	0.0017	0.0109	0.0176	0.0965
150	0.0083	0.0221	0.1385	0.2232	1.2254
151	0.0010	0.0028	0.0178	0.0305	0.1596
152	0.0117	0.0320	0.2084	0.3807	1.8583
153	0.0095	0.0262	0.1701	0.3107	1.5138
154	0.0017	0.0046	0.0297	0.0543	0.2644

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
155	0.0107	0.0294	0.1910	0.3489	1.6971
156	0.0096	0.0263	0.1710	0.3124	1.5193
157	0.0056	0.0153	0.0997	0.1821	0.8854
158	0.0057	0.0156	0.1015	0.1853	0.9011
159	0.0053	0.0145	0.0944	0.1724	0.8388
160	0.0014	0.0039	0.0256	0.0468	0.2277
161	0.0039	0.0106	0.0689	0.1259	0.6148
162	0.0053	0.0143	0.0974	0.1884	0.8672
163	0.0027	0.0071	0.0517	0.1077	0.4585
164	0.0014	0.0036	0.0257	0.0502	0.2247
165	0.0247	0.0634	0.4452	0.8254	3.7641
166	0.0415	0.1084	0.7135	1.2192	5.9509
167	0.0135	0.0356	0.2307	0.3873	1.9221
168	0.0006	0.0014	0.0100	0.0184	0.0857
169	0.0017	0.0043	0.0303	0.0557	0.2663
170	0.0201	0.0520	0.3678	0.6983	3.3360
171	0.0505	0.1334	0.9694	2.0091	9.4992
172	0.0135	0.0356	0.2590	0.5393	2.5445
173	0.0026	0.0070	0.0508	0.1057	0.4962
174	0.0073	0.0189	0.1335	0.2528	1.1918
175	0.0050	0.0129	0.0903	0.1659	0.7523
177	0.0017	0.0045	0.0312	0.0574	0.2607
179	0.0024	0.0062	0.0436	0.0802	0.3635
181	0.0050	0.0127	0.0892	0.1639	0.7809
183	0.0012	0.0032	0.0223	0.0410	0.1959
184	0.0024	0.0063	0.0439	0.0806	0.3899
185	0.0023	0.0059	0.0417	0.0766	0.3762
186	0.0332	0.0850	0.5956	1.0946	5.4366
187	0.0008	0.0020	0.0140	0.0258	0.1281
189	0.0015	0.0039	0.0271	0.0488	0.2461
191	0.0023	0.0060	0.0377	0.0608	0.3433
193	0.0010	0.0027	0.0166	0.0268	0.1513
195	0.0764	0.2049	1.3003	2.1878	11.7455
196	0.0417	0.1106	0.7785	1.5401	7.3996
197	0.0655	0.1728	1.2521	2.5745	11.4080
198	0.0359	0.0944	0.6811	1.3815	6.2713
199	0.0025	0.0067	0.0487	0.1014	0.4593
200	0.0049	0.0131	0.0952	0.1983	0.8993
201	0.0048	0.0127	0.0927	0.1930	0.8770
202	0.0048	0.0127	0.0921	0.1919	0.8733
203	0.0024	0.0063	0.0456	0.0915	0.4188
204	0.0181	0.0473	0.3374	0.6601	3.0319
205	0.0057	0.0150	0.1092	0.2275	1.0181
206	0.0046	0.0122	0.0885	0.1843	0.8235
207	0.0171	0.0448	0.3212	0.6381	2.6642
208	0.0030	0.0077	0.0553	0.1081	0.4521
209	0.0010	0.0026	0.0188	0.0368	0.1539
210	0.0095	0.0251	0.1823	0.3798	1.5397
211	0.0119	0.0315	0.2294	0.4776	1.9363
212	0.0012	0.0031	0.0222	0.0460	0.1875
213	0.0008	0.0020	0.0140	0.0273	0.1138

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
214	0.0014	0.0037	0.0265	0.0518	0.2163
215	0.0013	0.0035	0.0250	0.0489	0.2044
216	0.0014	0.0036	0.0254	0.0497	0.2083
217	0.0006	0.0017	0.0121	0.0236	0.0989
218	0.0465	0.1223	0.8831	1.7952	7.5086
219	0.0619	0.1629	1.1770	2.3943	10.1530
220	0.0234	0.0608	0.4323	0.8347	3.7176
222	0.0504	0.1334	0.9701	2.0203	8.8032
223	0.0018	0.0048	0.0347	0.0723	0.3257
225	0.0018	0.0049	0.0355	0.0739	0.3331
227	0.0015	0.0040	0.0278	0.0510	0.2427
229	0.0026	0.0068	0.0427	0.0691	0.3496
231	0.0007	0.0017	0.0109	0.0176	0.0894
233	0.0017	0.0046	0.0290	0.0468	0.2372
235	0.0006	0.0015	0.0096	0.0155	0.0773
236	0.0030	0.0080	0.0502	0.0810	0.4047
237	0.0030	0.0080	0.0501	0.0808	0.4042
238	0.0008	0.0020	0.0127	0.0205	0.1026
239	0.0022	0.0058	0.0366	0.0589	0.2948
240	0.0015	0.0039	0.0246	0.0397	0.1985
241	0.0024	0.0065	0.0405	0.0652	0.3265
242	0.0048	0.0128	0.0801	0.1291	0.6459
243	0.0048	0.0126	0.0792	0.1276	0.6389
244	0.0045	0.0123	0.0787	0.1368	0.6762
245	0.0022	0.0059	0.0385	0.0703	0.3448
246	0.0107	0.0294	0.1914	0.3496	1.7160
247	0.0301	0.0825	0.5365	0.9801	4.8130
248	0.0053	0.0145	0.0943	0.1723	0.8465
249	0.0351	0.0936	0.6660	1.3515	5.9675
Total	2.5489	6.7363	46.7415	89.8768	417.5661

Table 10. Predicted Crash Severity by Speed Change Lane (Speed Change)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
35	0.0000	0.0001	0.0005	0.0008	0.0030
37	0.0007	0.0019	0.0134	0.0246	0.0883
39	0.0015	0.0039	0.0273	0.0503	0.1804
41	0.0002	0.0006	0.0039	0.0072	0.0258
42	0.0000	0.0000	0.0003	0.0006	0.0018
44	0.0014	0.0036	0.0250	0.0460	0.1655
45	0.0016	0.0043	0.0311	0.0648	0.1968
47	0.0015	0.0039	0.0281	0.0551	0.1931
48	0.0019	0.0050	0.0363	0.0756	0.2296
50	0.0014	0.0037	0.0267	0.0555	0.1899
51	0.0028	0.0074	0.0541	0.1127	0.3421
53	0.0013	0.0035	0.0252	0.0525	0.1593
55	0.0011	0.0029	0.0208	0.0432	0.1312
57	0.0028	0.0074	0.0541	0.1127	0.3421
59	0.0025	0.0067	0.0489	0.1019	0.3093
61	0.0025	0.0067	0.0489	0.1019	0.3093
63	0.0025	0.0067	0.0489	0.1019	0.3093
65	0.0026	0.0069	0.0501	0.1043	0.3169
81	0.0042	0.0110	0.0800	0.1666	0.5843
82	0.0041	0.0112	0.0726	0.1326	0.4633
176	0.0000	0.0001	0.0004	0.0009	0.0027
178	0.0011	0.0029	0.0211	0.0439	0.1334
180	0.0016	0.0041	0.0299	0.0623	0.1892
182	0.0014	0.0036	0.0257	0.0498	0.1555
188	0.0007	0.0017	0.0117	0.0215	0.0612
190	0.0014	0.0036	0.0246	0.0443	0.1301
192	0.0018	0.0048	0.0301	0.0485	0.1659
194	0.0009	0.0023	0.0141	0.0228	0.0779
221	0.0060	0.0160	0.1160	0.2416	0.9163
224	0.0011	0.0028	0.0206	0.0430	0.1613
226	0.0011	0.0029	0.0215	0.0447	0.1678
228	0.0010	0.0026	0.0186	0.0388	0.1452
230	0.0016	0.0044	0.0285	0.0522	0.2066
232	0.0004	0.0011	0.0072	0.0132	0.0524
234	0.0011	0.0029	0.0190	0.0347	0.1377
Total	0.0578	0.1530	1.0855	2.1732	7.2448

Table 11. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.19	0.0	2.82	0.5	3.01	0.5
Highway Segment	Collision with Fixed Object	33.63	6.0	91.87	16.3	125.50	22.3
Highway Segment	Collision with Other Object	2.38	0.4	17.84	3.2	20.21	3.6
Highway Segment	Other Single-vehicle Collision	9.69	1.7	13.73	2.4	23.42	4.2
Highway Segment	Collision with Parked Vehicle	0.70	0.1	2.05	0.4	2.75	0.5
Highway Segment	Total Single Vehicle Crashes	46.58	8.3	128.31	22.8	174.89	31.0
Highway Segment	Right-Angle Collision	3.08	0.5	5.21	0.9	8.29	1.5
Highway Segment	Head-on Collision	0.80	0.1	0.58	0.1	1.37	0.2
Highway Segment	Other Multi-vehicle Collision	3.08	0.5	6.94	1.2	10.02	1.8
Highway Segment	Rear-end Collision	74.50	13.2	199.58	35.4	274.08	48.6
Highway Segment	Sideswipe, Same Direction Collision	17.88	3.2	76.94	13.7	94.82	16.8
Highway Segment	Total Multiple Vehicle Crashes	99.33	17.6	289.25	51.3	388.58	69.0
Highway Segment	Total Highway Segment Crashes	145.90	25.9	417.57	74.1	563.47	100.0
	Total Crashes	145.90	25.9	417.57	74.1	563.47	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 12. Predicted Exit Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.03	0.5	0.03	0.5
Highway Segment	Collision with Fixed Object	0.41	6.1	0.95	14.2	1.36	20.4
Highway Segment	Collision with Other Object	0.03	0.5	0.14	2.1	0.17	2.6
Highway Segment	Other Single-vehicle Collision	0.10	1.5	0.11	1.6	0.21	3.1
Highway Segment	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Total Single Vehicle Crashes	0.55	8.2	1.23	18.3	1.77	26.5
Highway Segment	Right-Angle Collision	0.02	0.3	0.06	0.8	0.08	1.2
Highway Segment	Head-on Collision	0.01	0.2	0.01	0.1	0.02	0.3
Highway Segment	Other Multi-vehicle Collision	0.03	0.5	0.07	1.1	0.11	1.6
Highway Segment	Rear-end Collision	1.15	17.2	2.60	38.8	3.75	56.0
Highway Segment	Sideswipe, Same Direction Collision	0.33	5.0	0.63	9.5	0.97	14.4
Highway Segment	Total Multiple Vehicle Crashes	1.55	23.2	3.37	50.3	4.92	73.5
Highway Segment	Total Highway Segment Crashes	2.10	31.4	4.60	68.6	6.70	100.0
	Total Crashes	2.10	31.4	4.60	68.6	6.70	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 13. Predicted Entrance Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.01	0.1	0.01	0.1
Highway Segment	Collision with Fixed Object	0.27	6.6	0.34	8.5	0.61	15.1
Highway Segment	Collision with Other Object	0.03	0.6	0.10	2.4	0.12	3.0
Highway Segment	Other Single-vehicle Collision	0.09	2.3	0.04	1.1	0.13	3.3
Highway Segment	Collision with Parked Vehicle	0.01	0.1	0.01	0.2	0.01	0.3
Highway Segment	Total Single Vehicle Crashes	0.39	9.7	0.49	12.3	0.88	21.9
Highway Segment	Right-Angle Collision	0.03	0.6	0.04	1.1	0.07	1.7
Highway Segment	Head-on Collision	0.01	0.1	0.00	0.1	0.01	0.2
Highway Segment	Other Multi-vehicle Collision	0.02	0.6	0.04	1.0	0.06	1.6
Highway Segment	Rear-end Collision	0.74	18.5	1.40	34.9	2.15	53.4
Highway Segment	Sideswipe, Same Direction Collision	0.18	4.5	0.67	16.6	0.85	21.1
Highway Segment	Total Multiple Vehicle Crashes	0.98	24.4	2.15	53.6	3.14	78.1
Highway Segment	Total Highway Segment Crashes	1.37	34.1	2.65	65.9	4.02	100.0
	Total Crashes	1.37	34.1	2.65	65.9	4.02	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 14. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3058+00.000	3065+13.000	for segment #1 (3058+00.000 to 3065+13.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3058+00.000	3065+13.000	for segment #1 (3058+00.000 to 3065+13.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3058+00.000	3065+13.000	for segment #1 (3058+00.000 to 3065+13.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3058+00.000	3065+13.000	for segment #1 (3058+00.000 to 3065+13.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3065+13.000	3065+38.000	for segment #2 (3065+13.000 to 3065+38.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3065+13.000	3065+38.000	for segment #2 (3065+13.000 to 3065+38.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3065+13.000	3065+38.000	for segment #2 (3065+13.000 to 3065+38.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3065+13.000	3065+38.000	for segment #2 (3065+13.000 to 3065+38.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3065+38.000	3067+33.000	for segment #3 (3065+38.000 to 3067+33.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3065+38.000	3067+33.000	for segment #3 (3065+38.000 to 3067+33.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3065+38.000	3067+33.000	for segment #3 (3065+38.000 to 3067+33.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3065+38.000	3067+33.000	for segment #3 (3065+38.000 to 3067+33.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3067+33.000	3068+88.000	for segment #4 (3067+33.000 to 3068+88.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3067+33.000	3068+88.000	for segment #4 (3067+33.000 to 3068+88.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3067+33.000	3068+88.000	for segment #4 (3067+33.000 to 3068+88.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3067+33.000	3068+88.000	for segment #4 (3067+33.000 to 3068+88.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3068+88.000	3077+84.000	for segment #5 (3068+88.000 to 3077+84.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3068+88.000	3077+84.000	for segment #5 (3068+88.000 to 3077+84.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3068+88.000	3077+84.000	for segment #5 (3068+88.000 to 3077+84.000), Outside barrier distance from edge of outside shoulder to barrier face (0.10 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3077+84.000	3079+00.000	for segment #6 (3077+84.000 to 3079+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3077+84.000	3079+00.000	for segment #6 (3077+84.000 to 3079+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3077+84.000	3079+00.000	for segment #6 (3077+84.000 to 3079+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3079+00.000	3081+51.000	for segment #7 (3079+00.000 to 3081+51.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3079+00.000	3081+51.000	for segment #7 (3079+00.000 to 3081+51.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3081+51.000	3082+31.000	for segment #8 (3081+51.000 to 3082+31.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3081+51.000	3082+31.000	for segment #8 (3081+51.000 to 3082+31.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3082+31.000	3084+00.000	for segment #9 (3082+31.000 to 3084+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3082+31.000	3084+00.000	for segment #9 (3082+31.000 to 3084+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3084+00.000	3084+73.000	for segment #10 (3084+00.000 to 3084+73.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3084+00.000	3084+73.000	for segment #10 (3084+00.000 to 3084+73.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3084+73.000	3085+07.000	for segment #11 (3084+73.000 to 3085+07.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3084+73.000	3085+07.000	for segment #11 (3084+73.000 to 3085+07.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3085+07.000	3085+84.000	for segment #12 (3085+07.000 to 3085+84.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3085+07.000	3085+84.000	for segment #12 (3085+07.000 to 3085+84.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3085+84.000	3086+81.000	for segment #13 (3085+84.000 to 3086+81.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3085+84.000	3086+81.000	for segment #13 (3085+84.000 to 3086+81.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3085+84.000	3086+81.000	for segment #13 (3085+84.000 to 3086+81.000), Outside barrier offset (3.95 feet) is less than the right outside shoulder width (4.35 feet). This indicates there is problem with the input data.
3086+81.000	3087+80.000	for segment #14 (3086+81.000 to 3087+80.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3086+81.000	3087+80.000	for segment #14 (3086+81.000 to 3087+80.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3086+81.000	3087+80.000	for segment #14 (3086+81.000 to 3087+80.000), Outside barrier offset (4.84 feet) is less than the right outside shoulder width (5.07 feet). This indicates there is problem with the input data.
3087+80.000	3088+10.000	for segment #15 (3087+80.000 to 3088+10.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3087+80.000	3088+10.000	for segment #15 (3087+80.000 to 3088+10.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3087+80.000	3088+10.000	for segment #15 (3087+80.000 to 3088+10.000), Outside barrier offset (5.43 feet) is less than the right outside shoulder width (5.54 feet). This indicates there is problem with the input data.
3087+80.000	3088+10.000	for segment #15 (3087+80.000 to 3088+10.000), Outside barrier offset (9.40 feet) is less than the left outside shoulder width (9.80 feet). This indicates there is problem with the input data.
3088+10.000	3088+58.000	for segment #16 (3088+10.000 to 3088+58.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3088+10.000	3088+58.000	for segment #16 (3088+10.000 to 3088+58.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3088+10.000	3088+58.000	for segment #16 (3088+10.000 to 3088+58.000), Outside barrier offset (5.78 feet) is less than the right outside shoulder width (5.82 feet). This indicates there is problem with the input data.
3088+10.000	3088+58.000	for segment #16 (3088+10.000 to 3088+58.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3088+58.000	3098+27.000	for segment #17 (3088+58.000 to 3098+27.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3088+58.000	3098+27.000	for segment #17 (3088+58.000 to 3098+27.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3088+58.000	3098+27.000	for segment #17 (3088+58.000 to 3098+27.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3088+58.000	3098+27.000	for segment #17 (3088+58.000 to 3098+27.000), Outside barrier offset (6.00 feet) is less than the right outside shoulder width (10.00 feet). This indicates there is problem with the input data.
3098+27.000	3100+36.000	for segment #18 (3098+27.000 to 3100+36.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3098+27.000	3100+36.000	for segment #18 (3098+27.000 to 3100+36.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3100+36.000	3112+00.000	for segment #19 (3100+36.000 to 3112+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3100+36.000	3112+00.000	for segment #19 (3100+36.000 to 3112+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3100+36.000	3112+00.000	for segment #19 (3100+36.000 to 3112+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3100+36.000	3112+00.000	for segment #19 (3100+36.000 to 3112+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3112+00.000	3113+01.000	for segment #20 (3112+00.000 to 3113+01.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3112+00.000	3113+01.000	for segment #20 (3112+00.000 to 3113+01.000), Median barrier offset (7.50 feet) is less than the left side inside shoulder width (7.50 feet). This indicates there is problem with the input data.
3112+00.000	3113+01.000	for segment #20 (3112+00.000 to 3113+01.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3113+01.000	3115+01.000	for segment #21 (3113+01.000 to 3115+01.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3113+01.000	3115+01.000	for segment #21 (3113+01.000 to 3115+01.000), Median barrier offset (5.99 feet) is less than the left side inside shoulder width (5.99 feet). This indicates there is problem with the input data.
3113+01.000	3115+01.000	for segment #21 (3113+01.000 to 3115+01.000), Median barrier distance from edge of inside shoulder to barrier face (0.40 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3113+01.000	3115+01.000	for segment #21 (3113+01.000 to 3115+01.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3115+01.000	3116+09.000	for segment #22 (3115+01.000 to 3116+09.000), Median barrier offset (4.45 feet) is less than the left side inside shoulder width (4.45 feet). This indicates there is problem with the input data.
3115+01.000	3116+09.000	for segment #22 (3115+01.000 to 3116+09.000), Median barrier offset (3.78 feet) is less than the right side inside shoulder width (3.78 feet). This indicates there is problem with the input data.
3115+01.000	3116+09.000	for segment #22 (3115+01.000 to 3116+09.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3116+09.000	3116+43.000	for segment #23 (3116+09.000 to 3116+43.000), Median barrier offset (3.74 feet) is less than the left side inside shoulder width (3.74 feet). This indicates there is problem with the input data.
3116+09.000	3116+43.000	for segment #23 (3116+09.000 to 3116+43.000), Median barrier offset (3.50 feet) is less than the right side inside shoulder width (3.50 feet). This indicates there is problem with the input data.
3116+09.000	3116+43.000	for segment #23 (3116+09.000 to 3116+43.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3116+43.000	3117+86.000	for segment #24 (3116+43.000 to 3117+86.000), Median barrier offset (2.86 feet) is less than the left side inside shoulder width (2.86 feet). This indicates there is problem with the input data.
3116+43.000	3117+86.000	for segment #24 (3116+43.000 to 3117+86.000), Median barrier offset (3.14 feet) is less than the right side inside shoulder width (3.14 feet). This indicates there is problem with the input data.
3116+43.000	3117+86.000	for segment #24 (3116+43.000 to 3117+86.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3117+86.000	3118+00.000	for segment #25 (3117+86.000 to 3118+00.000), Median barrier offset (2.07 feet) is less than the left side inside shoulder width (2.07 feet). This indicates there is problem with the input data.
3117+86.000	3118+00.000	for segment #25 (3117+86.000 to 3118+00.000), Median barrier offset (2.83 feet) is less than the right side inside shoulder width (2.83 feet). This indicates there is problem with the input data.
3117+86.000	3118+00.000	for segment #25 (3117+86.000 to 3118+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3118+00.000	3120+00.000	for segment #26 (3118+00.000 to 3120+00.000), Median barrier offset (2.40 feet) is less than the right side inside shoulder width (2.40 feet). This indicates there is problem with the input data.
3118+00.000	3120+00.000	for segment #26 (3118+00.000 to 3120+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3118+00.000	3120+00.000	for segment #26 (3118+00.000 to 3120+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3120+00.000	3120+27.000	for segment #27 (3120+00.000 to 3120+27.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3120+00.000	3120+27.000	for segment #27 (3120+00.000 to 3120+27.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3120+00.000	3120+27.000	for segment #27 (3120+00.000 to 3120+27.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3120+27.000	3120+55.000	for segment #28 (3120+27.000 to 3120+55.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3120+27.000	3120+55.000	for segment #28 (3120+27.000 to 3120+55.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3120+27.000	3120+55.000	for segment #28 (3120+27.000 to 3120+55.000), Outside barrier offset (13.49 feet) is less than the right outside shoulder width (13.49 feet). This indicates there is problem with the input data.
3120+55.000	3121+10.000	for segment #29 (3120+55.000 to 3121+10.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3120+55.000	3121+10.000	for segment #29 (3120+55.000 to 3121+10.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3120+55.000	3121+10.000	for segment #29 (3120+55.000 to 3121+10.000), Outside barrier offset (11.97 feet) is less than the right outside shoulder width (11.97 feet). This indicates there is problem with the input data.
3121+10.000	3121+64.000	for segment #30 (3121+10.000 to 3121+64.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3121+10.000	3121+64.000	for segment #30 (3121+10.000 to 3121+64.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3121+10.000	3121+64.000	for segment #30 (3121+10.000 to 3121+64.000), Outside barrier offset (9.98 feet) is less than the right outside shoulder width (9.98 feet). This indicates there is problem with the input data.
3121+10.000	3121+64.000	for segment #30 (3121+10.000 to 3121+64.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3121+64.000	3123+42.000	for segment #31 (3121+64.000 to 3123+42.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3121+64.000	3123+42.000	for segment #31 (3121+64.000 to 3123+42.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3121+64.000	3123+42.000	for segment #31 (3121+64.000 to 3123+42.000), Outside barrier offset (5.73 feet) is less than the right outside shoulder width (7.98 feet). This indicates there is problem with the input data.
3121+64.000	3123+42.000	for segment #31 (3121+64.000 to 3123+42.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3121+64.000	3123+42.000	for segment #31 (3121+64.000 to 3123+42.000), Outside barrier distance from edge of outside shoulder to barrier face (0.02 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3123+42.000	3123+89.000	for segment #32 (3123+42.000 to 3123+89.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3123+42.000	3123+89.000	for segment #32 (3123+42.000 to 3123+89.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3123+42.000	3123+89.000	for segment #32 (3123+42.000 to 3123+89.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3123+42.000	3123+89.000	for segment #32 (3123+42.000 to 3123+89.000), Outside barrier offset (5.98 feet) is less than the right outside shoulder width (5.98 feet). This indicates there is problem with the input data.
3123+89.000	3124+36.000	for segment #33 (3123+89.000 to 3124+36.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3123+89.000	3124+36.000	for segment #33 (3123+89.000 to 3124+36.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3123+89.000	3124+36.000	for segment #33 (3123+89.000 to 3124+36.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3123+89.000	3124+36.000	for segment #33 (3123+89.000 to 3124+36.000), Outside barrier offset (3.98 feet) is less than the right outside shoulder width (3.98 feet). This indicates there is problem with the input data.
3124+36.000	3129+76.000	for segment #34 (3124+36.000 to 3129+76.000), Outside shoulder width (3.75 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3124+36.000	3129+76.000	for segment #34 (3124+36.000 to 3129+76.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3124+36.000	3129+76.000	for segment #34 (3124+36.000 to 3129+76.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3124+36.000	3129+76.000	for segment #34 (3124+36.000 to 3129+76.000), Outside barrier offset (-8.51 feet) is less than the right outside shoulder width (2.49 feet). This indicates there is problem with the input data.
3124+36.000	3129+76.000	for segment #34 (3124+36.000 to 3129+76.000), Outside barrier offset (2.00 feet) is less than the right outside shoulder width (2.49 feet). This indicates there is problem with the input data.
3129+76.000	3130+00.000	for segment #36 (3129+76.000 to 3130+00.000), Outside shoulder width (1.26 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3129+76.000	3130+00.000	for segment #36 (3129+76.000 to 3130+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3129+76.000	3130+00.000	for segment #36 (3129+76.000 to 3130+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3130+00.000	3130+49.000	for segment #38 (3130+00.000 to 3130+49.000), Outside shoulder width (2.01 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3130+00.000	3130+49.000	for segment #38 (3130+00.000 to 3130+49.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3130+00.000	3130+49.000	for segment #38 (3130+00.000 to 3130+49.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3130+49.000	3130+56.000	for segment #40 (3130+49.000 to 3130+56.000), Outside shoulder width (3.58 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3130+49.000	3130+56.000	for segment #40 (3130+49.000 to 3130+56.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3130+49.000	3130+56.000	for segment #40 (3130+49.000 to 3130+56.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3130+56.000	3130+98.000	for segment #43 (3130+56.000 to 3130+98.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3130+56.000	3130+98.000	for segment #43 (3130+56.000 to 3130+98.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3130+56.000	3130+98.000	for segment #43 (3130+56.000 to 3130+98.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3130+98.000	3131+47.000	for segment #46 (3130+98.000 to 3131+47.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3130+98.000	3131+47.000	for segment #46 (3130+98.000 to 3131+47.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3130+98.000	3131+47.000	for segment #46 (3130+98.000 to 3131+47.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3130+98.000	3131+47.000	for segment #46 (3130+98.000 to 3131+47.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3131+47.000	3132+20.000	for segment #49 (3131+47.000 to 3132+20.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3131+47.000	3132+20.000	for segment #49 (3131+47.000 to 3132+20.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3131+47.000	3132+20.000	for segment #49 (3131+47.000 to 3132+20.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3131+47.000	3132+20.000	for segment #49 (3131+47.000 to 3132+20.000), Outside barrier distance from edge of outside shoulder to barrier face (0.37 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3132+20.000	3132+54.000	for segment #52 (3132+20.000 to 3132+54.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3132+20.000	3132+54.000	for segment #52 (3132+20.000 to 3132+54.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3132+20.000	3132+54.000	for segment #52 (3132+20.000 to 3132+54.000), Outside barrier offset (3.58 feet) is less than the right outside shoulder width (3.58 feet). This indicates there is problem with the input data.
3132+20.000	3132+54.000	for segment #52 (3132+20.000 to 3132+54.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3132+54.000	3132+82.000	for segment #54 (3132+54.000 to 3132+82.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3132+54.000	3132+82.000	for segment #54 (3132+54.000 to 3132+82.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3132+54.000	3132+82.000	for segment #54 (3132+54.000 to 3132+82.000), Outside barrier offset (2.49 feet) is less than the right outside shoulder width (2.49 feet). This indicates there is problem with the input data.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3132+54.000	3132+82.000	for segment #54 (3132+54.000 to 3132+82.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3132+82.000	3133+55.000	for segment #56 (3132+82.000 to 3133+55.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3132+82.000	3133+55.000	for segment #56 (3132+82.000 to 3133+55.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3132+82.000	3133+55.000	for segment #56 (3132+82.000 to 3133+55.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3132+82.000	3133+55.000	for segment #56 (3132+82.000 to 3133+55.000), Outside barrier offset (2.00 feet) is less than the right outside shoulder width (2.50 feet). This indicates there is problem with the input data.
3132+82.000	3133+55.000	for segment #56 (3132+82.000 to 3133+55.000), Outside barrier offset (1.89 feet) is less than the right outside shoulder width (2.50 feet). This indicates there is problem with the input data.
3133+55.000	3134+21.000	for segment #58 (3133+55.000 to 3134+21.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3133+55.000	3134+21.000	for segment #58 (3133+55.000 to 3134+21.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3133+55.000	3134+21.000	for segment #58 (3133+55.000 to 3134+21.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3133+55.000	3134+21.000	for segment #58 (3133+55.000 to 3134+21.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3134+21.000	3134+87.000	for segment #60 (3134+21.000 to 3134+87.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3134+21.000	3134+87.000	for segment #60 (3134+21.000 to 3134+87.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3134+21.000	3134+87.000	for segment #60 (3134+21.000 to 3134+87.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3134+21.000	3134+87.000	for segment #60 (3134+21.000 to 3134+87.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3134+87.000	3135+53.000	for segment #62 (3134+87.000 to 3135+53.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3134+87.000	3135+53.000	for segment #62 (3134+87.000 to 3135+53.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3134+87.000	3135+53.000	for segment #62 (3134+87.000 to 3135+53.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3134+87.000	3135+53.000	for segment #62 (3134+87.000 to 3135+53.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3135+53.000	3137+16.960	for segment #64 (3135+53.000 to 3137+16.960), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3135+53.000	3137+16.960	for segment #64 (3135+53.000 to 3137+16.960), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3135+53.000	3137+16.960	for segment #64 (3135+53.000 to 3137+16.960), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3135+53.000	3137+16.960	for segment #64 (3135+53.000 to 3137+16.960), Outside barrier distance from edge of outside shoulder to barrier face (0.49 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3137+16.960	3137+43.660	for segment #66 (3137+16.960 to 3137+43.660), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3137+16.960	3137+43.660	for segment #66 (3137+16.960 to 3137+43.660), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3137+16.960	3137+43.660	for segment #66 (3137+16.960 to 3137+43.660), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3137+43.660	3144+71.000	for segment #67 (3137+43.660 to 3144+71.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3137+43.660	3144+71.000	for segment #67 (3137+43.660 to 3144+71.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3137+43.660	3144+71.000	for segment #67 (3137+43.660 to 3144+71.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3137+43.660	3144+71.000	for segment #67 (3137+43.660 to 3144+71.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3144+71.000	3148+95.000	for segment #68 (3144+71.000 to 3148+95.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3144+71.000	3148+95.000	for segment #68 (3144+71.000 to 3148+95.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3144+71.000	3148+95.000	for segment #68 (3144+71.000 to 3148+95.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3144+71.000	3148+95.000	for segment #68 (3144+71.000 to 3148+95.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3148+95.000	3155+00.820	for segment #69 (3148+95.000 to 3155+00.820), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3148+95.000	3155+00.820	for segment #69 (3148+95.000 to 3155+00.820), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3148+95.000	3155+00.820	for segment #69 (3148+95.000 to 3155+00.820), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3148+95.000	3155+00.820	for segment #69 (3148+95.000 to 3155+00.820), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3155+00.820	3160+76.980	for segment #70 (3155+00.820 to 3160+76.980), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3155+00.820	3160+76.980	for segment #70 (3155+00.820 to 3160+76.980), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3155+00.820	3160+76.980	for segment #70 (3155+00.820 to 3160+76.980), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3155+00.820	3160+76.980	for segment #70 (3155+00.820 to 3160+76.980), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3160+76.980	3162+67.000	for segment #71 (3160+76.980 to 3162+67.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3160+76.980	3162+67.000	for segment #71 (3160+76.980 to 3162+67.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3160+76.980	3162+67.000	for segment #71 (3160+76.980 to 3162+67.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3160+76.980	3162+67.000	for segment #71 (3160+76.980 to 3162+67.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3162+67.000	3164+27.000	for segment #72 (3162+67.000 to 3164+27.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3162+67.000	3164+27.000	for segment #72 (3162+67.000 to 3164+27.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3162+67.000	3164+27.000	for segment #72 (3162+67.000 to 3164+27.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3162+67.000	3164+27.000	for segment #72 (3162+67.000 to 3164+27.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3164+27.000	3171+98.500	for segment #73 (3164+27.000 to 3171+98.500), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3164+27.000	3171+98.500	for segment #73 (3164+27.000 to 3171+98.500), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3164+27.000	3171+98.500	for segment #73 (3164+27.000 to 3171+98.500), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3164+27.000	3171+98.500	for segment #73 (3164+27.000 to 3171+98.500), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3171+98.500	3173+37.000	for segment #74 (3171+98.500 to 3173+37.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3171+98.500	3173+37.000	for segment #74 (3171+98.500 to 3173+37.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3171+98.500	3173+37.000	for segment #74 (3171+98.500 to 3173+37.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3171+98.500	3173+37.000	for segment #74 (3171+98.500 to 3173+37.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3173+37.000	3174+22.610	for segment #75 (3173+37.000 to 3174+22.610), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3173+37.000	3174+22.610	for segment #75 (3173+37.000 to 3174+22.610), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3173+37.000	3174+22.610	for segment #75 (3173+37.000 to 3174+22.610), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3173+37.000	3174+22.610	for segment #75 (3173+37.000 to 3174+22.610), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3174+22.610	3182+41.770	for segment #76 (3174+22.610 to 3182+41.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3174+22.610	3182+41.770	for segment #76 (3174+22.610 to 3182+41.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3174+22.610	3182+41.770	for segment #76 (3174+22.610 to 3182+41.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3174+22.610	3182+41.770	for segment #76 (3174+22.610 to 3182+41.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3182+41.770	3196+82.610	for segment #77 (3182+41.770 to 3196+82.610), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3182+41.770	3196+82.610	for segment #77 (3182+41.770 to 3196+82.610), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3182+41.770	3196+82.610	for segment #77 (3182+41.770 to 3196+82.610), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3182+41.770	3196+82.610	for segment #77 (3182+41.770 to 3196+82.610), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3196+82.610	3205+27.280	for segment #78 (3196+82.610 to 3205+27.280), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3196+82.610	3205+27.280	for segment #78 (3196+82.610 to 3205+27.280), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3196+82.610	3205+27.280	for segment #78 (3196+82.610 to 3205+27.280), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3196+82.610	3205+27.280	for segment #78 (3196+82.610 to 3205+27.280), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3205+27.280	3206+78.640	for segment #79 (3205+27.280 to 3206+78.640), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3205+27.280	3206+78.640	for segment #79 (3205+27.280 to 3206+78.640), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3205+27.280	3206+78.640	for segment #79 (3205+27.280 to 3206+78.640), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3205+27.280	3206+78.640	for segment #79 (3205+27.280 to 3206+78.640), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3206+78.640	3217+52.990	for segment #80 (3206+78.640 to 3217+52.990), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3206+78.640	3217+52.990	for segment #80 (3206+78.640 to 3217+52.990), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3206+78.640	3217+52.990	for segment #80 (3206+78.640 to 3217+52.990), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3206+78.640	3217+52.990	for segment #80 (3206+78.640 to 3217+52.990), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3217+52.990	3221+02.210	for segment #83 (3217+52.990 to 3221+02.210), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3217+52.990	3221+02.210	for segment #83 (3217+52.990 to 3221+02.210), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3217+52.990	3221+02.210	for segment #83 (3217+52.990 to 3221+02.210), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3217+52.990	3221+02.210	for segment #83 (3217+52.990 to 3221+02.210), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3221+02.210	3222+09.000	for segment #84 (3221+02.210 to 3222+09.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3221+02.210	3222+09.000	for segment #84 (3221+02.210 to 3222+09.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3221+02.210	3222+09.000	for segment #84 (3221+02.210 to 3222+09.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3221+02.210	3222+09.000	for segment #84 (3221+02.210 to 3222+09.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3222+09.000	3225+00.000	for segment #85 (3222+09.000 to 3225+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3222+09.000	3225+00.000	for segment #85 (3222+09.000 to 3225+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3222+09.000	3225+00.000	for segment #85 (3222+09.000 to 3225+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3222+09.000	3225+00.000	for segment #85 (3222+09.000 to 3225+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3225+00.000	3226+26.000	for segment #86 (3225+00.000 to 3226+26.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3225+00.000	3226+26.000	for segment #86 (3225+00.000 to 3226+26.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3225+00.000	3226+26.000	for segment #86 (3225+00.000 to 3226+26.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3225+00.000	3226+26.000	for segment #86 (3225+00.000 to 3226+26.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3226+26.000	3228+76.000	for segment #87 (3226+26.000 to 3228+76.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3226+26.000	3228+76.000	for segment #87 (3226+26.000 to 3228+76.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3226+26.000	3228+76.000	for segment #87 (3226+26.000 to 3228+76.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3226+26.000	3228+76.000	for segment #87 (3226+26.000 to 3228+76.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3228+76.000	3230+00.000	for segment #88 (3228+76.000 to 3230+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3228+76.000	3230+00.000	for segment #88 (3228+76.000 to 3230+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3230+00.000	3231+01.000	for segment #89 (3230+00.000 to 3231+01.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3230+00.000	3231+01.000	for segment #89 (3230+00.000 to 3231+01.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3231+01.000	3233+01.000	for segment #90 (3231+01.000 to 3233+01.000), Median barrier distance from edge of inside shoulder to barrier face (0.01 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3231+01.000	3233+01.000	for segment #90 (3231+01.000 to 3233+01.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3233+01.000	3233+14.630	for segment #91 (3233+01.000 to 3233+14.630), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3233+01.000	3233+14.630	for segment #91 (3233+01.000 to 3233+14.630), Median barrier offset (5.84 feet) is less than the left side inside shoulder width (5.84 feet). This indicates there is problem with the input data.
3233+14.630	3234+00.000	for segment #92 (3233+14.630 to 3234+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3233+14.630	3234+00.000	for segment #92 (3233+14.630 to 3234+00.000), Median barrier offset (4.85 feet) is less than the left side inside shoulder width (4.85 feet). This indicates there is problem with the input data.
3233+14.630	3234+00.000	for segment #92 (3233+14.630 to 3234+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3234+00.000	3234+05.270	for segment #93 (3234+00.000 to 3234+05.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3234+00.000	3234+05.270	for segment #93 (3234+00.000 to 3234+05.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3234+00.000	3234+05.270	for segment #93 (3234+00.000 to 3234+05.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3234+05.270	3235+40.000	for segment #94 (3234+05.270 to 3235+40.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3234+05.270	3235+40.000	for segment #94 (3234+05.270 to 3235+40.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3234+05.270	3235+40.000	for segment #94 (3234+05.270 to 3235+40.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3234+05.270	3235+40.000	for segment #94 (3234+05.270 to 3235+40.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3235+40.000	3235+71.000	for segment #95 (3235+40.000 to 3235+71.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3235+40.000	3235+71.000	for segment #95 (3235+40.000 to 3235+71.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3235+40.000	3235+71.000	for segment #95 (3235+40.000 to 3235+71.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3235+40.000	3235+71.000	for segment #95 (3235+40.000 to 3235+71.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3235+71.000	3236+00.000	for segment #96 (3235+71.000 to 3236+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3235+71.000	3236+00.000	for segment #96 (3235+71.000 to 3236+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3235+71.000	3236+00.000	for segment #96 (3235+71.000 to 3236+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3235+71.000	3236+00.000	for segment #96 (3235+71.000 to 3236+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3236+00.000	3237+44.000	for segment #97 (3236+00.000 to 3237+44.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3236+00.000	3237+44.000	for segment #97 (3236+00.000 to 3237+44.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3236+00.000	3237+44.000	for segment #97 (3236+00.000 to 3237+44.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3236+00.000	3237+44.000	for segment #97 (3236+00.000 to 3237+44.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3237+44.000	3239+23.000	for segment #98 (3237+44.000 to 3239+23.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3237+44.000	3239+23.000	for segment #98 (3237+44.000 to 3239+23.000), Median barrier offset (5.50 feet) is less than the right side inside shoulder width (5.50 feet). This indicates there is problem with the input data.
3237+44.000	3239+23.000	for segment #98 (3237+44.000 to 3239+23.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3237+44.000	3239+23.000	for segment #98 (3237+44.000 to 3239+23.000), Outside barrier offset (10.00 feet) is less than the right outside shoulder width (10.42 feet). This indicates there is problem with the input data.
3239+23.000	3239+58.000	for segment #99 (3239+23.000 to 3239+58.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3239+23.000	3239+58.000	for segment #99 (3239+23.000 to 3239+58.000), Median barrier offset (4.90 feet) is less than the right side inside shoulder width (4.90 feet). This indicates there is problem with the input data.
3239+58.000	3241+00.000	for segment #100 (3239+58.000 to 3241+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3239+58.000	3241+00.000	for segment #100 (3239+58.000 to 3241+00.000), Median barrier offset (4.40 feet) is less than the right side inside shoulder width (4.40 feet). This indicates there is problem with the input data.
3241+00.000	3244+00.000	for segment #101 (3241+00.000 to 3244+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3241+00.000	3244+00.000	for segment #101 (3241+00.000 to 3244+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3241+00.000	3244+00.000	for segment #101 (3241+00.000 to 3244+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.16 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3244+00.000	3244+76.000	for segment #102 (3244+00.000 to 3244+76.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3244+00.000	3244+76.000	for segment #102 (3244+00.000 to 3244+76.000), Median barrier offset (5.49 feet) is less than the left side inside shoulder width (5.49 feet). This indicates there is problem with the input data.
3244+00.000	3244+76.000	for segment #102 (3244+00.000 to 3244+76.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3244+76.000	3245+30.000	for segment #103 (3244+76.000 to 3245+30.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3244+76.000	3245+30.000	for segment #103 (3244+76.000 to 3245+30.000), Median barrier offset (4.63 feet) is less than the left side inside shoulder width (4.63 feet). This indicates there is problem with the input data.
3244+76.000	3245+30.000	for segment #103 (3244+76.000 to 3245+30.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3245+30.000	3246+26.000	for segment #104 (3245+30.000 to 3246+26.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3245+30.000	3246+26.000	for segment #104 (3245+30.000 to 3246+26.000), Median barrier offset (3.63 feet) is less than the left side inside shoulder width (3.63 feet). This indicates there is problem with the input data.
3245+30.000	3246+26.000	for segment #104 (3245+30.000 to 3246+26.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3246+26.000	3247+00.000	for segment #105 (3246+26.000 to 3247+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3246+26.000	3247+00.000	for segment #105 (3246+26.000 to 3247+00.000), Median barrier offset (2.49 feet) is less than the left side inside shoulder width (2.49 feet). This indicates there is problem with the input data.
3246+26.000	3247+00.000	for segment #105 (3246+26.000 to 3247+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3247+00.000	3248+58.200	for segment #106 (3247+00.000 to 3248+58.200), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3247+00.000	3248+58.200	for segment #106 (3247+00.000 to 3248+58.200), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3247+00.000	3248+58.200	for segment #106 (3247+00.000 to 3248+58.200), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3248+58.200	3257+00.000	for segment #107 (3248+58.200 to 3257+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3248+58.200	3257+00.000	for segment #107 (3248+58.200 to 3257+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3248+58.200	3257+00.000	for segment #107 (3248+58.200 to 3257+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3248+58.200	3257+00.000	for segment #107 (3248+58.200 to 3257+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3257+00.000	3258+01.000	for segment #108 (3257+00.000 to 3258+01.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3257+00.000	3258+01.000	for segment #108 (3257+00.000 to 3258+01.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3258+01.000	3258+41.000	for segment #109 (3258+01.000 to 3258+41.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3258+01.000	3258+41.000	for segment #109 (3258+01.000 to 3258+41.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3258+01.000	3258+41.000	for segment #109 (3258+01.000 to 3258+41.000), Outside barrier offset (4.68 feet) is less than the left outside shoulder width (8.00 feet). This indicates there is problem with the input data.
3258+41.000	3258+71.000	for segment #110 (3258+41.000 to 3258+71.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3258+41.000	3258+71.000	for segment #110 (3258+41.000 to 3258+71.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3258+41.000	3258+71.000	for segment #110 (3258+41.000 to 3258+71.000), Outside barrier offset (3.49 feet) is less than the left outside shoulder width (3.49 feet). This indicates there is problem with the input data.
3258+71.000	3259+00.000	for segment #111 (3258+71.000 to 3259+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3258+71.000	3259+00.000	for segment #111 (3258+71.000 to 3259+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3258+71.000	3259+00.000	for segment #111 (3258+71.000 to 3259+00.000), Outside barrier offset (2.49 feet) is less than the left outside shoulder width (2.49 feet). This indicates there is problem with the input data.
3259+00.000	3259+07.000	for segment #112 (3259+00.000 to 3259+07.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3259+00.000	3259+07.000	for segment #112 (3259+00.000 to 3259+07.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3259+00.000	3259+07.000	for segment #112 (3259+00.000 to 3259+07.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3259+00.000	3259+07.000	for segment #112 (3259+00.000 to 3259+07.000), Outside barrier offset (4.07 feet) is less than the right outside shoulder width (8.00 feet). This indicates there is problem with the input data.
3259+07.000	3259+51.000	for segment #113 (3259+07.000 to 3259+51.000), Outside shoulder width (2.75 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3259+07.000	3259+51.000	for segment #113 (3259+07.000 to 3259+51.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3259+07.000	3259+51.000	for segment #113 (3259+07.000 to 3259+51.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3259+07.000	3259+51.000	for segment #113 (3259+07.000 to 3259+51.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3259+07.000	3259+51.000	for segment #113 (3259+07.000 to 3259+51.000), Outside barrier offset (3.50 feet) is less than the right outside shoulder width (3.50 feet). This indicates there is problem with the input data.
3259+51.000	3264+55.000	for segment #114 (3259+51.000 to 3264+55.000), Outside shoulder width (2.25 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3259+51.000	3264+55.000	for segment #114 (3259+51.000 to 3264+55.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3259+51.000	3264+55.000	for segment #114 (3259+51.000 to 3264+55.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3259+51.000	3264+55.000	for segment #114 (3259+51.000 to 3264+55.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3259+51.000	3264+55.000	for segment #114 (3259+51.000 to 3264+55.000), Outside barrier offset (-2.71 feet) is less than the right outside shoulder width (2.50 feet). This indicates there is problem with the input data.
3259+51.000	3264+55.000	for segment #114 (3259+51.000 to 3264+55.000), Outside barrier offset (2.00 feet) is less than the right outside shoulder width (2.50 feet). This indicates there is problem with the input data.
3264+55.000	3264+85.000	for segment #115 (3264+55.000 to 3264+85.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3264+55.000	3264+85.000	for segment #115 (3264+55.000 to 3264+85.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3264+55.000	3264+85.000	for segment #115 (3264+55.000 to 3264+85.000), Median barrier offset (3.48 feet) is less than the right side inside shoulder width (3.48 feet). This indicates there is problem with the input data.
3264+55.000	3264+85.000	for segment #115 (3264+55.000 to 3264+85.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3264+55.000	3264+85.000	for segment #115 (3264+55.000 to 3264+85.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3264+85.000	3265+00.000	for segment #116 (3264+85.000 to 3265+00.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3264+85.000	3265+00.000	for segment #116 (3264+85.000 to 3265+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3264+85.000	3265+00.000	for segment #116 (3264+85.000 to 3265+00.000), Median barrier offset (2.71 feet) is less than the right side inside shoulder width (2.71 feet). This indicates there is problem with the input data.
3264+85.000	3265+00.000	for segment #116 (3264+85.000 to 3265+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3264+85.000	3265+00.000	for segment #116 (3264+85.000 to 3265+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3265+00.000	3265+13.000	for segment #117 (3265+00.000 to 3265+13.000), Outside shoulder width (1.94 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3265+00.000	3265+13.000	for segment #117 (3265+00.000 to 3265+13.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3265+00.000	3265+13.000	for segment #117 (3265+00.000 to 3265+13.000), Median barrier offset (2.22 feet) is less than the right side inside shoulder width (2.22 feet). This indicates there is problem with the input data.
3265+00.000	3265+13.000	for segment #117 (3265+00.000 to 3265+13.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3265+00.000	3265+13.000	for segment #117 (3265+00.000 to 3265+13.000), Outside barrier offset (1.87 feet) is less than the left outside shoulder width (1.87 feet). This indicates there is problem with the input data.
3265+13.000	3265+51.000	for segment #118 (3265+13.000 to 3265+51.000), Outside shoulder width (1.68 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3265+13.000	3265+51.000	for segment #118 (3265+13.000 to 3265+51.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3265+13.000	3265+51.000	for segment #118 (3265+13.000 to 3265+51.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3265+13.000	3265+51.000	for segment #118 (3265+13.000 to 3265+51.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3265+13.000	3265+51.000	for segment #118 (3265+13.000 to 3265+51.000), Outside barrier offset (1.36 feet) is less than the left outside shoulder width (1.36 feet). This indicates there is problem with the input data.
3265+51.000	3265+87.000	for segment #119 (3265+51.000 to 3265+87.000), Outside shoulder width (1.31 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3265+51.000	3265+87.000	for segment #119 (3265+51.000 to 3265+87.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3265+51.000	3265+87.000	for segment #119 (3265+51.000 to 3265+87.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3265+51.000	3265+87.000	for segment #119 (3265+51.000 to 3265+87.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3265+51.000	3265+87.000	for segment #119 (3265+51.000 to 3265+87.000), Outside barrier offset (0.62 feet) is less than the left outside shoulder width (0.62 feet). This indicates there is problem with the input data.
3265+87.000	3266+44.000	for segment #120 (3265+87.000 to 3266+44.000), Outside shoulder width (1.07 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3265+87.000	3266+44.000	for segment #120 (3265+87.000 to 3266+44.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3265+87.000	3266+44.000	for segment #120 (3265+87.000 to 3266+44.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3265+87.000	3266+44.000	for segment #120 (3265+87.000 to 3266+44.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3265+87.000	3266+44.000	for segment #120 (3265+87.000 to 3266+44.000), Outside barrier offset (-0.31 feet) is less than the left outside shoulder width (0.13 feet). This indicates there is problem with the input data.
3265+87.000	3266+44.000	for segment #120 (3265+87.000 to 3266+44.000), Outside barrier offset (0.00 feet) is less than the left outside shoulder width (0.13 feet). This indicates there is problem with the input data.
3266+44.000	3267+00.000	for segment #121 (3266+44.000 to 3267+00.000), Outside shoulder width (1.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3266+44.000	3267+00.000	for segment #121 (3266+44.000 to 3267+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3266+44.000	3267+00.000	for segment #121 (3266+44.000 to 3267+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3266+44.000	3267+00.000	for segment #121 (3266+44.000 to 3267+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3266+44.000	3267+00.000	for segment #121 (3266+44.000 to 3267+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3267+00.000	3267+04.000	for segment #122 (3267+00.000 to 3267+04.000), Outside shoulder width (1.50 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3267+00.000	3267+04.000	for segment #122 (3267+00.000 to 3267+04.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3267+00.000	3267+04.000	for segment #122 (3267+00.000 to 3267+04.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3267+00.000	3267+04.000	for segment #122 (3267+00.000 to 3267+04.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3267+00.000	3267+04.000	for segment #122 (3267+00.000 to 3267+04.000), Outside barrier offset (0.00 feet) is less than the left outside shoulder width (1.00 feet). This indicates there is problem with the input data.
3267+04.000	3267+28.700	for segment #123 (3267+04.000 to 3267+28.700), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3267+04.000	3267+28.700	for segment #123 (3267+04.000 to 3267+28.700), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3267+04.000	3267+28.700	for segment #123 (3267+04.000 to 3267+28.700), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3267+04.000	3267+28.700	for segment #123 (3267+04.000 to 3267+28.700), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3267+28.700	3274+00.000	for segment #124 (3267+28.700 to 3274+00.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3267+28.700	3274+00.000	for segment #124 (3267+28.700 to 3274+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3267+28.700	3274+00.000	for segment #124 (3267+28.700 to 3274+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3267+28.700	3274+00.000	for segment #124 (3267+28.700 to 3274+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3267+28.700	3274+00.000	for segment #124 (3267+28.700 to 3274+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3274+00.000	3274+68.000	for segment #125 (3274+00.000 to 3274+68.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3274+00.000	3274+68.000	for segment #125 (3274+00.000 to 3274+68.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3274+00.000	3274+68.000	for segment #125 (3274+00.000 to 3274+68.000), Median barrier offset (3.49 feet) is less than the left side inside shoulder width (3.49 feet). This indicates there is problem with the input data.
3274+00.000	3274+68.000	for segment #125 (3274+00.000 to 3274+68.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3274+00.000	3274+68.000	for segment #125 (3274+00.000 to 3274+68.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3274+68.000	3275+30.000	for segment #126 (3274+68.000 to 3275+30.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3274+68.000	3275+30.000	for segment #126 (3274+68.000 to 3275+30.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3274+68.000	3275+30.000	for segment #126 (3274+68.000 to 3275+30.000), Median barrier offset (2.52 feet) is less than the left side inside shoulder width (2.52 feet). This indicates there is problem with the input data.
3274+68.000	3275+30.000	for segment #126 (3274+68.000 to 3275+30.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3274+68.000	3275+30.000	for segment #126 (3274+68.000 to 3275+30.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3275+30.000	3275+34.000	for segment #127 (3275+30.000 to 3275+34.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3275+30.000	3275+34.000	for segment #127 (3275+30.000 to 3275+34.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3275+30.000	3275+34.000	for segment #127 (3275+30.000 to 3275+34.000), Median barrier offset (2.03 feet) is less than the left side inside shoulder width (2.03 feet). This indicates there is problem with the input data.
3275+30.000	3275+34.000	for segment #127 (3275+30.000 to 3275+34.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3275+30.000	3275+34.000	for segment #127 (3275+30.000 to 3275+34.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3275+34.000	3284+26.000	for segment #128 (3275+34.000 to 3284+26.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3275+34.000	3284+26.000	for segment #128 (3275+34.000 to 3284+26.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3275+34.000	3284+26.000	for segment #128 (3275+34.000 to 3284+26.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3275+34.000	3284+26.000	for segment #128 (3275+34.000 to 3284+26.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3275+34.000	3284+26.000	for segment #128 (3275+34.000 to 3284+26.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3284+26.000	3288+39.000	for segment #129 (3284+26.000 to 3288+39.000), Outside shoulder width (1.50 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3284+26.000	3288+39.000	for segment #129 (3284+26.000 to 3288+39.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3284+26.000	3288+39.000	for segment #129 (3284+26.000 to 3288+39.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3284+26.000	3288+39.000	for segment #129 (3284+26.000 to 3288+39.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3284+26.000	3288+39.000	for segment #129 (3284+26.000 to 3288+39.000), Outside barrier offset (0.00 feet) is less than the left outside shoulder width (1.00 feet). This indicates there is problem with the input data.
3288+39.000	3289+10.000	for segment #130 (3288+39.000 to 3289+10.000), Outside shoulder width (1.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3288+39.000	3289+10.000	for segment #130 (3288+39.000 to 3289+10.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3288+39.000	3289+10.000	for segment #130 (3288+39.000 to 3289+10.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3288+39.000	3289+10.000	for segment #130 (3288+39.000 to 3289+10.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3289+10.000	3289+67.480	for segment #131 (3289+10.000 to 3289+67.480), Outside shoulder width (1.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3289+10.000	3289+67.480	for segment #131 (3289+10.000 to 3289+67.480), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3289+10.000	3289+67.480	for segment #131 (3289+10.000 to 3289+67.480), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3289+10.000	3289+67.480	for segment #131 (3289+10.000 to 3289+67.480), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3289+67.480	3292+04.000	for segment #132 (3289+67.480 to 3292+04.000), Outside shoulder width (1.50 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3289+67.480	3292+04.000	for segment #132 (3289+67.480 to 3292+04.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3289+67.480	3292+04.000	for segment #132 (3289+67.480 to 3292+04.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3289+67.480	3292+04.000	for segment #132 (3289+67.480 to 3292+04.000), Outside barrier offset (0.00 feet) is less than the left outside shoulder width (1.00 feet). This indicates there is problem with the input data.
3289+67.480	3292+04.000	for segment #132 (3289+67.480 to 3292+04.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3292+04.000	3292+84.000	for segment #133 (3292+04.000 to 3292+84.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3292+04.000	3292+84.000	for segment #133 (3292+04.000 to 3292+84.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3292+04.000	3292+84.000	for segment #133 (3292+04.000 to 3292+84.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3292+84.000	3294+33.000	for segment #134 (3292+84.000 to 3294+33.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3292+84.000	3294+33.000	for segment #134 (3292+84.000 to 3294+33.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3292+84.000	3294+33.000	for segment #134 (3292+84.000 to 3294+33.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3292+84.000	3294+33.000	for segment #134 (3292+84.000 to 3294+33.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3294+33.000	3295+81.000	for segment #135 (3294+33.000 to 3295+81.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3294+33.000	3295+81.000	for segment #135 (3294+33.000 to 3295+81.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3294+33.000	3295+81.000	for segment #135 (3294+33.000 to 3295+81.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3294+33.000	3295+81.000	for segment #135 (3294+33.000 to 3295+81.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3295+81.000	3296+00.000	for segment #136 (3295+81.000 to 3296+00.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3295+81.000	3296+00.000	for segment #136 (3295+81.000 to 3296+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3295+81.000	3296+00.000	for segment #136 (3295+81.000 to 3296+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3295+81.000	3296+00.000	for segment #136 (3295+81.000 to 3296+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3296+00.000	3296+20.000	for segment #137 (3296+00.000 to 3296+20.000), Inside shoulder width (1.75 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3296+00.000	3296+20.000	for segment #137 (3296+00.000 to 3296+20.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3296+00.000	3296+20.000	for segment #137 (3296+00.000 to 3296+20.000), Median barrier offset (1.80 feet) is less than the left side inside shoulder width (1.80 feet). This indicates there is problem with the input data.
3296+00.000	3296+20.000	for segment #137 (3296+00.000 to 3296+20.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3296+00.000	3296+20.000	for segment #137 (3296+00.000 to 3296+20.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3296+20.000	3296+55.670	for segment #138 (3296+20.000 to 3296+55.670), Inside shoulder width (1.04 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3296+20.000	3296+55.670	for segment #138 (3296+20.000 to 3296+55.670), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3296+20.000	3296+55.670	for segment #138 (3296+20.000 to 3296+55.670), Median barrier offset (1.24 feet) is less than the left side inside shoulder width (1.24 feet). This indicates there is problem with the input data.
3296+20.000	3296+55.670	for segment #138 (3296+20.000 to 3296+55.670), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3296+20.000	3296+55.670	for segment #138 (3296+20.000 to 3296+55.670), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3296+55.670	3296+60.000	for segment #139 (3296+55.670 to 3296+60.000), Inside shoulder width (0.53 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3296+55.670	3296+60.000	for segment #139 (3296+55.670 to 3296+60.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3296+55.670	3296+60.000	for segment #139 (3296+55.670 to 3296+60.000), Median barrier offset (0.84 feet) is less than the left side inside shoulder width (0.84 feet). This indicates there is problem with the input data.
3296+55.670	3296+60.000	for segment #139 (3296+55.670 to 3296+60.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3296+60.000	3296+65.000	for segment #140 (3296+60.000 to 3296+65.000), Inside shoulder width (0.41 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3296+60.000	3296+65.000	for segment #140 (3296+60.000 to 3296+65.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3296+60.000	3296+65.000	for segment #140 (3296+60.000 to 3296+65.000), Median barrier offset (0.75 feet) is less than the left side inside shoulder width (0.75 feet). This indicates there is problem with the input data.
3296+60.000	3296+65.000	for segment #140 (3296+60.000 to 3296+65.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3296+65.000	3297+00.000	for segment #141 (3296+65.000 to 3297+00.000), Inside shoulder width (0.18 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3296+65.000	3297+00.000	for segment #141 (3296+65.000 to 3297+00.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3296+65.000	3297+00.000	for segment #141 (3296+65.000 to 3297+00.000), Median barrier offset (0.35 feet) is less than the left side inside shoulder width (0.35 feet). This indicates there is problem with the input data.
3296+65.000	3297+00.000	for segment #141 (3296+65.000 to 3297+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3297+00.000	3297+29.000	for segment #142 (3297+00.000 to 3297+29.000), Inside shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3297+00.000	3297+29.000	for segment #142 (3297+00.000 to 3297+29.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3297+00.000	3297+29.000	for segment #142 (3297+00.000 to 3297+29.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3297+00.000	3297+29.000	for segment #142 (3297+00.000 to 3297+29.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3297+29.000	3298+78.000	for segment #143 (3297+29.000 to 3298+78.000), Inside shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3297+29.000	3298+78.000	for segment #143 (3297+29.000 to 3298+78.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3297+29.000	3298+78.000	for segment #143 (3297+29.000 to 3298+78.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3297+29.000	3298+78.000	for segment #143 (3297+29.000 to 3298+78.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3298+78.000	3300+26.000	for segment #144 (3298+78.000 to 3300+26.000), Inside shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3298+78.000	3300+26.000	for segment #144 (3298+78.000 to 3300+26.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3298+78.000	3300+26.000	for segment #144 (3298+78.000 to 3300+26.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3298+78.000	3300+26.000	for segment #144 (3298+78.000 to 3300+26.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3300+26.000	3306+86.000	for segment #145 (3300+26.000 to 3306+86.000), Inside shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3300+26.000	3306+86.000	for segment #145 (3300+26.000 to 3306+86.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3300+26.000	3306+86.000	for segment #145 (3300+26.000 to 3306+86.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3300+26.000	3306+86.000	for segment #145 (3300+26.000 to 3306+86.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3300+26.000	3306+86.000	for segment #145 (3300+26.000 to 3306+86.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3306+86.000	3308+57.000	for segment #146 (3306+86.000 to 3308+57.000), Inside shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3306+86.000	3308+57.000	for segment #146 (3306+86.000 to 3308+57.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3306+86.000	3308+57.000	for segment #146 (3306+86.000 to 3308+57.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3306+86.000	3308+57.000	for segment #146 (3306+86.000 to 3308+57.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3308+57.000	3310+28.000	for segment #147 (3308+57.000 to 3310+28.000), Inside shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3308+57.000	3310+28.000	for segment #147 (3308+57.000 to 3310+28.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3308+57.000	3310+28.000	for segment #147 (3308+57.000 to 3310+28.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3310+28.000	3311+93.000	for segment #148 (3310+28.000 to 3311+93.000), Inside shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3310+28.000	3311+93.000	for segment #148 (3310+28.000 to 3311+93.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3310+28.000	3311+93.000	for segment #148 (3310+28.000 to 3311+93.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3311+93.000	3311+99.000	for segment #149 (3311+93.000 to 3311+99.000), Inside shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3311+93.000	3311+99.000	for segment #149 (3311+93.000 to 3311+99.000), Outside shoulder width (2.00 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3311+93.000	3311+99.000	for segment #149 (3311+93.000 to 3311+99.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3311+93.000	3311+99.000	for segment #149 (3311+93.000 to 3311+99.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3311+99.000	3312+75.000	for segment #150 (3311+99.000 to 3312+75.000), Inside shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3311+99.000	3312+75.000	for segment #150 (3311+99.000 to 3312+75.000), Outside shoulder width (2.50 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3311+99.000	3312+75.000	for segment #150 (3311+99.000 to 3312+75.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3311+99.000	3312+75.000	for segment #150 (3311+99.000 to 3312+75.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3312+75.000	3312+83.000	for segment #151 (3312+75.000 to 3312+83.000), Inside shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3312+75.000	3312+83.000	for segment #151 (3312+75.000 to 3312+83.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3312+75.000	3312+83.000	for segment #151 (3312+75.000 to 3312+83.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3312+75.000	3312+83.000	for segment #151 (3312+75.000 to 3312+83.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3312+83.000	3313+69.000	for segment #152 (3312+83.000 to 3313+69.000), Inside shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3312+83.000	3313+69.000	for segment #152 (3312+83.000 to 3313+69.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3312+83.000	3313+69.000	for segment #152 (3312+83.000 to 3313+69.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3312+83.000	3313+69.000	for segment #152 (3312+83.000 to 3313+69.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3312+83.000	3313+69.000	for segment #152 (3312+83.000 to 3313+69.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3313+69.000	3314+42.000	for segment #153 (3313+69.000 to 3314+42.000), Inside shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3313+69.000	3314+42.000	for segment #153 (3313+69.000 to 3314+42.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3313+69.000	3314+42.000	for segment #153 (3313+69.000 to 3314+42.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3313+69.000	3314+42.000	for segment #153 (3313+69.000 to 3314+42.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3313+69.000	3314+42.000	for segment #153 (3313+69.000 to 3314+42.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3314+42.000	3314+55.000	for segment #154 (3314+42.000 to 3314+55.000), Inside shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3314+42.000	3314+55.000	for segment #154 (3314+42.000 to 3314+55.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3314+42.000	3314+55.000	for segment #154 (3314+42.000 to 3314+55.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3314+42.000	3314+55.000	for segment #154 (3314+42.000 to 3314+55.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3314+42.000	3314+55.000	for segment #154 (3314+42.000 to 3314+55.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3314+55.000	3315+40.000	for segment #155 (3314+55.000 to 3315+40.000), Inside shoulder width (1.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3314+55.000	3315+40.000	for segment #155 (3314+55.000 to 3315+40.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3314+55.000	3315+40.000	for segment #155 (3314+55.000 to 3315+40.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3314+55.000	3315+40.000	for segment #155 (3314+55.000 to 3315+40.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3314+55.000	3315+40.000	for segment #155 (3314+55.000 to 3315+40.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3315+40.000	3316+18.000	for segment #156 (3315+40.000 to 3316+18.000), Inside shoulder width (1.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3315+40.000	3316+18.000	for segment #156 (3315+40.000 to 3316+18.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3315+40.000	3316+18.000	for segment #156 (3315+40.000 to 3316+18.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3315+40.000	3316+18.000	for segment #156 (3315+40.000 to 3316+18.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3315+40.000	3316+18.000	for segment #156 (3315+40.000 to 3316+18.000), Outside barrier distance from edge of outside shoulder to barrier face (0.06 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3315+40.000	3316+18.000	for segment #156 (3315+40.000 to 3316+18.000), Outside barrier distance from edge of outside shoulder to barrier face (0.19 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3316+18.000	3316+64.000	for segment #157 (3316+18.000 to 3316+64.000), Inside shoulder width (1.25 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3316+18.000	3316+64.000	for segment #157 (3316+18.000 to 3316+64.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3316+18.000	3316+64.000	for segment #157 (3316+18.000 to 3316+64.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3316+18.000	3316+64.000	for segment #157 (3316+18.000 to 3316+64.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3316+18.000	3316+64.000	for segment #157 (3316+18.000 to 3316+64.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3316+64.000	3317+11.000	for segment #158 (3316+64.000 to 3317+11.000), Inside shoulder width (1.76 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
3316+64.000	3317+11.000	for segment #158 (3316+64.000 to 3317+11.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3316+64.000	3317+11.000	for segment #158 (3316+64.000 to 3317+11.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3316+64.000	3317+11.000	for segment #158 (3316+64.000 to 3317+11.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3316+64.000	3317+11.000	for segment #158 (3316+64.000 to 3317+11.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3317+11.000	3317+55.000	for segment #159 (3317+11.000 to 3317+55.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3317+11.000	3317+55.000	for segment #159 (3317+11.000 to 3317+55.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3317+11.000	3317+55.000	for segment #159 (3317+11.000 to 3317+55.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3317+11.000	3317+55.000	for segment #159 (3317+11.000 to 3317+55.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3317+55.000	3317+67.000	for segment #160 (3317+55.000 to 3317+67.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3317+55.000	3317+67.000	for segment #160 (3317+55.000 to 3317+67.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3317+55.000	3317+67.000	for segment #160 (3317+55.000 to 3317+67.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3317+55.000	3317+67.000	for segment #160 (3317+55.000 to 3317+67.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3317+67.000	3318+00.000	for segment #161 (3317+67.000 to 3318+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3317+67.000	3318+00.000	for segment #161 (3317+67.000 to 3318+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3317+67.000	3318+00.000	for segment #161 (3317+67.000 to 3318+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3317+67.000	3318+00.000	for segment #161 (3317+67.000 to 3318+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3318+00.000	3318+51.000	for segment #162 (3318+00.000 to 3318+51.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3318+00.000	3318+51.000	for segment #162 (3318+00.000 to 3318+51.000), Median barrier offset (3.49 feet) is less than the left side inside shoulder width (3.49 feet). This indicates there is problem with the input data.
3318+00.000	3318+51.000	for segment #162 (3318+00.000 to 3318+51.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3318+00.000	3318+51.000	for segment #162 (3318+00.000 to 3318+51.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3318+51.000	3318+81.330	for segment #163 (3318+51.000 to 3318+81.330), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3318+51.000	3318+81.330	for segment #163 (3318+51.000 to 3318+81.330), Median barrier offset (2.68 feet) is less than the left side inside shoulder width (2.68 feet). This indicates there is problem with the input data.
3318+51.000	3318+81.330	for segment #163 (3318+51.000 to 3318+81.330), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3318+51.000	3318+81.330	for segment #163 (3318+51.000 to 3318+81.330), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3318+81.330	3319+00.000	for segment #164 (3318+81.330 to 3319+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3318+81.330	3319+00.000	for segment #164 (3318+81.330 to 3319+00.000), Median barrier offset (2.19 feet) is less than the left side inside shoulder width (2.19 feet). This indicates there is problem with the input data.
3318+81.330	3319+00.000	for segment #164 (3318+81.330 to 3319+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3319+00.000	3322+27.000	for segment #165 (3319+00.000 to 3322+27.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3319+00.000	3322+27.000	for segment #165 (3319+00.000 to 3322+27.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3319+00.000	3322+27.000	for segment #165 (3319+00.000 to 3322+27.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3322+27.000	3327+28.000	for segment #166 (3322+27.000 to 3327+28.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3322+27.000	3327+28.000	for segment #166 (3322+27.000 to 3327+28.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3327+28.000	3328+81.000	for segment #167 (3327+28.000 to 3328+81.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3327+28.000	3328+81.000	for segment #167 (3327+28.000 to 3328+81.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3328+81.000	3328+89.000	for segment #168 (3328+81.000 to 3328+89.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3328+81.000	3328+89.000	for segment #168 (3328+81.000 to 3328+89.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3328+89.000	3329+17.000	for segment #169 (3328+89.000 to 3329+17.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3328+89.000	3329+17.000	for segment #169 (3328+89.000 to 3329+17.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3329+17.000	3332+62.000	for segment #170 (3329+17.000 to 3332+62.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3329+17.000	3332+62.000	for segment #170 (3329+17.000 to 3332+62.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3329+17.000	3332+62.000	for segment #170 (3329+17.000 to 3332+62.000), Outside barrier offset (7.04 feet) is less than the right outside shoulder width (7.50 feet). This indicates there is problem with the input data.
3332+62.000	3342+00.000	for segment #171 (3332+62.000 to 3342+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3332+62.000	3342+00.000	for segment #171 (3332+62.000 to 3342+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3332+62.000	3342+00.000	for segment #171 (3332+62.000 to 3342+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3332+62.000	3342+00.000	for segment #171 (3332+62.000 to 3342+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3342+00.000	3344+51.000	for segment #172 (3342+00.000 to 3344+51.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3342+00.000	3344+51.000	for segment #172 (3342+00.000 to 3344+51.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3342+00.000	3344+51.000	for segment #172 (3342+00.000 to 3344+51.000), Outside barrier distance from edge of outside shoulder to barrier face (0.11 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3342+00.000	3344+51.000	for segment #172 (3342+00.000 to 3344+51.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3344+51.000	3345+00.000	for segment #173 (3344+51.000 to 3345+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3344+51.000	3345+00.000	for segment #173 (3344+51.000 to 3345+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3344+51.000	3345+00.000	for segment #173 (3344+51.000 to 3345+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3344+51.000	3345+00.000	for segment #173 (3344+51.000 to 3345+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.13 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3345+00.000	3346+24.000	for segment #174 (3345+00.000 to 3346+24.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3345+00.000	3346+24.000	for segment #174 (3345+00.000 to 3346+24.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3345+00.000	3346+24.000	for segment #174 (3345+00.000 to 3346+24.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3345+00.000	3346+24.000	for segment #174 (3345+00.000 to 3346+24.000), Outside barrier distance from edge of outside shoulder to barrier face (0.42 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3346+24.000	3347+04.000	for segment #175 (3346+24.000 to 3347+04.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3346+24.000	3347+04.000	for segment #175 (3346+24.000 to 3347+04.000), Median barrier distance from edge of inside shoulder to barrier face (0.01 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3346+24.000	3347+04.000	for segment #175 (3346+24.000 to 3347+04.000), Median barrier distance from edge of inside shoulder to barrier face (0.15 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3346+24.000	3347+04.000	for segment #175 (3346+24.000 to 3347+04.000), Outside barrier offset (4.00 feet) is less than the left outside shoulder width (7.00 feet). This indicates there is problem with the input data.
3347+04.000	3347+47.000	for segment #177 (3347+04.000 to 3347+47.000), Outside shoulder width (3.67 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3347+04.000	3347+47.000	for segment #177 (3347+04.000 to 3347+47.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3347+04.000	3347+47.000	for segment #177 (3347+04.000 to 3347+47.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3347+04.000	3347+47.000	for segment #177 (3347+04.000 to 3347+47.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3347+47.000	3348+08.000	for segment #179 (3347+47.000 to 3348+08.000), Outside shoulder width (3.25 feet) is less than specified boundaries (4.00 feet); adjusted in CMF calculations.
3347+47.000	3348+08.000	for segment #179 (3347+47.000 to 3348+08.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3347+47.000	3348+08.000	for segment #179 (3347+47.000 to 3348+08.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3347+47.000	3348+08.000	for segment #179 (3347+47.000 to 3348+08.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3348+08.000	3349+00.000	for segment #181 (3348+08.000 to 3349+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3348+08.000	3349+00.000	for segment #181 (3348+08.000 to 3349+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3348+08.000	3349+00.000	for segment #181 (3348+08.000 to 3349+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3349+00.000	3349+17.000	for segment #183 (3349+00.000 to 3349+17.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3349+00.000	3349+17.000	for segment #183 (3349+00.000 to 3349+17.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3349+17.000	3349+51.000	for segment #184 (3349+17.000 to 3349+51.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3349+17.000	3349+51.000	for segment #184 (3349+17.000 to 3349+51.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3349+51.000	3349+84.000	for segment #185 (3349+51.000 to 3349+84.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3349+51.000	3349+84.000	for segment #185 (3349+51.000 to 3349+84.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3349+84.000	3354+66.000	for segment #186 (3349+84.000 to 3354+66.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3349+84.000	3354+66.000	for segment #186 (3349+84.000 to 3354+66.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3354+66.000	3354+87.000	for segment #187 (3354+66.000 to 3354+87.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3354+66.000	3354+87.000	for segment #187 (3354+66.000 to 3354+87.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3354+87.000	3355+27.000	for segment #189 (3354+87.000 to 3355+27.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3354+87.000	3355+27.000	for segment #189 (3354+87.000 to 3355+27.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3355+27.000	3355+68.000	for segment #191 (3355+27.000 to 3355+68.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3355+27.000	3355+68.000	for segment #191 (3355+27.000 to 3355+68.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3355+68.000	3355+88.000	for segment #193 (3355+68.000 to 3355+88.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3355+68.000	3355+88.000	for segment #193 (3355+68.000 to 3355+88.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3355+88.000	3366+12.000	for segment #195 (3355+88.000 to 3366+12.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3355+88.000	3366+12.000	for segment #195 (3355+88.000 to 3366+12.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3355+88.000	3366+12.000	for segment #195 (3355+88.000 to 3366+12.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3366+12.000	3373+06.480	for segment #196 (3366+12.000 to 3373+06.480), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3366+12.000	3373+06.480	for segment #196 (3366+12.000 to 3373+06.480), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3366+12.000	3373+06.480	for segment #196 (3366+12.000 to 3373+06.480), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3366+12.000	3373+06.480	for segment #196 (3366+12.000 to 3373+06.480), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3373+06.480	3384+16.000	for segment #197 (3373+06.480 to 3384+16.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3373+06.480	3384+16.000	for segment #197 (3373+06.480 to 3384+16.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3373+06.480	3384+16.000	for segment #197 (3373+06.480 to 3384+16.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3384+16.000	3391+05.000	for segment #198 (3384+16.000 to 3391+05.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3384+16.000	3391+05.000	for segment #198 (3384+16.000 to 3391+05.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3384+16.000	3391+05.000	for segment #198 (3384+16.000 to 3391+05.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3384+16.000	3391+05.000	for segment #198 (3384+16.000 to 3391+05.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3391+05.000	3391+55.000	for segment #199 (3391+05.000 to 3391+55.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3391+05.000	3391+55.000	for segment #199 (3391+05.000 to 3391+55.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3391+05.000	3391+55.000	for segment #199 (3391+05.000 to 3391+55.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3391+05.000	3391+55.000	for segment #199 (3391+05.000 to 3391+55.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3391+55.000	3392+54.000	for segment #200 (3391+55.000 to 3392+54.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3391+55.000	3392+54.000	for segment #200 (3391+55.000 to 3392+54.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3391+55.000	3392+54.000	for segment #200 (3391+55.000 to 3392+54.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3391+55.000	3392+54.000	for segment #200 (3391+55.000 to 3392+54.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3392+54.000	3393+52.000	for segment #201 (3392+54.000 to 3393+52.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3392+54.000	3393+52.000	for segment #201 (3392+54.000 to 3393+52.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3392+54.000	3393+52.000	for segment #201 (3392+54.000 to 3393+52.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3392+54.000	3393+52.000	for segment #201 (3392+54.000 to 3393+52.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3393+52.000	3394+51.000	for segment #202 (3393+52.000 to 3394+51.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3393+52.000	3394+51.000	for segment #202 (3393+52.000 to 3394+51.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3393+52.000	3394+51.000	for segment #202 (3393+52.000 to 3394+51.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3393+52.000	3394+51.000	for segment #202 (3393+52.000 to 3394+51.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3394+51.000	3395+00.000	for segment #203 (3394+51.000 to 3395+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3394+51.000	3395+00.000	for segment #203 (3394+51.000 to 3395+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3394+51.000	3395+00.000	for segment #203 (3394+51.000 to 3395+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3394+51.000	3395+00.000	for segment #203 (3394+51.000 to 3395+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3395+00.000	3398+59.810	for segment #204 (3395+00.000 to 3398+59.810), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3395+00.000	3398+59.810	for segment #204 (3395+00.000 to 3398+59.810), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3395+00.000	3398+59.810	for segment #204 (3395+00.000 to 3398+59.810), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3398+59.810	3399+60.000	for segment #205 (3398+59.810 to 3399+60.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3398+59.810	3399+60.000	for segment #205 (3398+59.810 to 3399+60.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3398+59.810	3399+60.000	for segment #205 (3398+59.810 to 3399+60.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3398+59.810	3399+60.000	for segment #205 (3398+59.810 to 3399+60.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3399+60.000	3400+43.000	for segment #206 (3399+60.000 to 3400+43.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3399+60.000	3400+43.000	for segment #206 (3399+60.000 to 3400+43.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3399+60.000	3400+43.000	for segment #206 (3399+60.000 to 3400+43.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3399+60.000	3400+43.000	for segment #206 (3399+60.000 to 3400+43.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3400+43.000	3403+50.000	for segment #207 (3400+43.000 to 3403+50.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3400+43.000	3403+50.000	for segment #207 (3400+43.000 to 3403+50.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3400+43.000	3403+50.000	for segment #207 (3400+43.000 to 3403+50.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3400+43.000	3403+50.000	for segment #207 (3400+43.000 to 3403+50.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3403+50.000	3404+03.000	for segment #208 (3403+50.000 to 3404+03.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3403+50.000	3404+03.000	for segment #208 (3403+50.000 to 3404+03.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3403+50.000	3404+03.000	for segment #208 (3403+50.000 to 3404+03.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3404+03.000	3404+21.020	for segment #209 (3404+03.000 to 3404+21.020), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3404+03.000	3404+21.020	for segment #209 (3404+03.000 to 3404+21.020), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3404+03.000	3404+21.020	for segment #209 (3404+03.000 to 3404+21.020), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3404+21.020	3405+78.000	for segment #210 (3404+21.020 to 3405+78.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3404+21.020	3405+78.000	for segment #210 (3404+21.020 to 3405+78.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3404+21.020	3405+78.000	for segment #210 (3404+21.020 to 3405+78.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3404+21.020	3405+78.000	for segment #210 (3404+21.020 to 3405+78.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3405+78.000	3407+78.000	for segment #211 (3405+78.000 to 3407+78.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3405+78.000	3407+78.000	for segment #211 (3405+78.000 to 3407+78.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3405+78.000	3407+78.000	for segment #211 (3405+78.000 to 3407+78.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3405+78.000	3407+78.000	for segment #211 (3405+78.000 to 3407+78.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3407+78.000	3408+00.000	for segment #212 (3407+78.000 to 3408+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3407+78.000	3408+00.000	for segment #212 (3407+78.000 to 3408+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3407+78.000	3408+00.000	for segment #212 (3407+78.000 to 3408+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3407+78.000	3408+00.000	for segment #212 (3407+78.000 to 3408+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3408+00.000	3408+14.000	for segment #213 (3408+00.000 to 3408+14.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3408+00.000	3408+14.000	for segment #213 (3408+00.000 to 3408+14.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3408+00.000	3408+14.000	for segment #213 (3408+00.000 to 3408+14.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3408+14.000	3408+41.000	for segment #214 (3408+14.000 to 3408+41.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3408+14.000	3408+41.000	for segment #214 (3408+14.000 to 3408+41.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3408+14.000	3408+41.000	for segment #214 (3408+14.000 to 3408+41.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3408+41.000	3408+67.000	for segment #215 (3408+41.000 to 3408+67.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3408+41.000	3408+67.000	for segment #215 (3408+41.000 to 3408+67.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3408+41.000	3408+67.000	for segment #215 (3408+41.000 to 3408+67.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3408+67.000	3408+94.000	for segment #216 (3408+67.000 to 3408+94.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3408+67.000	3408+94.000	for segment #216 (3408+67.000 to 3408+94.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3408+67.000	3408+94.000	for segment #216 (3408+67.000 to 3408+94.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3408+94.000	3409+07.000	for segment #217 (3408+94.000 to 3409+07.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3408+94.000	3409+07.000	for segment #217 (3408+94.000 to 3409+07.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3408+94.000	3409+07.000	for segment #217 (3408+94.000 to 3409+07.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3409+07.000	3418+70.490	for segment #218 (3409+07.000 to 3418+70.490), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3409+07.000	3418+70.490	for segment #218 (3409+07.000 to 3418+70.490), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3409+07.000	3418+70.490	for segment #218 (3409+07.000 to 3418+70.490), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3409+07.000	3418+70.490	for segment #218 (3409+07.000 to 3418+70.490), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3418+70.490	3433+36.550	for segment #219 (3418+70.490 to 3433+36.550), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3418+70.490	3433+36.550	for segment #219 (3418+70.490 to 3433+36.550), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3418+70.490	3433+36.550	for segment #219 (3418+70.490 to 3433+36.550), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3418+70.490	3433+36.550	for segment #219 (3418+70.490 to 3433+36.550), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3433+36.550	3439+11.620	for segment #220 (3433+36.550 to 3439+11.620), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3433+36.550	3439+11.620	for segment #220 (3433+36.550 to 3439+11.620), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3433+36.550	3439+11.620	for segment #220 (3433+36.550 to 3439+11.620), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3433+36.550	3439+11.620	for segment #220 (3433+36.550 to 3439+11.620), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3439+11.620	3447+63.000	for segment #222 (3439+11.620 to 3447+63.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3439+11.620	3447+63.000	for segment #222 (3439+11.620 to 3447+63.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3439+11.620	3447+63.000	for segment #222 (3439+11.620 to 3447+63.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3439+11.620	3447+63.000	for segment #222 (3439+11.620 to 3447+63.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3447+63.000	3448+17.000	for segment #223 (3447+63.000 to 3448+17.000), Inside shoulder width (12.25 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3447+63.000	3448+17.000	for segment #223 (3447+63.000 to 3448+17.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3447+63.000	3448+17.000	for segment #223 (3447+63.000 to 3448+17.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3447+63.000	3448+17.000	for segment #223 (3447+63.000 to 3448+17.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3447+63.000	3448+17.000	for segment #223 (3447+63.000 to 3448+17.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3448+17.000	3448+72.150	for segment #225 (3448+17.000 to 3448+72.150), Inside shoulder width (12.76 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3448+17.000	3448+72.150	for segment #225 (3448+17.000 to 3448+72.150), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3448+17.000	3448+72.150	for segment #225 (3448+17.000 to 3448+72.150), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3448+17.000	3448+72.150	for segment #225 (3448+17.000 to 3448+72.150), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3448+17.000	3448+72.150	for segment #225 (3448+17.000 to 3448+72.150), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3448+72.150	3449+25.000	for segment #227 (3448+72.150 to 3449+25.000), Inside shoulder width (13.26 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3448+72.150	3449+25.000	for segment #227 (3448+72.150 to 3449+25.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3448+72.150	3449+25.000	for segment #227 (3448+72.150 to 3449+25.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3448+72.150	3449+25.000	for segment #227 (3448+72.150 to 3449+25.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3449+25.000	3450+00.000	for segment #229 (3449+25.000 to 3450+00.000), Inside shoulder width (13.86 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3449+25.000	3450+00.000	for segment #229 (3449+25.000 to 3450+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3449+25.000	3450+00.000	for segment #229 (3449+25.000 to 3450+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3449+25.000	3450+00.000	for segment #229 (3449+25.000 to 3450+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3450+00.000	3450+19.000	for segment #231 (3450+00.000 to 3450+19.000), Inside shoulder width (14.36 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3450+00.000	3450+19.000	for segment #231 (3450+00.000 to 3450+19.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3450+00.000	3450+19.000	for segment #231 (3450+00.000 to 3450+19.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3450+00.000	3450+19.000	for segment #231 (3450+00.000 to 3450+19.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3450+19.000	3450+68.980	for segment #233 (3450+19.000 to 3450+68.980), Inside shoulder width (14.91 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3450+19.000	3450+68.980	for segment #233 (3450+19.000 to 3450+68.980), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3450+19.000	3450+68.980	for segment #233 (3450+19.000 to 3450+68.980), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3450+19.000	3450+68.980	for segment #233 (3450+19.000 to 3450+68.980), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3450+68.980	3450+81.000	for segment #235 (3450+68.980 to 3450+81.000), Inside shoulder width (15.40 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3450+68.980	3450+81.000	for segment #235 (3450+68.980 to 3450+81.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3450+68.980	3450+81.000	for segment #235 (3450+68.980 to 3450+81.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3450+81.000	3451+44.000	for segment #236 (3450+81.000 to 3451+44.000), Inside shoulder width (16.00 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3450+81.000	3451+44.000	for segment #236 (3450+81.000 to 3451+44.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3450+81.000	3451+44.000	for segment #236 (3450+81.000 to 3451+44.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3451+44.000	3452+07.000	for segment #237 (3451+44.000 to 3452+07.000), Inside shoulder width (17.01 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3451+44.000	3452+07.000	for segment #237 (3451+44.000 to 3452+07.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3451+44.000	3452+07.000	for segment #237 (3451+44.000 to 3452+07.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3452+07.000	3452+23.000	for segment #238 (3452+07.000 to 3452+23.000), Inside shoulder width (17.64 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3452+07.000	3452+23.000	for segment #238 (3452+07.000 to 3452+23.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3452+07.000	3452+23.000	for segment #238 (3452+07.000 to 3452+23.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3452+23.000	3452+69.000	for segment #239 (3452+23.000 to 3452+69.000), Inside shoulder width (18.14 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3452+23.000	3452+69.000	for segment #239 (3452+23.000 to 3452+69.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3452+23.000	3452+69.000	for segment #239 (3452+23.000 to 3452+69.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3452+69.000	3453+00.000	for segment #240 (3452+69.000 to 3453+00.000), Inside shoulder width (18.75 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3452+69.000	3453+00.000	for segment #240 (3452+69.000 to 3453+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3452+69.000	3453+00.000	for segment #240 (3452+69.000 to 3453+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3453+00.000	3453+51.000	for segment #241 (3453+00.000 to 3453+51.000), Inside shoulder width (18.75 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3453+00.000	3453+51.000	for segment #241 (3453+00.000 to 3453+51.000), Median barrier offset (21.49 feet) is less than the right side inside shoulder width (21.49 feet). This indicates there is problem with the input data.
3453+00.000	3453+51.000	for segment #241 (3453+00.000 to 3453+51.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3453+51.000	3454+52.000	for segment #242 (3453+51.000 to 3454+52.000), Inside shoulder width (17.99 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3453+51.000	3454+52.000	for segment #242 (3453+51.000 to 3454+52.000), Median barrier offset (19.99 feet) is less than the right side inside shoulder width (19.99 feet). This indicates there is problem with the input data.
3453+51.000	3454+52.000	for segment #242 (3453+51.000 to 3454+52.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3454+52.000	3455+52.000	for segment #243 (3454+52.000 to 3455+52.000), Inside shoulder width (17.00 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3454+52.000	3455+52.000	for segment #243 (3454+52.000 to 3455+52.000), Median barrier offset (17.99 feet) is less than the right side inside shoulder width (17.99 feet). This indicates there is problem with the input data.
3454+52.000	3455+52.000	for segment #243 (3454+52.000 to 3455+52.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3455+52.000	3456+53.000	for segment #244 (3455+52.000 to 3456+53.000), Inside shoulder width (16.00 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3455+52.000	3456+53.000	for segment #244 (3455+52.000 to 3456+53.000), Median barrier offset (16.00 feet) is less than the right side inside shoulder width (16.00 feet). This indicates there is problem with the input data.
3455+52.000	3456+53.000	for segment #244 (3455+52.000 to 3456+53.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3455+52.000	3456+53.000	for segment #244 (3455+52.000 to 3456+53.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3455+52.000	3456+53.000	for segment #244 (3455+52.000 to 3456+53.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3456+53.000	3457+03.000	for segment #245 (3456+53.000 to 3457+03.000), Inside shoulder width (15.25 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3456+53.000	3457+03.000	for segment #245 (3456+53.000 to 3457+03.000), Median barrier offset (14.50 feet) is less than the right side inside shoulder width (14.50 feet). This indicates there is problem with the input data.
3456+53.000	3457+03.000	for segment #245 (3456+53.000 to 3457+03.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3456+53.000	3457+03.000	for segment #245 (3456+53.000 to 3457+03.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3456+53.000	3457+03.000	for segment #245 (3456+53.000 to 3457+03.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3457+03.000	3459+52.000	for segment #246 (3457+03.000 to 3459+52.000), Inside shoulder width (15.00 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3457+03.000	3459+52.000	for segment #246 (3457+03.000 to 3459+52.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3457+03.000	3459+52.000	for segment #246 (3457+03.000 to 3459+52.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3457+03.000	3459+52.000	for segment #246 (3457+03.000 to 3459+52.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3457+03.000	3459+52.000	for segment #246 (3457+03.000 to 3459+52.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3459+52.000	3466+51.000	for segment #247 (3459+52.000 to 3466+51.000), Inside shoulder width (15.00 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3459+52.000	3466+51.000	for segment #247 (3459+52.000 to 3466+51.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3459+52.000	3466+51.000	for segment #247 (3459+52.000 to 3466+51.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3459+52.000	3466+51.000	for segment #247 (3459+52.000 to 3466+51.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3459+52.000	3466+51.000	for segment #247 (3459+52.000 to 3466+51.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3466+51.000	3467+74.000	for segment #248 (3466+51.000 to 3467+74.000), Inside shoulder width (15.00 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3466+51.000	3467+74.000	for segment #248 (3466+51.000 to 3467+74.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3466+51.000	3467+74.000	for segment #248 (3466+51.000 to 3467+74.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3466+51.000	3467+74.000	for segment #248 (3466+51.000 to 3467+74.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3466+51.000	3467+74.000	for segment #248 (3466+51.000 to 3467+74.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3467+74.000	3477+00.000	for segment #249 (3467+74.000 to 3477+00.000), Inside shoulder width (15.00 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
3467+74.000	3477+00.000	for segment #249 (3467+74.000 to 3477+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3467+74.000	3477+00.000	for segment #249 (3467+74.000 to 3477+00.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3467+74.000	3477+00.000	for segment #249 (3467+74.000 to 3477+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3467+74.000	3477+00.000	for segment #249 (3467+74.000 to 3477+00.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3129+75.190	3129+76.000	for segment #35 (3129+75.190 to 3129+76.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3129+76.000	3130+00.000	for segment #37 (3129+76.000 to 3130+00.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3130+00.000	3130+49.000	for segment #39 (3130+00.000 to 3130+49.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3130+49.000	3130+56.000	for segment #41 (3130+49.000 to 3130+56.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3130+55.620	3130+56.000	for segment #42 (3130+55.620 to 3130+56.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3130+56.000	3130+98.000	for segment #44 (3130+56.000 to 3130+98.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3130+56.000	3130+98.000	for segment #45 (3130+56.000 to 3130+98.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3130+98.000	3131+47.000	for segment #47 (3130+98.000 to 3131+47.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3130+98.000	3131+47.000	for segment #48 (3130+98.000 to 3131+47.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3131+47.000	3131+95.190	for segment #50 (3131+47.000 to 3131+95.190), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3131+47.000	3132+20.000	for segment #51 (3131+47.000 to 3132+20.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3132+20.000	3132+54.000	for segment #53 (3132+20.000 to 3132+54.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3132+54.000	3132+82.000	for segment #55 (3132+54.000 to 3132+82.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3132+82.000	3133+55.000	for segment #57 (3132+82.000 to 3133+55.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3133+55.000	3134+21.000	for segment #59 (3133+55.000 to 3134+21.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3134+21.000	3134+87.000	for segment #61 (3134+21.000 to 3134+87.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3134+87.000	3135+53.000	for segment #63 (3134+87.000 to 3135+53.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3135+53.000	3136+20.620	for segment #65 (3135+53.000 to 3136+20.620), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3206+78.640	3209+38.640	for segment #81 (3206+78.640 to 3209+38.640), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3215+47.990	3217+52.990	for segment #82 (3215+47.990 to 3217+52.990), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3347+03.140	3347+04.000	for segment #176 (3347+03.140 to 3347+04.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3347+04.000	3347+47.000	for segment #178 (3347+04.000 to 3347+47.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3347+47.000	3348+08.000	for segment #180 (3347+47.000 to 3348+08.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3348+08.000	3348+58.140	for segment #182 (3348+08.000 to 3348+58.140), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3354+67.260	3354+87.000	for segment #188 (3354+67.260 to 3354+87.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3354+87.000	3355+27.000	for segment #190 (3354+87.000 to 3355+27.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3355+27.000	3355+68.000	for segment #192 (3355+27.000 to 3355+68.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3355+68.000	3355+87.260	for segment #194 (3355+68.000 to 3355+87.260), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3433+36.550	3436+61.550	for segment #221 (3433+36.550 to 3436+61.550), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3447+63.980	3448+17.000	for segment #224 (3447+63.980 to 3448+17.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3448+17.000	3448+72.150	for segment #226 (3448+17.000 to 3448+72.150), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3448+72.150	3449+25.000	for segment #228 (3448+72.150 to 3449+25.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3449+25.000	3450+00.000	for segment #230 (3449+25.000 to 3450+00.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3450+00.000	3450+19.000	for segment #232 (3450+00.000 to 3450+19.000), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3450+19.000	3450+68.980	for segment #234 (3450+19.000 to 3450+68.980), For Speed Change Lane Median barrier offset (17.23 feet) is less than the right side inside shoulder width (17.23 feet). This indicates there is problem with the input data.
3082+31.000	3084+00.000	for segment #9 (3082+31.000 to 3084+00.000), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
3084+00.000	3084+73.000	for segment #10 (3084+00.000 to 3084+73.000), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
3087+80.000	3088+10.000	for segment #15 (3087+80.000 to 3088+10.000), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
3088+10.000	3088+58.000	for segment #16 (3088+10.000 to 3088+58.000), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
3088+58.000	3098+27.000	for segment #17 (3088+58.000 to 3098+27.000), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
3100+36.000	3112+00.000	for segment #19 (3100+36.000 to 3112+00.000), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
3112+00.000	3113+01.000	for segment #20 (3112+00.000 to 3113+01.000), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
3113+01.000	3115+01.000	for segment #21 (3113+01.000 to 3115+01.000), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
3115+01.000	3116+09.000	for segment #22 (3115+01.000 to 3116+09.000), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
3137+16.960	3137+43.660	for segment #66 (3137+16.960 to 3137+43.660), traffic volume (177,350 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3137+16.960	3137+43.660	for segment #66 (3137+16.960 to 3137+43.660), Freeway Segment of type Six-lane Freeway is using unbalanced lane processing with types Four-lane Freeway and Eight-lane Freeway
3137+43.660	3144+71.000	for segment #67 (3137+43.660 to 3144+71.000), traffic volume (125,800 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3144+71.000	3148+95.000	for segment #68 (3144+71.000 to 3148+95.000), traffic volume (125,800 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3144+71.000	3148+95.000	for segment #68 (3144+71.000 to 3148+95.000), Freeway Segment of type Five-lane Freeway is using unbalanced lane processing with types Four-lane Freeway and Six-lane Freeway
3148+95.000	3155+00.820	for segment #69 (3148+95.000 to 3155+00.820), traffic volume (125,800 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3155+00.820	3160+76.980	for segment #70 (3155+00.820 to 3160+76.980), traffic volume (122,800 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3160+76.980	3162+67.000	for segment #71 (3160+76.980 to 3162+67.000), traffic volume (126,900 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3162+67.000	3164+27.000	for segment #72 (3162+67.000 to 3164+27.000), traffic volume (126,900 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3162+67.000	3164+27.000	for segment #72 (3162+67.000 to 3164+27.000), Freeway Segment of type Five-lane Freeway is using unbalanced lane processing with types Four-lane Freeway and Six-lane Freeway
3164+27.000	3171+98.500	for segment #73 (3164+27.000 to 3171+98.500), traffic volume (126,900 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3171+98.500	3173+37.000	for segment #74 (3171+98.500 to 3173+37.000), traffic volume (126,900 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3171+98.500	3173+37.000	for segment #74 (3171+98.500 to 3173+37.000), Freeway Segment of type Five-lane Freeway is using unbalanced lane processing with types Four-lane Freeway and Six-lane Freeway
3173+37.000	3174+22.610	for segment #75 (3173+37.000 to 3174+22.610), traffic volume (126,900 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3174+22.610	3182+41.770	for segment #76 (3174+22.610 to 3182+41.770), traffic volume (121,750 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3182+41.770	3196+82.610	for segment #77 (3182+41.770 to 3196+82.610), traffic volume (110,750 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3196+82.610	3205+27.280	for segment #78 (3196+82.610 to 3205+27.280), traffic volume (119,500 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3196+82.610	3205+27.280	for segment #78 (3196+82.610 to 3205+27.280), Freeway Segment of type Five-lane Freeway is using unbalanced lane processing with types Four-lane Freeway and Six-lane Freeway
3205+27.280	3206+78.640	for segment #79 (3205+27.280 to 3206+78.640), traffic volume (117,050 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3206+78.640	3217+52.990	for segment #80 (3206+78.640 to 3217+52.990), traffic volume (124,450 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3217+52.990	3221+02.210	for segment #83 (3217+52.990 to 3221+02.210), traffic volume (121,100 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3221+02.210	3222+09.000	for segment #84 (3221+02.210 to 3222+09.000), traffic volume (123,600 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3222+09.000	3225+00.000	for segment #85 (3222+09.000 to 3225+00.000), traffic volume (123,600 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3222+09.000	3225+00.000	for segment #85 (3222+09.000 to 3225+00.000), Freeway Segment of type Five-lane Freeway is using unbalanced lane processing with types Four-lane Freeway and Six-lane Freeway
3225+00.000	3226+26.000	for segment #86 (3225+00.000 to 3226+26.000), traffic volume (123,600 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3226+26.000	3228+76.000	for segment #87 (3226+26.000 to 3228+76.000), traffic volume (123,600 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3228+76.000	3230+00.000	for segment #88 (3228+76.000 to 3230+00.000), traffic volume (123,600 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3230+00.000	3231+01.000	for segment #89 (3230+00.000 to 3231+01.000), traffic volume (123,600 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3231+01.000	3233+01.000	for segment #90 (3231+01.000 to 3233+01.000), traffic volume (123,600 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3233+01.000	3233+14.630	for segment #91 (3233+01.000 to 3233+14.630), traffic volume (123,600 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3233+14.630	3234+00.000	for segment #92 (3233+14.630 to 3234+00.000), traffic volume (167,600 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3233+14.630	3234+00.000	for segment #92 (3233+14.630 to 3234+00.000), Freeway Segment of type Six-lane Freeway is using unbalanced lane processing with types Four-lane Freeway and Eight-lane Freeway
3234+00.000	3234+05.270	for segment #93 (3234+00.000 to 3234+05.270), traffic volume (167,600 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3234+00.000	3234+05.270	for segment #93 (3234+00.000 to 3234+05.270), Freeway Segment of type Six-lane Freeway is using unbalanced lane processing with types Four-lane Freeway and Eight-lane Freeway
3245+30.000	3246+26.000	for segment #104 (3245+30.000 to 3246+26.000), traffic volume (203,400 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3245+30.000	3246+26.000	for segment #104 (3245+30.000 to 3246+26.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3246+26.000	3247+00.000	for segment #105 (3246+26.000 to 3247+00.000), traffic volume (203,400 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3246+26.000	3247+00.000	for segment #105 (3246+26.000 to 3247+00.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3247+00.000	3248+58.200	for segment #106 (3247+00.000 to 3248+58.200), traffic volume (203,400 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3247+00.000	3248+58.200	for segment #106 (3247+00.000 to 3248+58.200), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3248+58.200	3257+00.000	for segment #107 (3248+58.200 to 3257+00.000), traffic volume (192,750 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3257+00.000	3258+01.000	for segment #108 (3257+00.000 to 3258+01.000), traffic volume (192,750 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3258+01.000	3258+41.000	for segment #109 (3258+01.000 to 3258+41.000), traffic volume (192,750 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3258+41.000	3258+71.000	for segment #110 (3258+41.000 to 3258+71.000), traffic volume (206,100 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3258+41.000	3258+71.000	for segment #110 (3258+41.000 to 3258+71.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3258+71.000	3259+00.000	for segment #111 (3258+71.000 to 3259+00.000), traffic volume (206,100 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3258+71.000	3259+00.000	for segment #111 (3258+71.000 to 3259+00.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3259+00.000	3259+07.000	for segment #112 (3259+00.000 to 3259+07.000), traffic volume (206,100 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3259+00.000	3259+07.000	for segment #112 (3259+00.000 to 3259+07.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3267+04.000	3267+28.700	for segment #123 (3267+04.000 to 3267+28.700), traffic volume (202,250 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3267+04.000	3267+28.700	for segment #123 (3267+04.000 to 3267+28.700), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3267+28.700	3274+00.000	for segment #124 (3267+28.700 to 3274+00.000), traffic volume (191,000 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3274+00.000	3274+68.000	for segment #125 (3274+00.000 to 3274+68.000), traffic volume (191,000 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3274+68.000	3275+30.000	for segment #126 (3274+68.000 to 3275+30.000), traffic volume (191,000 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3275+30.000	3275+34.000	for segment #127 (3275+30.000 to 3275+34.000), traffic volume (191,000 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3275+34.000	3284+26.000	for segment #128 (3275+34.000 to 3284+26.000), traffic volume (191,000 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3284+26.000	3288+39.000	for segment #129 (3284+26.000 to 3288+39.000), traffic volume (191,000 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3288+39.000	3289+10.000	for segment #130 (3288+39.000 to 3289+10.000), traffic volume (198,850 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3288+39.000	3289+10.000	for segment #130 (3288+39.000 to 3289+10.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3289+10.000	3289+67.480	for segment #131 (3289+10.000 to 3289+67.480), traffic volume (198,850 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3289+10.000	3289+67.480	for segment #131 (3289+10.000 to 3289+67.480), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3292+04.000	3292+84.000	for segment #133 (3292+04.000 to 3292+84.000), traffic volume (200,600 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3292+04.000	3292+84.000	for segment #133 (3292+04.000 to 3292+84.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3292+84.000	3294+33.000	for segment #134 (3292+84.000 to 3294+33.000), traffic volume (200,600 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3292+84.000	3294+33.000	for segment #134 (3292+84.000 to 3294+33.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3294+33.000	3295+81.000	for segment #135 (3294+33.000 to 3295+81.000), traffic volume (200,600 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3294+33.000	3295+81.000	for segment #135 (3294+33.000 to 3295+81.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3295+81.000	3296+00.000	for segment #136 (3295+81.000 to 3296+00.000), traffic volume (200,600 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3295+81.000	3296+00.000	for segment #136 (3295+81.000 to 3296+00.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3296+00.000	3296+20.000	for segment #137 (3296+00.000 to 3296+20.000), traffic volume (200,600 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3296+00.000	3296+20.000	for segment #137 (3296+00.000 to 3296+20.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3296+20.000	3296+55.670	for segment #138 (3296+20.000 to 3296+55.670), traffic volume (200,600 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3296+20.000	3296+55.670	for segment #138 (3296+20.000 to 3296+55.670), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3296+55.670	3296+60.000	for segment #139 (3296+55.670 to 3296+60.000), traffic volume (192,300 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3296+60.000	3296+65.000	for segment #140 (3296+60.000 to 3296+65.000), traffic volume (192,300 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3296+65.000	3297+00.000	for segment #141 (3296+65.000 to 3297+00.000), traffic volume (192,300 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3297+00.000	3297+29.000	for segment #142 (3297+00.000 to 3297+29.000), traffic volume (192,300 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3297+29.000	3298+78.000	for segment #143 (3297+29.000 to 3298+78.000), traffic volume (192,300 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3298+78.000	3300+26.000	for segment #144 (3298+78.000 to 3300+26.000), traffic volume (192,300 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3300+26.000	3306+86.000	for segment #145 (3300+26.000 to 3306+86.000), traffic volume (192,300 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3306+86.000	3308+57.000	for segment #146 (3306+86.000 to 3308+57.000), traffic volume (192,300 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3308+57.000	3310+28.000	for segment #147 (3308+57.000 to 3310+28.000), traffic volume (192,300 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3310+28.000	3311+93.000	for segment #148 (3310+28.000 to 3311+93.000), traffic volume (192,300 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3311+93.000	3311+99.000	for segment #149 (3311+93.000 to 3311+99.000), traffic volume (192,300 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3311+99.000	3312+75.000	for segment #150 (3311+99.000 to 3312+75.000), traffic volume (192,300 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3312+75.000	3312+83.000	for segment #151 (3312+75.000 to 3312+83.000), traffic volume (205,850 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3312+75.000	3312+83.000	for segment #151 (3312+75.000 to 3312+83.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3318+81.330	3319+00.000	for segment #164 (3318+81.330 to 3319+00.000), traffic volume (194,350 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3318+81.330	3319+00.000	for segment #164 (3318+81.330 to 3319+00.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3319+00.000	3322+27.000	for segment #165 (3319+00.000 to 3322+27.000), traffic volume (194,350 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3319+00.000	3322+27.000	for segment #165 (3319+00.000 to 3322+27.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3322+27.000	3327+28.000	for segment #166 (3322+27.000 to 3327+28.000), traffic volume (194,350 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3322+27.000	3327+28.000	for segment #166 (3322+27.000 to 3327+28.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3327+28.000	3328+81.000	for segment #167 (3327+28.000 to 3328+81.000), traffic volume (194,350 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3327+28.000	3328+81.000	for segment #167 (3327+28.000 to 3328+81.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3328+81.000	3328+89.000	for segment #168 (3328+81.000 to 3328+89.000), traffic volume (194,350 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3328+81.000	3328+89.000	for segment #168 (3328+81.000 to 3328+89.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3347+04.000	3347+47.000	for segment #177 (3347+04.000 to 3347+47.000), traffic volume (181,700 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3347+47.000	3348+08.000	for segment #179 (3347+47.000 to 3348+08.000), traffic volume (181,700 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3348+08.000	3349+00.000	for segment #181 (3348+08.000 to 3349+00.000), traffic volume (181,700 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3349+00.000	3349+17.000	for segment #183 (3349+00.000 to 3349+17.000), traffic volume (181,700 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3349+17.000	3349+51.000	for segment #184 (3349+17.000 to 3349+51.000), traffic volume (181,700 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3349+51.000	3349+84.000	for segment #185 (3349+51.000 to 3349+84.000), traffic volume (181,700 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3349+84.000	3354+66.000	for segment #186 (3349+84.000 to 3354+66.000), traffic volume (181,700 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3354+66.000	3354+87.000	for segment #187 (3354+66.000 to 3354+87.000), traffic volume (181,700 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3354+87.000	3355+27.000	for segment #189 (3354+87.000 to 3355+27.000), traffic volume (181,700 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3355+27.000	3355+68.000	for segment #191 (3355+27.000 to 3355+68.000), traffic volume (181,700 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3355+68.000	3355+88.000	for segment #193 (3355+68.000 to 3355+88.000), traffic volume (181,700 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3366+12.000	3373+06.480	for segment #196 (3366+12.000 to 3373+06.480), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3384+16.000	3391+05.000	for segment #198 (3384+16.000 to 3391+05.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3391+05.000	3391+55.000	for segment #199 (3391+05.000 to 3391+55.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3391+55.000	3392+54.000	for segment #200 (3391+55.000 to 3392+54.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3392+54.000	3393+52.000	for segment #201 (3392+54.000 to 3393+52.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3393+52.000	3394+51.000	for segment #202 (3393+52.000 to 3394+51.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3394+51.000	3395+00.000	for segment #203 (3394+51.000 to 3395+00.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3395+00.000	3398+59.810	for segment #204 (3395+00.000 to 3398+59.810), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3398+59.810	3399+60.000	for segment #205 (3398+59.810 to 3399+60.000), Freeway Segment of type Eight-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Ten-lane Freeway
3399+60.000	3400+43.000	for segment #206 (3399+60.000 to 3400+43.000), Freeway Segment of type Eight-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Ten-lane Freeway
3400+43.000	3403+50.000	for segment #207 (3400+43.000 to 3403+50.000), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
3403+50.000	3404+03.000	for segment #208 (3403+50.000 to 3404+03.000), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
3404+03.000	3404+21.020	for segment #209 (3404+03.000 to 3404+21.020), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
3408+00.000	3408+14.000	for segment #213 (3408+00.000 to 3408+14.000), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
3408+14.000	3408+41.000	for segment #214 (3408+14.000 to 3408+41.000), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
3408+41.000	3408+67.000	for segment #215 (3408+41.000 to 3408+67.000), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
3408+67.000	3408+94.000	for segment #216 (3408+67.000 to 3408+94.000), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
3408+94.000	3409+07.000	for segment #217 (3408+94.000 to 3409+07.000), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
3409+07.000	3418+70.490	for segment #218 (3409+07.000 to 3418+70.490), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
3439+11.620	3447+63.000	for segment #222 (3439+11.620 to 3447+63.000), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
3448+72.150	3449+25.000	for segment #227 (3448+72.150 to 3449+25.000), traffic volume (181,950 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3448+72.150	3449+25.000	for segment #227 (3448+72.150 to 3449+25.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3449+25.000	3450+00.000	for segment #229 (3449+25.000 to 3450+00.000), traffic volume (181,950 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3449+25.000	3450+00.000	for segment #229 (3449+25.000 to 3450+00.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3450+00.000	3450+19.000	for segment #231 (3450+00.000 to 3450+19.000), traffic volume (181,950 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3450+00.000	3450+19.000	for segment #231 (3450+00.000 to 3450+19.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3450+19.000	3450+68.980	for segment #233 (3450+19.000 to 3450+68.980), traffic volume (181,950 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F
3450+19.000	3450+68.980	for segment #233 (3450+19.000 to 3450+68.980), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3467+74.000	3477+00.000	for segment #249 (3467+74.000 to 3477+00.000), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
3206+78.640	3209+38.640	for segment #81 (3206+78.640 to 3209+38.640), traffic volume (124,450 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4SC
3215+47.990	3217+52.990	for segment #82 (3215+47.990 to 3217+52.990), traffic volume (124,450 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4SC
3347+03.140	3347+04.000	for segment #176 (3347+03.140 to 3347+04.000), traffic volume (181,700 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6SC
3347+04.000	3347+47.000	for segment #178 (3347+04.000 to 3347+47.000), traffic volume (181,700 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6SC
3347+47.000	3348+08.000	for segment #180 (3347+47.000 to 3348+08.000), traffic volume (181,700 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6SC
3348+08.000	3348+58.140	for segment #182 (3348+08.000 to 3348+58.140), traffic volume (181,700 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6SC
3354+67.260	3354+87.000	for segment #188 (3354+67.260 to 3354+87.000), traffic volume (181,700 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6SC
3354+87.000	3355+27.000	for segment #190 (3354+87.000 to 3355+27.000), traffic volume (181,700 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6SC
3355+27.000	3355+68.000	for segment #192 (3355+27.000 to 3355+68.000), traffic volume (181,700 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6SC
3355+68.000	3355+87.260	for segment #194 (3355+68.000 to 3355+87.260), traffic volume (181,700 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6SC
3448+72.150	3449+25.000	for segment #228 (3448+72.150 to 3449+25.000), traffic volume (181,950 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6SC
3448+72.150	3449+25.000	for segment #228 (3448+72.150 to 3449+25.000), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
3449+25.000	3450+00.000	for segment #230 (3449+25.000 to 3450+00.000), traffic volume (181,950 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6SC
3449+25.000	3450+00.000	for segment #230 (3449+25.000 to 3450+00.000), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
3450+00.000	3450+19.000	for segment #232 (3450+00.000 to 3450+19.000), traffic volume (181,950 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6SC
3450+00.000	3450+19.000	for segment #232 (3450+00.000 to 3450+19.000), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
3450+19.000	3450+68.980	for segment #234 (3450+19.000 to 3450+68.980), traffic volume (181,950 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6SC
3450+19.000	3450+68.980	for segment #234 (3450+19.000 to 3450+68.980), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

Report Generated: Aug 24, 2022 10:34 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 29 14:13:21 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0(Copy 1)
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RAISEDEX
Highway Comment: Imported from CENTRALEX - Copy.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jul 29 14:13:01 CDT 2021

Minimum Location: 3137+30.310
Maximum Location: 3233+59.950

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 3137+30.310
Evaluation End Location: 3233+59.950
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_EX=1.0; FI_MV=1.0; FI_SV=1.0; PDO_EX=1.0; PDO_MV=1.0; PDO_SV=1.0;

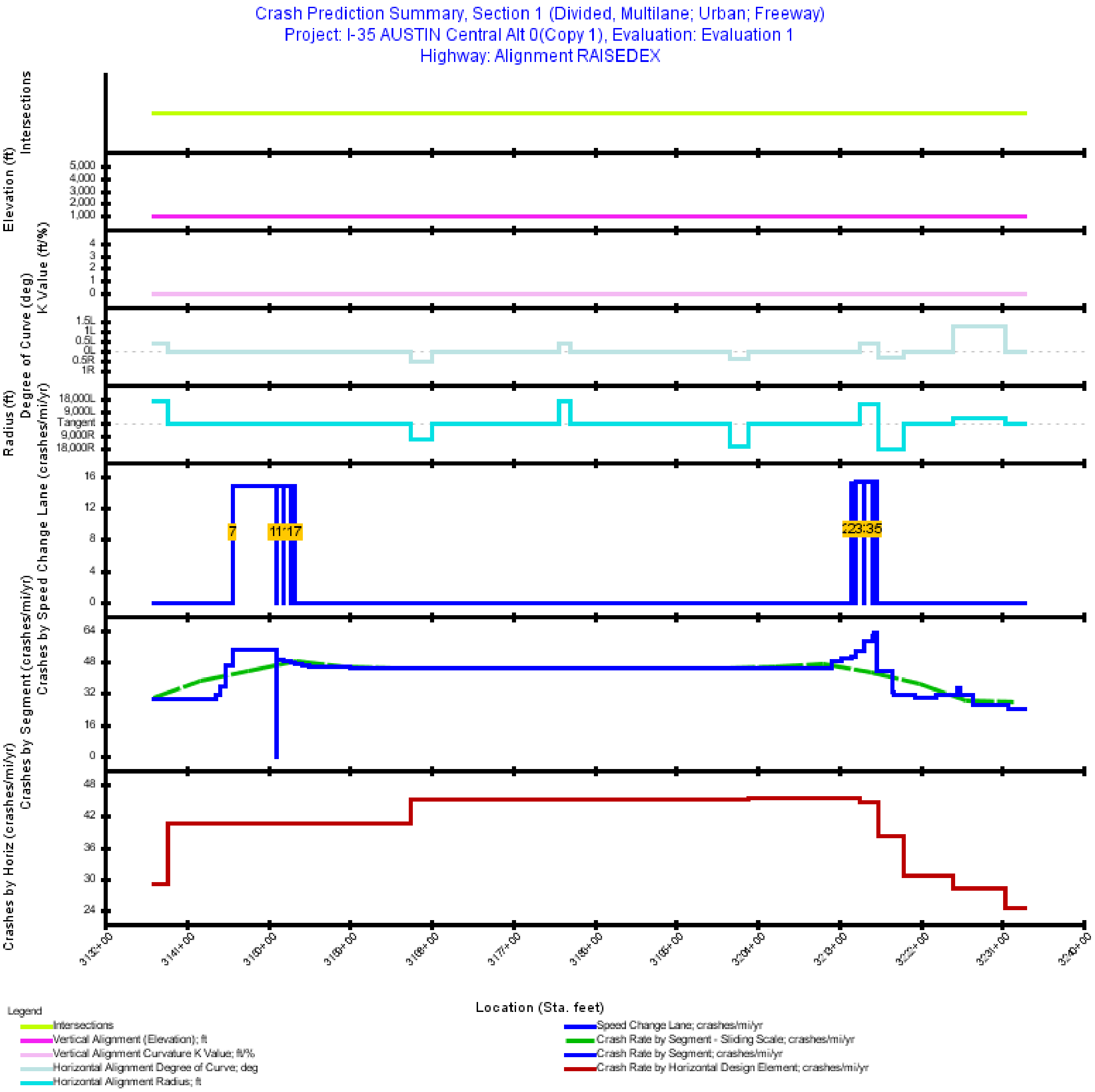

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Four-lane Freeway	Urban	3137+30.310	3144+26.330	696.02	0.1318	2030: 101,600	2.00	Non-Traversable Median	14.00
2	Four-lane Freeway	Urban	3144+26.330	3144+70.310	43.98	0.0083	2030: 101,600	2.00	Non-Traversable Median	53.00
3	Four-lane Freeway	Urban	3144+70.310	3145+27.310	57.00	0.0108	2030: 101,600	80.00	Non-Traversable Median	92.00
4	Four-lane Freeway	Urban	3145+27.310	3146+14.310	87.00	0.0165	2030: 110,300	80.00	Non-Traversable Median	92.00
6	Four-lane Freeway	Urban	3146+14.310	3150+89.310	475.00	0.0900	2030: 118,300	80.00	Non-Traversable Median	92.00
8	Four-lane Freeway	Urban	3150+89.310	3150+95.330	6.02	0.0011	2030: 118,300	80.00	Non-Traversable Median	92.00
10	Four-lane Freeway	Urban	3150+95.330	3151+69.310	73.98	0.0140	2030: 118,300	80.00	Non-Traversable Median	92.00
12	Four-lane Freeway	Urban	3151+69.310	3152+47.310	78.00	0.0148	2030: 118,300	80.00	Non-Traversable Median	92.00
14	Four-lane Freeway	Urban	3152+47.310	3152+94.100	46.79	0.0089	2030: 118,300	80.00	Non-Traversable Median	92.00
16	Four-lane Freeway	Urban	3152+94.100	3153+66.310	72.21	0.0137	2030: 118,300	80.00	Non-Traversable Median	92.00
18	Four-lane Freeway	Urban	3153+66.310	3154+55.330	89.02	0.0169	2030: 118,300	80.00	Non-Traversable Median	92.00
19	Four-lane Freeway	Urban	3154+55.330	3157+36.310	280.98	0.0532	2030: 118,300	80.00	Non-Traversable Median	89.49
20	Four-lane Freeway	Urban	3157+36.310	3159+08.310	172.00	0.0326	2030: 118,300	69.96	Non-Traversable Median	81.96
21	Four-lane Freeway	Urban	3159+08.310	3160+79.310	171.00	0.0324	2030: 118,300	59.97	Non-Traversable Median	71.97
22	Four-lane Freeway	Urban	3160+79.310	3212+12.090	5,132.78	0.9721	2030: 118,300	50.00	Non-Traversable Median	64.50
23	Four-lane Freeway	Urban	3212+12.090	3213+33.310	121.22	0.0230	2030: 118,300	50.00	Non-Traversable Median	62.00
24	Four-lane Freeway	Urban	3213+33.310	3214+31.950	98.64	0.0187	2030: 118,300	50.00	Non-Traversable Median	62.00
26	Four-lane Freeway	Urban	3214+31.950	3214+85.310	53.36	0.0101	2030: 118,300	50.00	Non-Traversable Median	62.00
28	Four-lane Freeway	Urban	3214+85.310	3215+75.310	90.00	0.0170	2030: 118,300	50.00	Non-Traversable Median	62.54
30	Four-lane Freeway	Urban	3215+75.310	3216+68.310	93.00	0.0176	2030: 118,300	53.04	Non-Traversable Median	65.04
32	Four-lane Freeway	Urban	3216+68.310	3216+93.460	25.15	0.0048	2030: 118,300	55.55	Non-Traversable Median	67.55
34	Four-lane Freeway	Urban	3216+93.460	3217+20.460	27.00	0.0051	2030: 118,300	56.65	Non-Traversable Median	68.65
36	Four-lane Freeway	Urban	3217+20.460	3218+88.310	167.85	0.0318	2030: 105,850	60.78	Non-Traversable Median	72.78
37	Four-lane Freeway	Urban	3218+88.310	3219+04.310	16.00	0.0030	2030: 90,300	64.68	Non-Traversable Median	76.68
38	Four-lane Freeway	Urban	3219+04.310	3221+40.310	236.00	0.0447	2030: 90,300	70.02	Non-Traversable Median	82.02

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
39	Four-lane Freeway	Urban	3221+40.310	3223+76.310	236.00	0.0447	2030: 90,300	80.03	Non-Traversable Median	92.03
40	Four-lane Freeway	Urban	3223+76.310	3226+12.310	236.00	0.0447	2030: 90,300	90.04	Non-Traversable Median	102.04
41	Four-lane Freeway	Urban	3226+12.310	3226+35.310	23.00	0.0044	2030: 90,300	95.53	Non-Traversable Median	60.52
42	Four-lane Freeway	Urban	3226+35.310	3227+77.350	142.04	0.0269	2030: 90,300	2.00	Non-Traversable Median	14.00
43	Four-lane Freeway	Urban	3227+77.350	3231+68.310	390.96	0.0740	2030: 90,300	2.00	Non-Traversable Median	14.00
44	Four-lane Freeway	Urban	3231+68.310	3233+59.950	191.64	0.0363	2030: 90,300	2.00	Non-Traversable Median	14.00

Table 2. Evaluation Freeway - Speed Change Lanes (Speed Change)

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
5	Four-lane Freeway Speed Change	Exit	3146+14.240	3146+14.310	0.07	0.0000	2030: 118,300	80.00	Non-Traversable Median	92.00
7	Four-lane Freeway Speed Change	Exit	3146+14.310	3150+89.310	475.00	0.0900	2030: 118,300	80.00	Non-Traversable Median	92.00
9	Four-lane Freeway Speed Change	Exit	3150+89.310	3150+95.330	6.02	0.0011	2030: 118,300	80.00	Non-Traversable Median	92.00
11	Four-lane Freeway Speed Change	Exit	3150+95.330	3151+69.310	73.98	0.0140	2030: 118,300	80.00	Non-Traversable Median	92.00
13	Four-lane Freeway Speed Change	Exit	3151+69.310	3152+47.310	78.00	0.0148	2030: 118,300	80.00	Non-Traversable Median	92.00
15	Four-lane Freeway Speed Change	Exit	3152+47.310	3152+94.100	46.79	0.0089	2030: 118,300	80.00	Non-Traversable Median	92.00
17	Four-lane Freeway Speed Change	Exit	3152+94.100	3152+94.240	0.14	0.0000	2030: 118,300	80.00	Non-Traversable Median	92.00
25	Four-lane Freeway Speed Change	Exit	3214+30.460	3214+31.950	1.49	0.0003	2030: 118,300	50.00	Non-Traversable Median	62.00
27	Four-lane Freeway Speed Change	Exit	3214+31.950	3214+85.310	53.36	0.0101	2030: 118,300	50.00	Non-Traversable Median	62.00
29	Four-lane Freeway Speed Change	Exit	3214+85.310	3215+75.310	90.00	0.0170	2030: 118,300	50.00	Non-Traversable Median	62.54
31	Four-lane Freeway Speed Change	Exit	3215+75.310	3216+68.310	93.00	0.0176	2030: 118,300	53.04	Non-Traversable Median	65.04
33	Four-lane Freeway Speed Change	Exit	3216+68.310	3216+93.460	25.15	0.0048	2030: 118,300	55.55	Non-Traversable Median	67.55
35	Four-lane Freeway Speed Change	Exit	3216+93.460	3217+20.460	27.00	0.0051	2030: 118,300	56.65	Non-Traversable Median	68.65

Table 3. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**1.7314**
Average Future Road AADT (vpd)	**112,032**
Predicted Crashes	
Total Crashes	**72.21**
Fatal and Injury Crashes	**18.20**
Property-Damage-Only Crashes	**54.01**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**25**
Percent Property-Damage-Only Crashes (%)	**75**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**41.7064**
FI Crash Rate (crashes/mi/yr)	**10.5127**
PDO Crash Rate (crashes/mi/yr)	**31.1937**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**70.80**
Travel Crash Rate (crashes/million veh-mi)	**1.02**
Travel FI Crash Rate (crashes/million veh-mi)	**0.26**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.76**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Table 4. Predicted Freeway Speed Change Lane Crash Rates and Frequencies Summary (Speed Change)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Length (mi)	**0.1837**
Average Future Road AADT (vpd)	**59,150**
Predicted Crashes	
Total Crashes	**2.74**
Fatal and Injury Crashes	**0.78**
Property-Damage-Only Crashes	**1.96**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**29**
Percent Property-Damage-Only Crashes (%)	**71**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**14.9173**
FI Crash Rate (crashes/mi/yr)	**4.2583**
PDO Crash Rate (crashes/mi/yr)	**10.6590**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**3.97**
Travel Crash Rate (crashes/million veh-mi)	**0.69**
Travel FI Crash Rate (crashes/million veh-mi)	**0.20**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.49**

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 5. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	3137+30.310	3144+26.330	0.1318	3.835	3.8346	1.0164	2.8182	29.0894	0.78
2	3144+26.330	3144+70.310	0.0083	0.259	0.2586	0.0685	0.1901	31.0489	0.84
3	3144+70.310	3145+27.310	0.0108	0.381	0.3806	0.0994	0.2812	35.2556	0.95
4	3145+27.310	3146+14.310	0.0165	0.762	0.7623	0.2020	0.5603	46.2844	1.15
6	3146+14.310	3150+89.310	0.0450	2.432	2.4318	0.6399	1.7919	54.0629	1.25
8	3150+89.310	3150+95.330	0.0000	0.000	0.0000	0.0000	0.0000	0.0000	0.00
10	3150+95.330	3151+69.310	0.0070	0.346	0.3463	0.0902	0.2562	49.4333	1.15
12	3151+69.310	3152+47.310	0.0074	0.358	0.3581	0.0917	0.2664	48.4793	1.12
14	3152+47.310	3152+94.100	0.0044	0.212	0.2118	0.0535	0.1583	47.7935	1.11
16	3152+94.100	3153+66.310	0.0137	0.646	0.6461	0.1616	0.4844	47.2852	1.09
18	3153+66.310	3154+55.330	0.0169	0.788	0.7881	0.1956	0.5925	46.7416	1.08
19	3154+55.330	3157+36.310	0.0532	2.447	2.4473	0.6040	1.8434	45.9888	1.06
20	3157+36.310	3159+08.310	0.0326	1.480	1.4804	0.3648	1.1157	45.4457	1.05
21	3159+08.310	3160+79.310	0.0324	1.464	1.4640	0.3604	1.1036	45.2043	1.05
22	3160+79.310	3212+12.090	0.9721	43.811	43.8106	10.7705	33.0401	45.0672	1.04
23	3212+12.090	3213+33.310	0.0230	1.114	1.1139	0.2771	0.8368	48.5169	1.12
24	3213+33.310	3214+31.950	0.0185	0.923	0.9233	0.2316	0.6918	49.7998	1.15
26	3214+31.950	3214+85.310	0.0051	0.257	0.2574	0.0651	0.1923	50.9415	1.18
28	3214+85.310	3215+75.310	0.0085	0.459	0.4589	0.1155	0.3434	53.8410	1.25
30	3215+75.310	3216+68.310	0.0088	0.518	0.5182	0.1286	0.3897	58.8462	1.36
32	3216+68.310	3216+93.460	0.0024	0.146	0.1464	0.0363	0.1101	61.4780	1.42
34	3216+93.460	3217+20.460	0.0026	0.160	0.1601	0.0397	0.1204	62.6292	1.45
36	3217+20.460	3218+88.310	0.0318	1.384	1.3843	0.3496	1.0347	43.5451	1.13
37	3218+88.310	3219+04.310	0.0030	0.100	0.0998	0.0266	0.0732	32.9259	1.00
38	3219+04.310	3221+40.310	0.0447	1.397	1.3971	0.3839	1.0132	31.2567	0.95
39	3221+40.310	3223+76.310	0.0447	1.338	1.3378	0.3775	0.9603	29.9301	0.91
40	3223+76.310	3226+12.310	0.0447	1.384	1.3839	0.3852	0.9987	30.9629	0.94
41	3226+12.310	3226+35.310	0.0044	0.152	0.1525	0.0404	0.1121	35.0149	1.06
42	3226+35.310	3227+77.350	0.0269	0.834	0.8340	0.2264	0.6076	31.0029	0.94
43	3227+77.350	3231+68.310	0.0740	1.953	1.9526	0.5483	1.4043	26.3701	0.80
44	3231+68.310	3233+59.950	0.0363	0.868	0.8682	0.2510	0.6172	23.9201	0.73
Total			1.7314	72.209	72.2091	18.2013	54.0078	41.7064	1.02

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 6. Predicted Crash Frequencies and Rates by Freeway Speed Change Lane (Speed Change)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
5	3146+14.240	3146+14.310	0.0000	0.000	0.0002	0.0001	0.0001	14.7449	0.68
7	3146+14.310	3150+89.310	0.0900	1.327	1.3265	0.3687	0.9578	14.7449	0.68
9	3150+89.310	3150+95.330	0.0011	0.017	0.0168	0.0047	0.0121	14.7449	0.68
11	3150+95.330	3151+69.310	0.0140	0.207	0.2066	0.0574	0.1492	14.7449	0.68
13	3151+69.310	3152+47.310	0.0148	0.218	0.2178	0.0605	0.1573	14.7449	0.68
15	3152+47.310	3152+94.100	0.0089	0.131	0.1307	0.0363	0.0944	14.7449	0.68
17	3152+94.100	3152+94.240	0.0000	0.000	0.0004	0.0001	0.0003	14.7449	0.68
25	3214+30.460	3214+31.950	0.0003	0.004	0.0043	0.0013	0.0030	15.2726	0.71
27	3214+31.950	3214+85.310	0.0101	0.154	0.1543	0.0467	0.1076	15.2726	0.71
29	3214+85.310	3215+75.310	0.0170	0.261	0.2610	0.0790	0.1820	15.3112	0.71
31	3215+75.310	3216+68.310	0.0176	0.270	0.2703	0.0817	0.1886	15.3466	0.71
33	3216+68.310	3216+93.460	0.0048	0.073	0.0731	0.0221	0.0510	15.3466	0.71
35	3216+93.460	3217+20.460	0.0051	0.079	0.0785	0.0237	0.0548	15.3466	0.71
Total			0.1837	2.740	2.7405	0.7823	1.9582	14.9173	0.69

Note: *Travel Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 7. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	3137+30.310	3138+86.459	0.0296	0.860	0.8603	0.2280	0.6323	29.0894	0.78
Tangent	3138+86.459	3165+74.797	0.5092	20.678	20.6779	5.2874	15.3906	40.6122	1.21
Simple Curve 2	3165+74.797	3168+01.375	0.0429	1.934	1.9339	0.4754	1.4585	45.0672	1.04
Tangent	3168+01.375	3182+09.730	0.2667	12.021	12.0210	2.9553	9.0657	45.0672	1.04
Simple Curve 3	3182+09.730	3183+34.300	0.0236	1.063	1.0633	0.2614	0.8019	45.0672	1.04
Tangent	3183+34.300	3200+96.777	0.3338	15.043	15.0435	3.6983	11.3452	45.0672	1.04
Simple Curve 4	3200+96.777	3203+03.737	0.0392	1.766	1.7665	0.4343	1.3322	45.0672	1.04
Tangent	3203+03.737	3215+28.342	0.2319	10.551	10.5506	2.6208	7.9298	45.4901	1.13
Simple Curve 5	3215+28.342	3217+34.090	0.0390	1.735	1.7348	0.4621	1.2727	44.5183	2.00
Simple Curve 6	3217+34.090	3220+09.173	0.0521	1.992	1.9924	0.5184	1.4740	38.2430	1.05
Tangent	3220+09.173	3225+63.235	0.1049	3.210	3.2103	0.8959	2.3143	30.5925	0.93
Simple Curve 7	3225+63.235	3231+29.979	0.1073	3.035	3.0355	0.8415	2.1940	28.2797	0.86
Tangent	3231+29.979	3233+59.950	0.0436	1.060	1.0596	0.3048	0.7548	24.3284	0.74

Table 8. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	74.95	18.98	25.328	55.97	74.671
Total	74.95	18.98	25.328	55.97	74.671
Average	74.95	18.98	25.328	55.97	74.671

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 9. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0193	0.0498	0.3402	0.6071	2.8182
2	0.0012	0.0030	0.0217	0.0426	0.1901
3	0.0016	0.0042	0.0304	0.0633	0.2812
4	0.0032	0.0085	0.0618	0.1286	0.5603
6	0.0102	0.0269	0.1956	0.4073	1.7919
8	0.0000	0.0000	0.0000	0.0000	0.0000
10	0.0014	0.0038	0.0276	0.0574	0.2562
12	0.0015	0.0039	0.0280	0.0583	0.2664
14	0.0008	0.0022	0.0163	0.0340	0.1583
16	0.0026	0.0068	0.0494	0.1029	0.4844
18	0.0031	0.0082	0.0598	0.1245	0.5925
19	0.0096	0.0254	0.1846	0.3844	1.8434
20	0.0058	0.0153	0.1115	0.2322	1.1157
21	0.0057	0.0151	0.1101	0.2294	1.1036
22	0.1739	0.4619	3.3195	6.8152	33.0401
23	0.0044	0.0116	0.0847	0.1764	0.8368
24	0.0037	0.0097	0.0708	0.1474	0.6918
26	0.0010	0.0027	0.0199	0.0414	0.1923
28	0.0020	0.0054	0.0367	0.0714	0.3434
30	0.0024	0.0065	0.0423	0.0774	0.3897
32	0.0007	0.0018	0.0120	0.0219	0.1101
34	0.0007	0.0020	0.0131	0.0239	0.1204
36	0.0065	0.0177	0.1151	0.2103	1.0347
37	0.0005	0.0014	0.0091	0.0156	0.0732
38	0.0070	0.0185	0.1259	0.2324	1.0132
39	0.0064	0.0168	0.1198	0.2344	0.9603
40	0.0068	0.0178	0.1242	0.2364	0.9987
41	0.0008	0.0022	0.0138	0.0237	0.1121
42	0.0050	0.0131	0.0812	0.1271	0.6076
43	0.0131	0.0337	0.2054	0.2961	1.4043
44	0.0050	0.0126	0.0861	0.1473	0.6172
Total	0.3058	0.8086	5.7167	11.3702	54.0078

Table 10. Predicted Crash Severity by Speed Change Lane (Speed Change)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
5	0.0000	0.0000	0.0000	0.0000	0.0001
7	0.0059	0.0155	0.1127	0.2346	0.9578
9	0.0001	0.0002	0.0014	0.0030	0.0121
11	0.0009	0.0024	0.0175	0.0365	0.1492
13	0.0010	0.0025	0.0185	0.0385	0.1573
15	0.0006	0.0015	0.0111	0.0231	0.0944
17	0.0000	0.0000	0.0000	0.0001	0.0003
25	0.0000	0.0001	0.0004	0.0008	0.0030
27	0.0007	0.0020	0.0143	0.0298	0.1076
29	0.0014	0.0037	0.0251	0.0488	0.1820
31	0.0015	0.0041	0.0269	0.0492	0.1886
33	0.0004	0.0011	0.0073	0.0133	0.0510
35	0.0004	0.0012	0.0078	0.0143	0.0548
Total	0.0129	0.0343	0.2431	0.4921	1.9582

Table 11. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.03	0.0	0.45	0.6	0.47	0.7
Highway Segment	Collision with Fixed Object	4.75	6.6	14.61	20.2	19.36	26.8
Highway Segment	Collision with Other Object	0.34	0.5	2.83	3.9	3.17	4.4
Highway Segment	Other Single-vehicle Collision	1.37	1.9	2.18	3.0	3.55	4.9
Highway Segment	Collision with Parked Vehicle	0.10	0.1	0.33	0.5	0.42	0.6
Highway Segment	Total Single Vehicle Crashes	6.58	9.1	20.40	28.2	26.98	37.4
Highway Segment	Right-Angle Collision	0.36	0.5	0.60	0.8	0.96	1.3
Highway Segment	Head-on Collision	0.09	0.1	0.07	0.1	0.16	0.2
Highway Segment	Other Multi-vehicle Collision	0.36	0.5	0.81	1.1	1.17	1.6
Highway Segment	Rear-end Collision	8.71	12.1	23.19	32.1	31.90	44.2
Highway Segment	Sideswipe, Same Direction Collision	2.09	2.9	8.94	12.4	11.03	15.3
Highway Segment	Total Multiple Vehicle Crashes	11.62	16.1	33.61	46.5	45.23	62.6
Highway Segment	Total Highway Segment Crashes	18.20	25.2	54.01	74.8	72.21	100.0
	Total Crashes	18.20	25.2	54.01	74.8	72.21	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 12. Predicted Exit Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.01	0.5	0.01	0.5
Highway Segment	Collision with Fixed Object	0.15	5.6	0.41	14.8	0.56	20.4
Highway Segment	Collision with Other Object	0.01	0.5	0.06	2.1	0.07	2.6
Highway Segment	Other Single-vehicle Collision	0.04	1.4	0.04	1.6	0.08	3.0
Highway Segment	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Total Single Vehicle Crashes	0.20	7.5	0.52	19.1	0.73	26.5
Highway Segment	Right-Angle Collision	0.01	0.3	0.02	0.9	0.03	1.2
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.1	0.01	0.3
Highway Segment	Other Multi-vehicle Collision	0.01	0.5	0.03	1.1	0.04	1.6
Highway Segment	Rear-end Collision	0.43	15.7	1.11	40.4	1.54	56.0
Highway Segment	Sideswipe, Same Direction Collision	0.12	4.5	0.27	9.9	0.39	14.4
Highway Segment	Total Multiple Vehicle Crashes	0.58	21.1	1.44	52.4	2.01	73.5
Highway Segment	Total Highway Segment Crashes	0.78	28.5	1.96	71.5	2.74	100.0
	Total Crashes	0.78	28.5	1.96	71.5	2.74	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 13. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3137+30.310	3144+26.330	for segment #1 (3137+30.310 to 3144+26.330), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3137+30.310	3144+26.330	for segment #1 (3137+30.310 to 3144+26.330), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3144+26.330	3144+70.310	for segment #2 (3144+26.330 to 3144+70.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3144+26.330	3144+70.310	for segment #2 (3144+26.330 to 3144+70.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3144+26.330	3144+70.310	for segment #2 (3144+26.330 to 3144+70.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3144+26.330	3144+70.310	for segment #2 (3144+26.330 to 3144+70.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3144+70.310	3145+27.310	for segment #3 (3144+70.310 to 3145+27.310), Effective median width (92.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
3144+70.310	3145+27.310	for segment #3 (3144+70.310 to 3145+27.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3144+70.310	3145+27.310	for segment #3 (3144+70.310 to 3145+27.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3144+70.310	3145+27.310	for segment #3 (3144+70.310 to 3145+27.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3144+70.310	3145+27.310	for segment #3 (3144+70.310 to 3145+27.310), Outside barrier offset (6.00 feet) is less than the right outside shoulder width (8.00 feet). This indicates there is problem with the input data.
3145+27.310	3146+14.310	for segment #4 (3145+27.310 to 3146+14.310), Effective median width (92.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
3145+27.310	3146+14.310	for segment #4 (3145+27.310 to 3146+14.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3145+27.310	3146+14.310	for segment #4 (3145+27.310 to 3146+14.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3145+27.310	3146+14.310	for segment #4 (3145+27.310 to 3146+14.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3145+27.310	3146+14.310	for segment #4 (3145+27.310 to 3146+14.310), Outside barrier offset (6.00 feet) is less than the left outside shoulder width (8.00 feet). This indicates there is problem with the input data.
3146+14.310	3150+89.310	for segment #6 (3146+14.310 to 3150+89.310), Effective median width (92.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
3146+14.310	3150+89.310	for segment #6 (3146+14.310 to 3150+89.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3146+14.310	3150+89.310	for segment #6 (3146+14.310 to 3150+89.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3146+14.310	3150+89.310	for segment #6 (3146+14.310 to 3150+89.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3146+14.310	3150+89.310	for segment #6 (3146+14.310 to 3150+89.310), Outside barrier offset (6.00 feet) is less than the left outside shoulder width (6.51 feet). This indicates there is problem with the input data.
3146+14.310	3150+89.310	for segment #6 (3146+14.310 to 3150+89.310), Outside barrier offset (3.54 feet) is less than the left outside shoulder width (6.51 feet). This indicates there is problem with the input data.
3150+89.310	3150+95.330	for segment #8 (3150+89.310 to 3150+95.330), Effective median width (92.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3150+89.310	3150+95.330	for segment #8 (3150+89.310 to 3150+95.330), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3150+89.310	3150+95.330	for segment #8 (3150+89.310 to 3150+95.330), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3150+89.310	3150+95.330	for segment #8 (3150+89.310 to 3150+95.330), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3150+89.310	3150+95.330	for segment #8 (3150+89.310 to 3150+95.330), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3150+95.330	3151+69.310	for segment #10 (3150+95.330 to 3151+69.310), Effective median width (92.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
3150+95.330	3151+69.310	for segment #10 (3150+95.330 to 3151+69.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3150+95.330	3151+69.310	for segment #10 (3150+95.330 to 3151+69.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3150+95.330	3151+69.310	for segment #10 (3150+95.330 to 3151+69.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3150+95.330	3151+69.310	for segment #10 (3150+95.330 to 3151+69.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3151+69.310	3152+47.310	for segment #12 (3151+69.310 to 3152+47.310), Effective median width (92.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
3151+69.310	3152+47.310	for segment #12 (3151+69.310 to 3152+47.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3151+69.310	3152+47.310	for segment #12 (3151+69.310 to 3152+47.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3151+69.310	3152+47.310	for segment #12 (3151+69.310 to 3152+47.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3151+69.310	3152+47.310	for segment #12 (3151+69.310 to 3152+47.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3152+47.310	3152+94.100	for segment #14 (3152+47.310 to 3152+94.100), Effective median width (92.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
3152+47.310	3152+94.100	for segment #14 (3152+47.310 to 3152+94.100), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3152+47.310	3152+94.100	for segment #14 (3152+47.310 to 3152+94.100), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3152+47.310	3152+94.100	for segment #14 (3152+47.310 to 3152+94.100), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3152+47.310	3152+94.100	for segment #14 (3152+47.310 to 3152+94.100), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3152+94.100	3153+66.310	for segment #16 (3152+94.100 to 3153+66.310), Effective median width (92.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
3152+94.100	3153+66.310	for segment #16 (3152+94.100 to 3153+66.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3152+94.100	3153+66.310	for segment #16 (3152+94.100 to 3153+66.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3152+94.100	3153+66.310	for segment #16 (3152+94.100 to 3153+66.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3152+94.100	3153+66.310	for segment #16 (3152+94.100 to 3153+66.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3153+66.310	3154+55.330	for segment #18 (3153+66.310 to 3154+55.330), Effective median width (92.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3153+66.310	3154+55.330	for segment #18 (3153+66.310 to 3154+55.330), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3153+66.310	3154+55.330	for segment #18 (3153+66.310 to 3154+55.330), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3153+66.310	3154+55.330	for segment #18 (3153+66.310 to 3154+55.330), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3153+66.310	3154+55.330	for segment #18 (3153+66.310 to 3154+55.330), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3154+55.330	3157+36.310	for segment #19 (3154+55.330 to 3157+36.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3154+55.330	3157+36.310	for segment #19 (3154+55.330 to 3157+36.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3154+55.330	3157+36.310	for segment #19 (3154+55.330 to 3157+36.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3154+55.330	3157+36.310	for segment #19 (3154+55.330 to 3157+36.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3157+36.310	3159+08.310	for segment #20 (3157+36.310 to 3159+08.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3157+36.310	3159+08.310	for segment #20 (3157+36.310 to 3159+08.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3157+36.310	3159+08.310	for segment #20 (3157+36.310 to 3159+08.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3157+36.310	3159+08.310	for segment #20 (3157+36.310 to 3159+08.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3159+08.310	3160+79.310	for segment #21 (3159+08.310 to 3160+79.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3159+08.310	3160+79.310	for segment #21 (3159+08.310 to 3160+79.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3159+08.310	3160+79.310	for segment #21 (3159+08.310 to 3160+79.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3159+08.310	3160+79.310	for segment #21 (3159+08.310 to 3160+79.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3160+79.310	3212+12.090	for segment #22 (3160+79.310 to 3212+12.090), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3160+79.310	3212+12.090	for segment #22 (3160+79.310 to 3212+12.090), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3160+79.310	3212+12.090	for segment #22 (3160+79.310 to 3212+12.090), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3160+79.310	3212+12.090	for segment #22 (3160+79.310 to 3212+12.090), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3212+12.090	3213+33.310	for segment #23 (3212+12.090 to 3213+33.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3212+12.090	3213+33.310	for segment #23 (3212+12.090 to 3213+33.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3212+12.090	3213+33.310	for segment #23 (3212+12.090 to 3213+33.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3212+12.090	3213+33.310	for segment #23 (3212+12.090 to 3213+33.310), Outside barrier offset (9.50 feet) is less than the left outside shoulder width (9.50 feet). This indicates there is problem with the input data.
3213+33.310	3214+31.950	for segment #24 (3213+33.310 to 3214+31.950), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3213+33.310	3214+31.950	for segment #24 (3213+33.310 to 3214+31.950), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3213+33.310	3214+31.950	for segment #24 (3213+33.310 to 3214+31.950), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3213+33.310	3214+31.950	for segment #24 (3213+33.310 to 3214+31.950), Outside barrier offset (8.58 feet) is less than the left outside shoulder width (8.58 feet). This indicates there is problem with the input data.
3214+31.950	3214+85.310	for segment #26 (3214+31.950 to 3214+85.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3214+31.950	3214+85.310	for segment #26 (3214+31.950 to 3214+85.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3214+31.950	3214+85.310	for segment #26 (3214+31.950 to 3214+85.310), Outside barrier offset (7.95 feet) is less than the left outside shoulder width (7.95 feet). This indicates there is problem with the input data.
3214+31.950	3214+85.310	for segment #26 (3214+31.950 to 3214+85.310), Outside barrier offset (9.63 feet) is less than the right outside shoulder width (9.63 feet). This indicates there is problem with the input data.
3214+85.310	3215+75.310	for segment #28 (3214+85.310 to 3215+75.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3214+85.310	3215+75.310	for segment #28 (3214+85.310 to 3215+75.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3214+85.310	3215+75.310	for segment #28 (3214+85.310 to 3215+75.310), Outside barrier offset (7.36 feet) is less than the left outside shoulder width (7.36 feet). This indicates there is problem with the input data.
3214+85.310	3215+75.310	for segment #28 (3214+85.310 to 3215+75.310), Outside barrier offset (8.64 feet) is less than the right outside shoulder width (8.64 feet). This indicates there is problem with the input data.
3215+75.310	3216+68.310	for segment #30 (3215+75.310 to 3216+68.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3215+75.310	3216+68.310	for segment #30 (3215+75.310 to 3216+68.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3215+75.310	3216+68.310	for segment #30 (3215+75.310 to 3216+68.310), Outside barrier offset (6.60 feet) is less than the left outside shoulder width (6.60 feet). This indicates there is problem with the input data.
3215+75.310	3216+68.310	for segment #30 (3215+75.310 to 3216+68.310), Outside barrier offset (7.37 feet) is less than the right outside shoulder width (7.37 feet). This indicates there is problem with the input data.
3216+68.310	3216+93.460	for segment #32 (3216+68.310 to 3216+93.460), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3216+68.310	3216+93.460	for segment #32 (3216+68.310 to 3216+93.460), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3216+68.310	3216+93.460	for segment #32 (3216+68.310 to 3216+93.460), Outside barrier offset (6.10 feet) is less than the left outside shoulder width (6.10 feet). This indicates there is problem with the input data.
3216+68.310	3216+93.460	for segment #32 (3216+68.310 to 3216+93.460), Outside barrier offset (6.55 feet) is less than the right outside shoulder width (6.55 feet). This indicates there is problem with the input data.
3216+93.460	3217+20.460	for segment #34 (3216+93.460 to 3217+20.460), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3216+93.460	3217+20.460	for segment #34 (3216+93.460 to 3217+20.460), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3216+93.460	3217+20.460	for segment #34 (3216+93.460 to 3217+20.460), Outside barrier offset (6.19 feet) is less than the right outside shoulder width (6.19 feet). This indicates there is problem with the input data.
3216+93.460	3217+20.460	for segment #34 (3216+93.460 to 3217+20.460), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3217+20.460	3218+88.310	for segment #36 (3217+20.460 to 3218+88.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3217+20.460	3218+88.310	for segment #36 (3217+20.460 to 3218+88.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3217+20.460	3218+88.310	for segment #36 (3217+20.460 to 3218+88.310), Outside barrier offset (6.00 feet) is less than the left outside shoulder width (7.00 feet). This indicates there is problem with the input data.
3217+20.460	3218+88.310	for segment #36 (3217+20.460 to 3218+88.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3218+88.310	3219+04.310	for segment #37 (3218+88.310 to 3219+04.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3218+88.310	3219+04.310	for segment #37 (3218+88.310 to 3219+04.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3218+88.310	3219+04.310	for segment #37 (3218+88.310 to 3219+04.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3219+04.310	3221+40.310	for segment #38 (3219+04.310 to 3221+40.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3219+04.310	3221+40.310	for segment #38 (3219+04.310 to 3221+40.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3219+04.310	3221+40.310	for segment #38 (3219+04.310 to 3221+40.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3221+40.310	3223+76.310	for segment #39 (3221+40.310 to 3223+76.310), Effective median width (92.03 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
3221+40.310	3223+76.310	for segment #39 (3221+40.310 to 3223+76.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3221+40.310	3223+76.310	for segment #39 (3221+40.310 to 3223+76.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3221+40.310	3223+76.310	for segment #39 (3221+40.310 to 3223+76.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3223+76.310	3226+12.310	for segment #40 (3223+76.310 to 3226+12.310), Effective median width (102.04 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
3223+76.310	3226+12.310	for segment #40 (3223+76.310 to 3226+12.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3223+76.310	3226+12.310	for segment #40 (3223+76.310 to 3226+12.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3223+76.310	3226+12.310	for segment #40 (3223+76.310 to 3226+12.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3226+12.310	3226+35.310	for segment #41 (3226+12.310 to 3226+35.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3226+12.310	3226+35.310	for segment #41 (3226+12.310 to 3226+35.310), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3226+12.310	3226+35.310	for segment #41 (3226+12.310 to 3226+35.310), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3226+35.310	3227+77.350	for segment #42 (3226+35.310 to 3227+77.350), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3226+35.310	3227+77.350	for segment #42 (3226+35.310 to 3227+77.350), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3231+68.310	3233+59.950	for segment #44 (3231+68.310 to 3233+59.950), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3146+14.240	3146+14.310	for segment #5 (3146+14.240 to 3146+14.310), For Speed Change Lane the Effective median width (92.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
3146+14.240	3146+14.310	for segment #5 (3146+14.240 to 3146+14.310), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3146+14.310	3150+89.310	for segment #7 (3146+14.310 to 3150+89.310), For Speed Change Lane the Effective median width (92.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
3146+14.310	3150+89.310	for segment #7 (3146+14.310 to 3150+89.310), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3150+89.310	3150+95.330	for segment #9 (3150+89.310 to 3150+95.330), For Speed Change Lane the Effective median width (92.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
3150+89.310	3150+95.330	for segment #9 (3150+89.310 to 3150+95.330), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3150+95.330	3151+69.310	for segment #11 (3150+95.330 to 3151+69.310), For Speed Change Lane the Effective median width (92.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
3150+95.330	3151+69.310	for segment #11 (3150+95.330 to 3151+69.310), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3151+69.310	3152+47.310	for segment #13 (3151+69.310 to 3152+47.310), For Speed Change Lane the Effective median width (92.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
3151+69.310	3152+47.310	for segment #13 (3151+69.310 to 3152+47.310), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3152+47.310	3152+94.100	for segment #15 (3152+47.310 to 3152+94.100), For Speed Change Lane the Effective median width (92.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
3152+47.310	3152+94.100	for segment #15 (3152+47.310 to 3152+94.100), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3152+94.100	3152+94.240	for segment #17 (3152+94.100 to 3152+94.240), For Speed Change Lane the Effective median width (92.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
3152+94.100	3152+94.240	for segment #17 (3152+94.100 to 3152+94.240), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3214+30.460	3214+31.950	for segment #25 (3214+30.460 to 3214+31.950), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3214+31.950	3214+85.310	for segment #27 (3214+31.950 to 3214+85.310), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3214+85.310	3215+75.310	for segment #29 (3214+85.310 to 3215+75.310), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3215+75.310	3216+68.310	for segment #31 (3215+75.310 to 3216+68.310), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3216+68.310	3216+93.460	for segment #33 (3216+68.310 to 3216+93.460), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3216+93.460	3217+20.460	for segment #35 (3216+93.460 to 3217+20.460), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
3145+27.310	3146+14.310	for segment #4 (3145+27.310 to 3146+14.310), traffic volume (110,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3146+14.310	3150+89.310	for segment #6 (3146+14.310 to 3150+89.310), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F

Start Location (Sta. ft)	End Location (Sta. ft)	Message
3150+89.310	3150+95.330	for segment #8 (3150+89.310 to 3150+95.330), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3150+95.330	3151+69.310	for segment #10 (3150+95.330 to 3151+69.310), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3151+69.310	3152+47.310	for segment #12 (3151+69.310 to 3152+47.310), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3152+47.310	3152+94.100	for segment #14 (3152+47.310 to 3152+94.100), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3152+94.100	3153+66.310	for segment #16 (3152+94.100 to 3153+66.310), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3153+66.310	3154+55.330	for segment #18 (3153+66.310 to 3154+55.330), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3154+55.330	3157+36.310	for segment #19 (3154+55.330 to 3157+36.310), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3157+36.310	3159+08.310	for segment #20 (3157+36.310 to 3159+08.310), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3159+08.310	3160+79.310	for segment #21 (3159+08.310 to 3160+79.310), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3160+79.310	3212+12.090	for segment #22 (3160+79.310 to 3212+12.090), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3212+12.090	3213+33.310	for segment #23 (3212+12.090 to 3213+33.310), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3213+33.310	3214+31.950	for segment #24 (3213+33.310 to 3214+31.950), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3214+31.950	3214+85.310	for segment #26 (3214+31.950 to 3214+85.310), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3214+85.310	3215+75.310	for segment #28 (3214+85.310 to 3215+75.310), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3215+75.310	3216+68.310	for segment #30 (3215+75.310 to 3216+68.310), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3216+68.310	3216+93.460	for segment #32 (3216+68.310 to 3216+93.460), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3216+93.460	3217+20.460	for segment #34 (3216+93.460 to 3217+20.460), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4F
3146+14.240	3146+14.310	for segment #5 (3146+14.240 to 3146+14.310), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4SC
3146+14.310	3150+89.310	for segment #7 (3146+14.310 to 3150+89.310), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4SC
3150+89.310	3150+95.330	for segment #9 (3150+89.310 to 3150+95.330), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4SC
3150+95.330	3151+69.310	for segment #11 (3150+95.330 to 3151+69.310), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4SC
3151+69.310	3152+47.310	for segment #13 (3151+69.310 to 3152+47.310), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4SC
3152+47.310	3152+94.100	for segment #15 (3152+47.310 to 3152+94.100), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4SC
3152+94.100	3152+94.240	for segment #17 (3152+94.100 to 3152+94.240), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4SC
3214+30.460	3214+31.950	for segment #25 (3214+30.460 to 3214+31.950), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4SC
3214+31.950	3214+85.310	for segment #27 (3214+31.950 to 3214+85.310), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4SC
3214+85.310	3215+75.310	for segment #29 (3214+85.310 to 3215+75.310), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4SC
3215+75.310	3216+68.310	for segment #31 (3215+75.310 to 3216+68.310), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4SC
3216+68.310	3216+93.460	for segment #33 (3216+68.310 to 3216+93.460), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4SC
3216+93.460	3217+20.460	for segment #35 (3216+93.460 to 3217+20.460), traffic volume (118,300 vpd) for 2030 is not within the model limit (110,000 vpd) for reliable results for segment type 4SC

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:03 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:03:02 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment CDNB0
Highway Comment: Imported from CDNB0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:02:47 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1095+66.446
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1095+66.446
Functional Class: Freeway C-D Road & System Ramp

Type of Alignment: One Direction

Model Category: C-D Road & System Ramp

Calibration Factor: CD_MV_FI=1.0; CD_MV_PDO=1.0; CD_SV_FI=1.0; CD_SV_PDO=1.0;

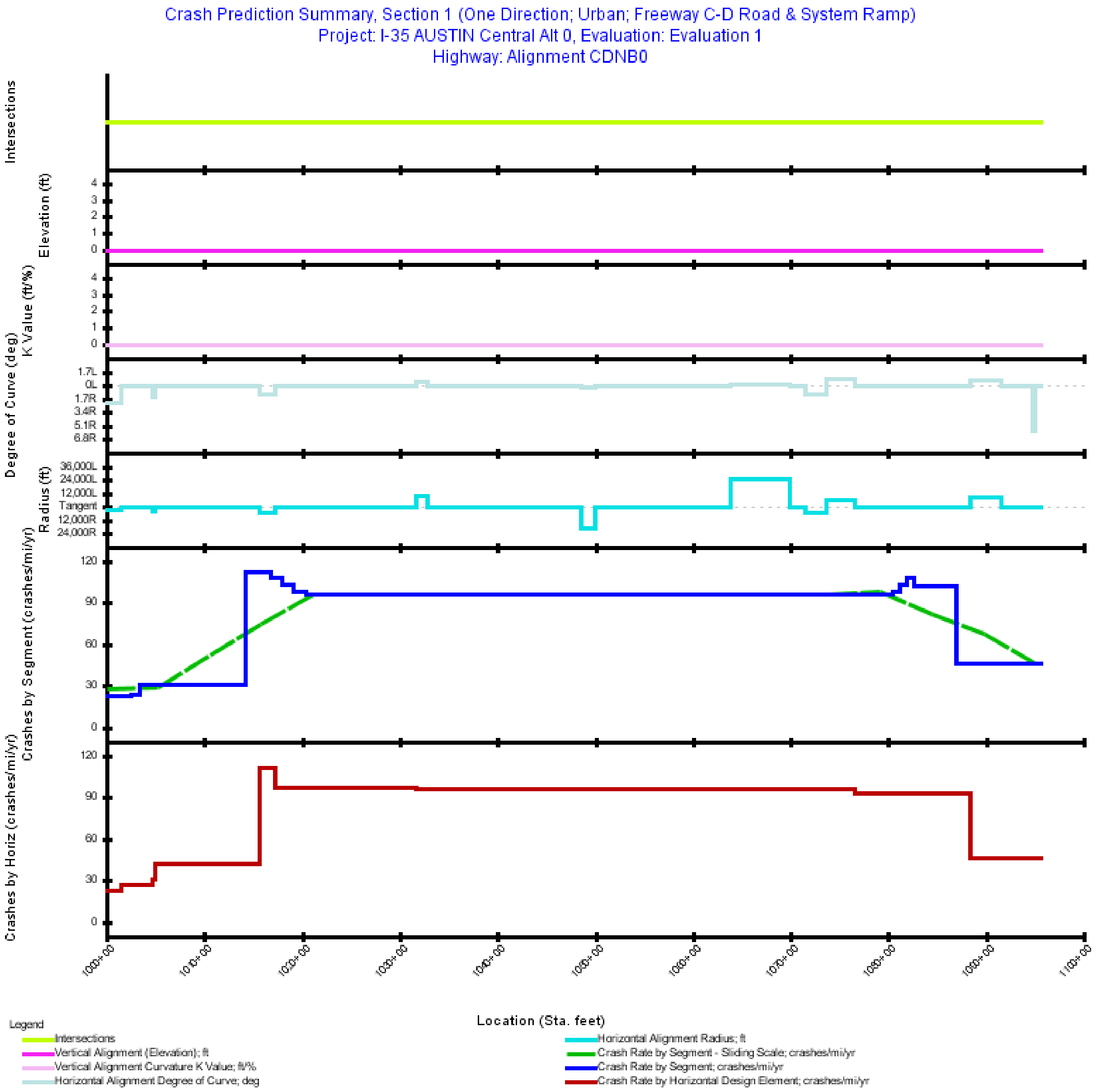

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1000+00.000	1000+85.000	85.00	0.0161	2030: 44,000
2	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1000+85.000	1002+55.000	170.00	0.0322	2030: 44,000
3	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1002+55.000	1003+39.000	84.00	0.0159	2030: 44,000
4	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1003+39.000	1014+21.000	1,082.00	0.2049	2030: 44,000
5	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1014+21.000	1016+77.000	256.00	0.0485	2030: 59,550
6	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1016+77.000	1017+97.000	120.00	0.0227	2030: 59,550
7	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1017+97.000	1019+17.000	120.00	0.0227	2030: 59,550
8	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1019+17.000	1020+37.000	120.00	0.0227	2030: 59,550
9	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1020+37.000	1080+51.000	6,014.00	1.1390	2030: 59,550
10	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1080+51.000	1081+19.000	68.00	0.0129	2030: 59,550
11	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1081+19.000	1081+88.000	69.00	0.0131	2030: 59,550
12	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1081+88.000	1082+56.000	68.00	0.0129	2030: 59,550
13	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1082+56.000	1086+96.000	440.00	0.0833	2030: 59,550
14	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1086+96.000	1095+66.446	870.45	0.1649	2030: 51,550

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**1.8118**
Average Future Road AADT (vpd)	**56,512**
Predicted Crashes	
Total Crashes	**149.72**
Fatal and Injury Crashes	**110.01**
Property-Damage-Only Crashes	**39.71**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**73**
Percent Property-Damage-Only Crashes (%)	**27**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**82.6371**
FI Crash Rate (crashes/mi/yr)	**60.7188**
PDO Crash Rate (crashes/mi/yr)	**21.9183**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**37.37**
Travel Crash Rate (crashes/million veh-mi)	**4.01**
Travel FI Crash Rate (crashes/million veh-mi)	**2.94**
Travel PDO Crash Rate (crashes/million veh-mi)	**1.06**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+85.000	0.0161	0.364	0.3643	0.1996	0.1647	22.6285	1.41
2	1000+85.000	1002+55.000	0.0322	0.743	0.7427	0.4107	0.3320	23.0663	1.44
3	1002+55.000	1003+39.000	0.0159	0.376	0.3756	0.2096	0.1660	23.6102	1.47
4	1003+39.000	1014+21.000	0.2049	6.395	6.3947	3.6546	2.7401	31.2052	1.94
5	1014+21.000	1016+77.000	0.0485	5.446	5.4460	4.1639	1.2821	112.3229	5.17
6	1016+77.000	1017+97.000	0.0227	2.462	2.4624	1.8733	0.5891	108.3446	4.99
7	1017+97.000	1019+17.000	0.0227	2.345	2.3448	1.7718	0.5730	103.1702	4.75
8	1019+17.000	1020+37.000	0.0227	2.237	2.2374	1.6790	0.5584	98.4444	4.53
9	1020+37.000	1080+51.000	1.1390	109.152	109.1524	81.6225	27.5299	95.8305	4.41
10	1080+51.000	1081+19.000	0.0129	1.268	1.2684	0.9519	0.3165	98.4876	4.53
11	1081+19.000	1081+88.000	0.0131	1.349	1.3490	1.0194	0.3296	103.2256	4.75
12	1081+88.000	1082+56.000	0.0129	1.394	1.3936	1.0603	0.3333	108.2073	4.98
13	1082+56.000	1086+96.000	0.0833	8.499	8.4990	6.4115	2.0876	101.9883	4.69
14	1086+96.000	1095+66.446	0.1649	7.694	7.6940	4.9839	2.7101	46.6708	2.48
Total			1.8118	149.724	149.7241	110.0120	39.7121	82.6371	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+51.632	0.0287	0.655	0.6554	0.3606	0.2948	22.8209	1.42
Tangent	1001+51.632	1004+68.416	0.0600	1.592	1.5921	0.8965	0.6956	26.5355	1.65
Simple Curve 2	1004+68.416	1005+02.833	0.0065	0.203	0.2034	0.1162	0.0872	31.2052	1.94
Tangent	1005+02.833	1015+63.859	0.2010	8.466	8.4655	5.4248	3.0407	42.1271	2.38
Simple Curve 3	1015+63.859	1017+19.061	0.0294	3.270	3.2699	2.4969	0.7731	111.2447	5.12
Tangent	1017+19.061	1031+60.864	0.2731	26.579	26.5793	19.9207	6.6586	97.3354	4.48
Simple Curve 4	1031+60.864	1032+86.745	0.0238	2.285	2.2847	1.7085	0.5762	95.8305	4.41
Tangent	1032+86.745	1048+50.740	0.2962	28.386	28.3861	21.2267	7.1594	95.8305	4.41
Simple Curve 5	1048+50.740	1050+00.785	0.0284	2.723	2.7233	2.0364	0.6868	95.8305	4.41
Tangent	1050+00.785	1063+86.369	0.2624	25.148	25.1480	18.8053	6.3427	95.8305	4.41
Simple Curve 6	1063+86.369	1069+89.456	0.1142	10.946	10.9459	8.1851	2.7607	95.8305	4.41
Tangent	1069+89.456	1071+48.040	0.0300	2.878	2.8782	2.1523	0.7259	95.8305	4.41
Simple Curve 7	1071+48.040	1073+72.717	0.0426	4.078	4.0778	3.0493	1.0285	95.8305	4.41
Simple Curve 8	1073+72.717	1076+48.682	0.0523	5.009	5.0087	3.7454	1.2633	95.8305	4.41
Tangent	1076+48.682	1088+37.235	0.2251	21.060	21.0603	15.7120	5.3483	93.5579	4.34
Simple Curve 9	1088+37.235	1091+53.965	0.0600	2.800	2.7996	1.8135	0.9861	46.6708	2.48
Tangent	1091+53.965	1094+68.465	0.0596	2.780	2.7799	1.8007	0.9792	46.6708	2.48
Simple Curve 10	1094+68.465	1095+05.772	0.0071	0.330	0.3298	0.2136	0.1162	46.6708	2.48
Tangent	1095+05.772	1095+66.446	0.0115	0.536	0.5363	0.3474	0.1889	46.6708	2.48

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	149.72	110.01	73.477	39.71	26.523
Total	149.72	110.01	73.477	39.71	26.523
Average	149.72	110.01	73.477	39.71	26.523

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the

distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0040	0.0123	0.0635	0.1198	0.1647
2	0.0083	0.0253	0.1307	0.2464	0.3320
3	0.0043	0.0129	0.0667	0.1258	0.1660
4	0.0652	0.1976	1.0438	2.3480	2.7401
5	0.0609	0.1846	1.0045	2.9139	1.2821
6	0.0274	0.0831	0.4519	1.3109	0.5891
7	0.0259	0.0786	0.4274	1.2399	0.5730
8	0.0245	0.0744	0.4050	1.1750	0.5584
9	1.1934	3.6187	19.6907	57.1196	27.5299
10	0.0139	0.0422	0.2296	0.6662	0.3165
11	0.0149	0.0452	0.2459	0.7134	0.3296
12	0.0155	0.0470	0.2558	0.7420	0.3333
13	0.0937	0.2843	1.5467	4.4868	2.0876
14	0.0840	0.2546	1.3569	3.2884	2.7101
Total	1.6360	4.9607	26.9193	76.4960	39.7121

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.0	0.09	0.1	0.10	0.1
Highway Segment	Collision with Fixed Object	2.04	1.4	2.94	2.0	4.97	3.3
Highway Segment	Collision with Other Object	0.14	0.1	0.57	0.4	0.71	0.5
Highway Segment	Other Single-vehicle Collision	0.59	0.4	0.44	0.3	1.03	0.7
Highway Segment	Collision with Parked Vehicle	0.04	0.0	0.07	0.0	0.11	0.1
Highway Segment	Total Single Vehicle Crashes	2.82	1.9	4.10	2.7	6.92	4.6
Highway Segment	Right-Angle Collision	3.32	2.2	0.64	0.4	3.96	2.6
Highway Segment	Head-on Collision	0.86	0.6	0.07	0.0	0.93	0.6
Highway Segment	Other Multi-vehicle Collision	3.32	2.2	0.85	0.6	4.18	2.8
Highway Segment	Rear-end Collision	80.39	53.7	24.57	16.4	104.96	70.1
Highway Segment	Sideswipe, Same Direction Collision	19.29	12.9	9.47	6.3	28.77	19.2
Highway Segment	Total Multiple Vehicle Crashes	107.19	71.6	35.61	23.8	142.80	95.4
Highway Segment	Total Highway Segment Crashes	110.01	73.5	39.71	26.5	149.72	100.0
	Total Crashes	110.01	73.5	39.71	26.5	149.72	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+85.000	for segment #1 (1000+00.000 to 1000+85.000), traffic volume (44,000 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1000+85.000	1002+55.000	for segment #2 (1000+85.000 to 1002+55.000), traffic volume (44,000 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1002+55.000	1003+39.000	for segment #3 (1002+55.000 to 1003+39.000), traffic volume (44,000 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1003+39.000	1014+21.000	for segment #4 (1003+39.000 to 1014+21.000), traffic volume (44,000 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1014+21.000	1016+77.000	for segment #5 (1014+21.000 to 1016+77.000), traffic volume (59,550 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1016+77.000	1017+97.000	for segment #6 (1016+77.000 to 1017+97.000), traffic volume (59,550 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1017+97.000	1019+17.000	for segment #7 (1017+97.000 to 1019+17.000), traffic volume (59,550 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1019+17.000	1020+37.000	for segment #8 (1019+17.000 to 1020+37.000), traffic volume (59,550 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1020+37.000	1080+51.000	for segment #9 (1020+37.000 to 1080+51.000), traffic volume (59,550 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1080+51.000	1081+19.000	for segment #10 (1080+51.000 to 1081+19.000), traffic volume (59,550 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1081+19.000	1081+88.000	for segment #11 (1081+19.000 to 1081+88.000), traffic volume (59,550 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1081+88.000	1082+56.000	for segment #12 (1081+88.000 to 1082+56.000), traffic volume (59,550 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1082+56.000	1086+96.000	for segment #13 (1082+56.000 to 1086+96.000), traffic volume (59,550 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1086+96.000	1095+66.446	for segment #14 (1086+96.000 to 1095+66.446), traffic volume (51,550 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:06 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:05:02 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment CDSB0
Highway Comment: Imported from CDSB0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:04:46 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1096+93.896
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1096+93.896
Functional Class: Freeway C-D Road & System Ramp
Type of Alignment: One Direction
Model Category: C-D Road & System Ramp
Calibration Factor: CD_MV_FI=1.0; CD_MV_PDO=1.0; CD_SV_FI=1.0; CD_SV_PDO=1.0;

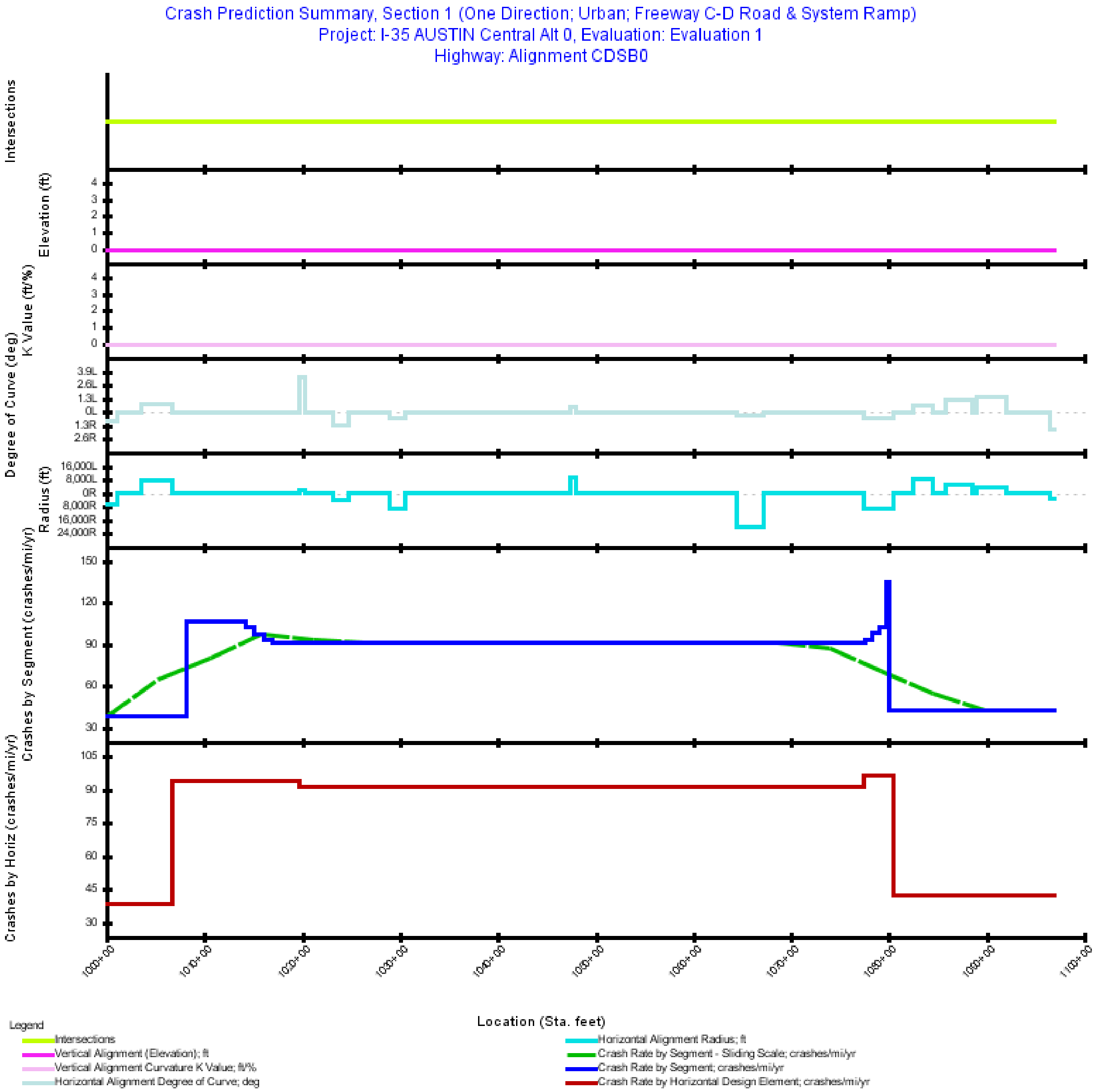

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1000+00.000	1008+11.000	811.00	0.1536	2030: 50,050
2	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1008+11.000	1014+24.000	613.00	0.1161	2030: 58,750
3	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1014+24.000	1015+14.000	90.00	0.0170	2030: 58,750
4	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1015+14.000	1016+04.000	90.00	0.0170	2030: 58,750
5	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1016+04.000	1016+94.000	90.00	0.0170	2030: 58,750
6	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1016+94.000	1077+52.000	6,058.00	1.1473	2030: 58,750
7	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1077+52.000	1078+24.000	72.00	0.0136	2030: 58,750
8	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1078+24.000	1078+97.000	73.00	0.0138	2030: 58,750
9	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1078+97.000	1079+69.000	72.00	0.0136	2030: 58,750
10	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1079+69.000	1080+05.130	36.13	0.0068	2030: 58,750
11	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1080+05.130	1096+93.896	1,688.77	0.3198	2030: 46,300

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**1.8360**
Average Future Road AADT (vpd)	**55,853**
Predicted Crashes	
Total Crashes	**146.50**
Fatal and Injury Crashes	**106.28**
Property-Damage-Only Crashes	**40.22**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**73**
Percent Property-Damage-Only Crashes (%)	**27**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**79.7938**
FI Crash Rate (crashes/mi/yr)	**57.8882**
PDO Crash Rate (crashes/mi/yr)	**21.9056**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**37.43**
Travel Crash Rate (crashes/million veh-mi)	**3.91**
Travel FI Crash Rate (crashes/million veh-mi)	**2.84**
Travel PDO Crash Rate (crashes/million veh-mi)	**1.07**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1008+11.000	0.1536	5.946	5.9462	3.7966	2.1496	38.7124	2.12
2	1008+11.000	1014+24.000	0.1161	12.367	12.3666	9.3529	3.0137	106.5186	4.97
3	1014+24.000	1015+14.000	0.0170	1.753	1.7527	1.3188	0.4340	102.8275	4.79
4	1015+14.000	1016+04.000	0.0170	1.672	1.6724	1.2496	0.4229	98.1168	4.58
5	1016+04.000	1016+94.000	0.0170	1.596	1.5961	1.1840	0.4121	93.6358	4.37
6	1016+94.000	1077+52.000	1.1473	104.677	104.6766	77.3679	27.3087	91.2335	4.25
7	1077+52.000	1078+24.000	0.0136	1.280	1.2795	0.9492	0.3303	93.8294	4.38
8	1078+24.000	1078+97.000	0.0138	1.359	1.3593	1.0157	0.3436	98.3177	4.58
9	1078+97.000	1079+69.000	0.0136	1.405	1.4050	1.0572	0.3478	103.0360	4.80
10	1079+69.000	1080+05.130	0.0068	0.926	0.9260	0.7480	0.1779	135.3201	6.31
11	1080+05.130	1096+93.896	0.3198	13.518	13.5181	8.2408	5.2773	42.2649	2.50
Total			1.8360	146.499	146.4986	106.2807	40.2179	79.7938	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+10.733	0.0210	0.812	0.8119	0.5184	0.2935	38.7124	2.12
Tangent	1001+10.733	1003+47.665	0.0449	1.737	1.7372	1.1092	0.6280	38.7124	2.12
Simple Curve 2	1003+47.665	1006+64.016	0.0599	2.319	2.3194	1.4809	0.8385	38.7124	2.12
Tangent	1006+64.016	1019+66.992	0.2468	23.183	23.1826	17.2798	5.9028	93.9420	4.42
Simple Curve 3	1019+66.992	1020+26.303	0.0112	1.025	1.0248	0.7575	0.2674	91.2335	4.25
Tangent	1020+26.303	1023+14.842	0.0546	4.986	4.9857	3.6850	1.3007	91.2335	4.25
Simple Curve 4	1023+14.842	1024+75.125	0.0304	2.769	2.7695	2.0470	0.7225	91.2335	4.25
Tangent	1024+75.125	1028+90.713	0.0787	7.181	7.1810	5.3075	1.8734	91.2335	4.25
Simple Curve 5	1028+90.713	1030+52.815	0.0307	2.801	2.8010	2.0702	0.7307	91.2335	4.25
Tangent	1030+52.815	1047+42.498	0.3200	29.196	29.1961	21.5793	7.6169	91.2335	4.25
Simple Curve 6	1047+42.498	1048+04.203	0.0117	1.066	1.0662	0.7880	0.2782	91.2335	4.25
Tangent	1048+04.203	1064+48.375	0.3114	28.410	28.4098	20.9980	7.4117	91.2335	4.25
Simple Curve 7	1064+48.375	1067+18.916	0.0512	4.675	4.6747	3.4551	1.2196	91.2335	4.25
Tangent	1067+18.916	1077+35.030	0.1924	17.558	17.5575	12.9770	4.5805	91.2335	4.25
Simple Curve 8	1077+35.030	1080+38.723	0.0575	5.532	5.5320	4.1508	1.3812	96.1782	4.54
Tangent	1080+38.723	1082+41.151	0.0383	1.620	1.6204	0.9878	0.6326	42.2649	2.50
Simple Curve 9	1082+41.151	1084+54.692	0.0404	1.709	1.7093	1.0420	0.6673	42.2649	2.50
Tangent	1084+54.692	1085+80.369	0.0238	1.006	1.0060	0.6133	0.3927	42.2649	2.50
Simple Curve 10	1085+80.369	1088+54.136	0.0518	2.191	2.1914	1.3359	0.8555	42.2649	2.50
Tangent	1088+54.136	1089+00.853	0.0088	0.374	0.3740	0.2280	0.1460	42.2649	2.50
Simple Curve 11	1089+00.853	1091+99.033	0.0565	2.387	2.3868	1.4551	0.9318	42.2649	2.50
Tangent	1091+99.033	1096+45.078	0.0845	3.571	3.5705	2.1766	1.3939	42.2649	2.50
Simple Curve 12	1096+45.078	1096+93.896	0.0092	0.391	0.3908	0.2382	0.1526	42.2649	2.50

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	146.50	106.28	72.547	40.22	27.453
Total	146.50	106.28	72.547	40.22	27.453
Average	146.50	106.28	72.547	40.22	27.453

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0644	0.1953	1.0396	2.4973	2.1496
2	0.1368	0.4147	2.2563	6.5452	3.0137
3	0.0193	0.0585	0.3181	0.9229	0.4340
4	0.0183	0.0554	0.3015	0.8745	0.4229
5	0.0173	0.0525	0.2856	0.8286	0.4121
6	1.1312	3.4301	18.6643	54.1422	27.3087
7	0.0139	0.0421	0.2290	0.6643	0.3303
8	0.0149	0.0450	0.2450	0.7108	0.3436
9	0.0155	0.0469	0.2550	0.7398	0.3478
10	0.0109	0.0332	0.1805	0.5235	0.1779
11	0.1369	0.4152	2.2172	5.4715	5.2773
Total	1.5793	4.7888	25.9922	73.9205	40.2179

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.0	0.09	0.1	0.10	0.1
Highway Segment	Collision with Fixed Object	2.11	1.4	3.00	2.0	5.11	3.5
Highway Segment	Collision with Other Object	0.15	0.1	0.58	0.4	0.73	0.5
Highway Segment	Other Single-vehicle Collision	0.61	0.4	0.45	0.3	1.06	0.7
Highway Segment	Collision with Parked Vehicle	0.04	0.0	0.07	0.0	0.11	0.1
Highway Segment	Total Single Vehicle Crashes	2.92	2.0	4.19	2.9	7.11	4.9
Highway Segment	Right-Angle Collision	3.20	2.2	0.65	0.4	3.85	2.6
Highway Segment	Head-on Collision	0.83	0.6	0.07	0.0	0.90	0.6
Highway Segment	Other Multi-vehicle Collision	3.20	2.2	0.86	0.6	4.07	2.8
Highway Segment	Rear-end Collision	77.52	52.9	24.86	17.0	102.38	69.9
Highway Segment	Sideswipe, Same Direction Collision	18.60	12.7	9.58	6.5	28.19	19.2
Highway Segment	Total Multiple Vehicle Crashes	103.36	70.6	36.03	24.6	139.38	95.1
Highway Segment	Total Highway Segment Crashes	106.28	72.5	40.22	27.5	146.50	100.0
	Total Crashes	106.28	72.5	40.22	27.5	146.50	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1008+11.000	for segment #1 (1000+00.000 to 1008+11.000), traffic volume (50,050 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1008+11.000	1014+24.000	for segment #2 (1008+11.000 to 1014+24.000), traffic volume (58,750 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1014+24.000	1015+14.000	for segment #3 (1014+24.000 to 1015+14.000), traffic volume (58,750 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1015+14.000	1016+04.000	for segment #4 (1015+14.000 to 1016+04.000), traffic volume (58,750 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1016+04.000	1016+94.000	for segment #5 (1016+04.000 to 1016+94.000), traffic volume (58,750 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1016+94.000	1077+52.000	for segment #6 (1016+94.000 to 1077+52.000), traffic volume (58,750 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1077+52.000	1078+24.000	for segment #7 (1077+52.000 to 1078+24.000), traffic volume (58,750 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1078+24.000	1078+97.000	for segment #8 (1078+24.000 to 1078+97.000), traffic volume (58,750 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1078+97.000	1079+69.000	for segment #9 (1078+97.000 to 1079+69.000), traffic volume (58,750 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1079+69.000	1080+05.130	for segment #10 (1079+69.000 to 1080+05.130), traffic volume (58,750 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD
1080+05.130	1096+93.896	for segment #11 (1080+05.130 to 1096+93.896), traffic volume (46,300 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2CD

I-35 No-Build Model At-Grade Freeway Ramps

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:25 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:25:13 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBX2900
Highway Comment: Imported from RGPNBX2900.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:25:02 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1022+06.001
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1022+06.001
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

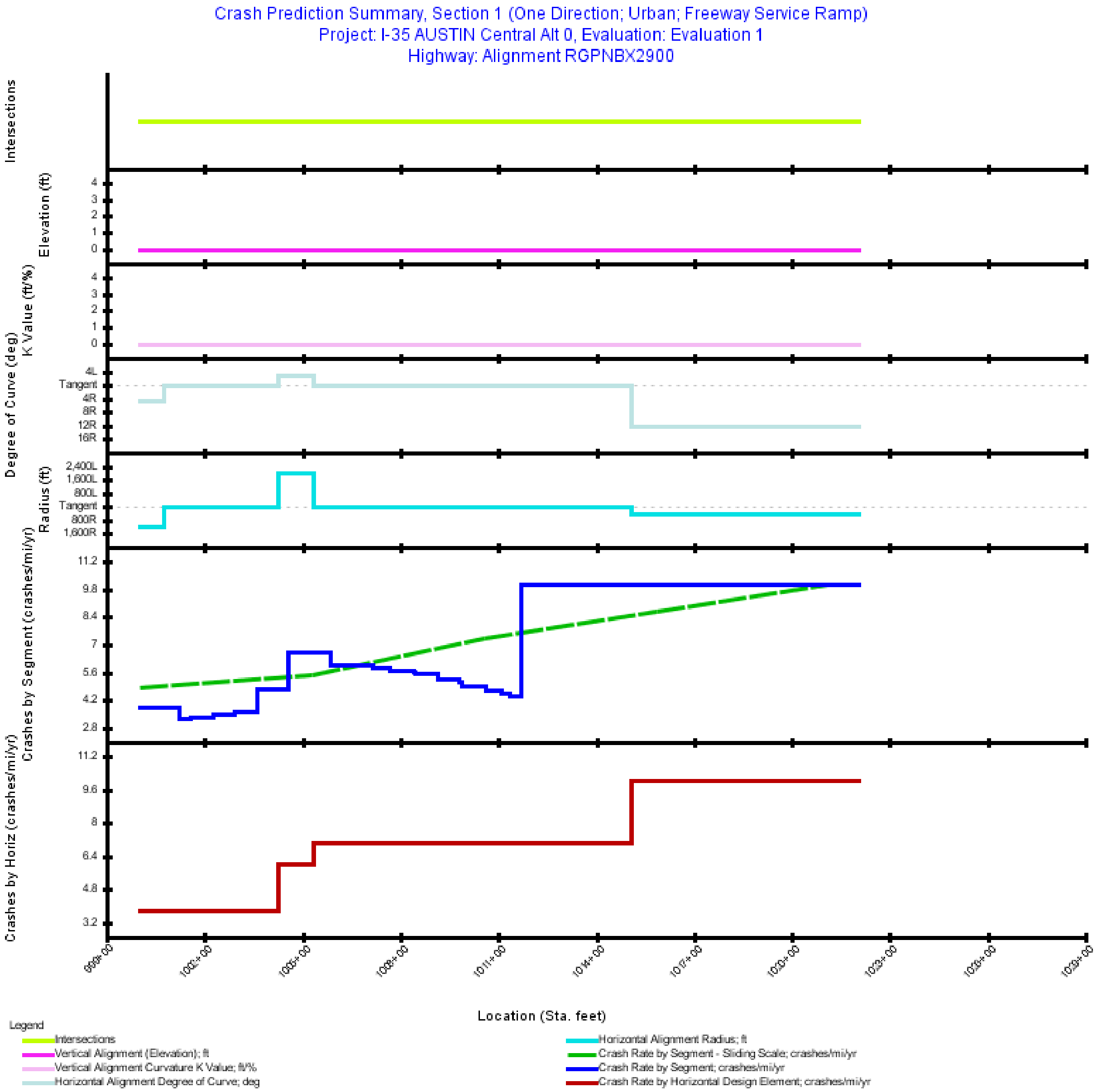

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1001+25.000	125.00	0.0237	2030: 12,850
2	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+25.000	1001+59.000	34.00	0.0064	2030: 12,850
3	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+59.000	1002+26.000	67.00	0.0127	2030: 12,850
4	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+26.000	1002+93.000	67.00	0.0127	2030: 12,850
5	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+93.000	1003+60.000	67.00	0.0127	2030: 12,850
6	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+60.000	1004+58.000	98.00	0.0186	2030: 12,850
7	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+58.000	1005+88.000	130.00	0.0246	2030: 12,850
8	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1005+88.000	1007+18.000	130.00	0.0246	2030: 12,850
9	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1007+18.000	1007+30.000	12.00	0.0023	2030: 12,850
10	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1007+30.000	1007+67.000	37.00	0.0070	2030: 12,850
11	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1007+67.000	1008+41.000	74.00	0.0140	2030: 12,850
12	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1008+41.000	1008+48.000	7.00	0.0013	2030: 12,850
13	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1008+48.000	1009+15.000	67.00	0.0127	2030: 12,850
14	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1009+15.000	1009+78.000	63.00	0.0119	2030: 12,850
15	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1009+78.000	1009+88.000	10.00	0.0019	2030: 12,850
16	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1009+88.000	1010+62.000	74.00	0.0140	2030: 12,850
17	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1010+62.000	1011+08.000	46.00	0.0087	2030: 12,850
18	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1011+08.000	1011+36.000	28.00	0.0053	2030: 12,850
19	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1011+36.000	1011+72.000	36.00	0.0068	2030: 12,850
20	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1011+72.000	1022+06.001	1,034.00	0.1958	2030: 12,850

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.4178**
Average Future Road AADT (vpd)	**12,850**
Predicted Crashes	
Total Crashes	**3.05**
Fatal and Injury Crashes	**1.40**
Property-Damage-Only Crashes	**1.65**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**46**
Percent Property-Damage-Only Crashes (%)	**54**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**7.2941**
FI Crash Rate (crashes/mi/yr)	**3.3380**
PDO Crash Rate (crashes/mi/yr)	**3.9561**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.96**
Travel Crash Rate (crashes/million veh-mi)	**1.55**
Travel FI Crash Rate (crashes/million veh-mi)	**0.71**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.84**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1001+25.000	0.0237	0.090	0.0900	0.0435	0.0465	3.8033	0.81
2	1001+25.000	1001+59.000	0.0064	0.021	0.0209	0.0103	0.0106	3.2510	0.69
3	1001+59.000	1002+26.000	0.0127	0.043	0.0425	0.0211	0.0214	3.3499	0.71
4	1002+26.000	1002+93.000	0.0127	0.044	0.0442	0.0223	0.0219	3.4863	0.74
5	1002+93.000	1003+60.000	0.0127	0.046	0.0461	0.0236	0.0225	3.6290	0.77
6	1003+60.000	1004+58.000	0.0186	0.088	0.0883	0.0457	0.0426	4.7569	1.01
7	1004+58.000	1005+88.000	0.0246	0.162	0.1623	0.0844	0.0779	6.5904	1.41
8	1005+88.000	1007+18.000	0.0246	0.147	0.1469	0.0758	0.0712	5.9669	1.27
9	1007+18.000	1007+30.000	0.0023	0.013	0.0133	0.0068	0.0065	5.8369	1.24
10	1007+30.000	1007+67.000	0.0070	0.041	0.0406	0.0207	0.0199	5.7928	1.24
11	1007+67.000	1008+41.000	0.0140	0.080	0.0798	0.0405	0.0393	5.6942	1.21
12	1008+41.000	1008+48.000	0.0013	0.007	0.0075	0.0038	0.0037	5.6235	1.20
13	1008+48.000	1009+15.000	0.0127	0.070	0.0704	0.0354	0.0350	5.5471	1.18
14	1009+15.000	1009+78.000	0.0119	0.063	0.0626	0.0309	0.0317	5.2497	1.12
15	1009+78.000	1009+88.000	0.0019	0.010	0.0096	0.0047	0.0049	5.0906	1.08
16	1009+88.000	1010+62.000	0.0140	0.069	0.0689	0.0332	0.0357	4.9142	1.05
17	1010+62.000	1011+08.000	0.0087	0.041	0.0407	0.0192	0.0215	4.6739	1.00
18	1011+08.000	1011+36.000	0.0053	0.024	0.0240	0.0112	0.0128	4.5324	0.97
19	1011+36.000	1011+72.000	0.0068	0.030	0.0301	0.0139	0.0162	4.4139	0.94
20	1011+72.000	1022+06.001	0.1958	1.959	1.9587	0.8476	1.1112	10.0021	2.13
Total			0.4178	3.047	3.0475	1.3946	1.6529	7.2941	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1000+76.360	0.0145	0.055	0.0550	0.0266	0.0284	3.8033	0.81
Tangent	1000+76.360	1004+23.904	0.0658	0.246	0.2463	0.1241	0.1223	3.7425	0.80
Simple Curve 2	1004+23.904	1005+32.082	0.0205	0.123	0.1232	0.0640	0.0592	6.0125	1.28
Tangent	1005+32.082	1015+07.448	0.1847	1.300	1.2997	0.6074	0.6923	7.0356	1.50
Simple Curve 3	1015+07.448	1022+06.001	0.1323	1.323	1.3233	0.5726	0.7507	10.0021	2.13

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	3.05	1.40	45.763	1.65	54.237
Total	3.05	1.40	45.763	1.65	54.237
Average	3.05	1.40	45.763	1.65	54.237

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0014	0.0041	0.0171	0.0209	0.0465
2	0.0003	0.0010	0.0041	0.0049	0.0106
3	0.0007	0.0020	0.0083	0.0102	0.0214
4	0.0007	0.0021	0.0088	0.0107	0.0219
5	0.0007	0.0022	0.0093	0.0113	0.0225
6	0.0013	0.0039	0.0166	0.0239	0.0426
7	0.0020	0.0061	0.0265	0.0498	0.0779
8	0.0018	0.0054	0.0238	0.0447	0.0712
9	0.0002	0.0005	0.0021	0.0040	0.0065
10	0.0005	0.0015	0.0065	0.0122	0.0199
11	0.0010	0.0029	0.0127	0.0239	0.0393
12	0.0001	0.0003	0.0012	0.0022	0.0037
13	0.0008	0.0025	0.0111	0.0209	0.0350
14	0.0007	0.0022	0.0097	0.0182	0.0317
15	0.0001	0.0003	0.0015	0.0028	0.0049
16	0.0008	0.0024	0.0104	0.0196	0.0357
17	0.0005	0.0014	0.0060	0.0114	0.0215
18	0.0003	0.0008	0.0035	0.0066	0.0128
19	0.0003	0.0010	0.0044	0.0082	0.0162
20	0.0205	0.0622	0.2709	0.4940	1.1112
Total	0.0346	0.1049	0.4547	0.8005	1.6529

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.2	0.03	1.1	0.04	1.3
Highway Segment	Collision with Fixed Object	0.97	31.7	1.08	35.4	2.05	67.2
Highway Segment	Collision with Other Object	0.07	2.2	0.21	6.9	0.28	9.1
Highway Segment	Other Single-vehicle Collision	0.28	9.1	0.16	5.3	0.44	14.4
Highway Segment	Collision with Parked Vehicle	0.02	0.7	0.02	0.8	0.04	1.5
Highway Segment	Total Single Vehicle Crashes	1.34	44.0	1.51	49.5	2.85	93.5
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.01	0.2
Highway Segment	Rear-end Collision	0.04	1.4	0.10	3.3	0.14	4.6
Highway Segment	Sideswipe, Same Direction Collision	0.01	0.3	0.04	1.3	0.05	1.6
Highway Segment	Total Multiple Vehicle Crashes	0.06	1.8	0.14	4.7	0.20	6.5
Highway Segment	Total Highway Segment Crashes	1.40	45.8	1.65	54.2	3.05	100.0
	Total Crashes	1.40	45.8	1.65	54.2	3.05	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1001+25.000	for segment #1 (1000+00.000 to 1001+25.000), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1001+25.000	for segment #1 (1000+00.000 to 1001+25.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+25.000	1001+59.000	for segment #2 (1001+25.000 to 1001+59.000), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+25.000	1001+59.000	for segment #2 (1001+25.000 to 1001+59.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+59.000	1002+26.000	for segment #3 (1001+59.000 to 1002+26.000), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+59.000	1002+26.000	for segment #3 (1001+59.000 to 1002+26.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+26.000	1002+93.000	for segment #4 (1002+26.000 to 1002+93.000), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+26.000	1002+93.000	for segment #4 (1002+26.000 to 1002+93.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+93.000	1003+60.000	for segment #5 (1002+93.000 to 1003+60.000), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+93.000	1003+60.000	for segment #5 (1002+93.000 to 1003+60.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+60.000	1004+58.000	for segment #6 (1003+60.000 to 1004+58.000), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+60.000	1004+58.000	for segment #6 (1003+60.000 to 1004+58.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+58.000	1005+88.000	for segment #7 (1004+58.000 to 1005+88.000), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+58.000	1005+88.000	for segment #7 (1004+58.000 to 1005+88.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+88.000	1007+18.000	for segment #8 (1005+88.000 to 1007+18.000), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+88.000	1007+18.000	for segment #8 (1005+88.000 to 1007+18.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1007+18.000	1007+30.000	for segment #9 (1007+18.000 to 1007+30.000), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1007+18.000	1007+30.000	for segment #9 (1007+18.000 to 1007+30.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1007+30.000	1007+67.000	for segment #10 (1007+30.000 to 1007+67.000), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1007+30.000	1007+67.000	for segment #10 (1007+30.000 to 1007+67.000), Left shoulder width (0.25 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1007+67.000	1008+41.000	for segment #11 (1007+67.000 to 1008+41.000), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1007+67.000	1008+41.000	for segment #11 (1007+67.000 to 1008+41.000), Left shoulder width (1.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1008+41.000	1008+48.000	for segment #12 (1008+41.000 to 1008+48.000), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1008+41.000	1008+48.000	for segment #12 (1008+41.000 to 1008+48.000), Left shoulder width (1.55 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1008+48.000	1009+15.000	for segment #13 (1008+48.000 to 1009+15.000), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1009+15.000	1009+78.000	for segment #14 (1009+15.000 to 1009+78.000), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1009+78.000	1009+88.000	for segment #15 (1009+78.000 to 1009+88.000), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1009+88.000	1010+62.000	for segment #16 (1009+88.000 to 1010+62.000), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1010+62.000	1011+08.000	for segment #17 (1010+62.000 to 1011+08.000), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1011+08.000	1011+36.000	for segment #18 (1011+08.000 to 1011+36.000), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1011+36.000	1011+72.000	for segment #19 (1011+36.000 to 1011+72.000), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1011+72.000	1022+06.001	for segment #20 (1011+72.000 to 1022+06.001), The ramp type for Ramp Alignment RGPNBX2900 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:30 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:30:02 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBXKNG0
Highway Comment: Imported from RGPNBXKNG0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:29:52 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1004+36.175
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1004+36.175
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

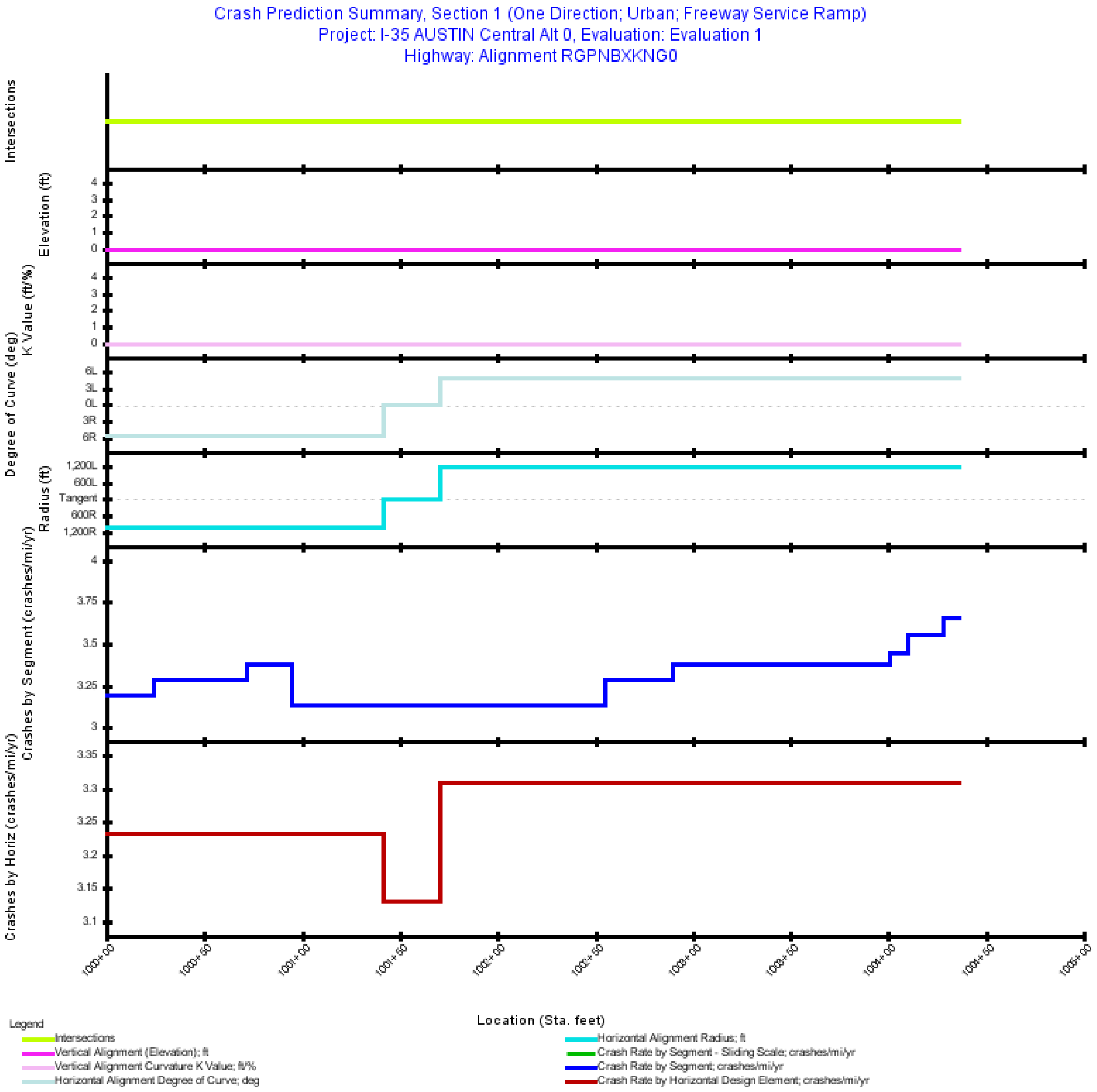

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1000+24.000	24.00	0.0045	2030: 9,500
2	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+24.000	1000+72.000	48.00	0.0091	2030: 9,500
3	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+72.000	1000+95.000	23.00	0.0044	2030: 9,500
4	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+95.000	1002+55.000	160.00	0.0303	2030: 9,500
5	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+55.000	1002+90.000	35.00	0.0066	2030: 9,500
6	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+90.000	1004+01.000	111.00	0.0210	2030: 9,500
7	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+01.000	1004+10.000	9.00	0.0017	2030: 9,500
8	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+10.000	1004+28.000	18.00	0.0034	2030: 9,500
9	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+28.000	1004+36.175	8.18	0.0015	2030: 9,500

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0826**
Average Future Road AADT (vpd)	**9,500**
Predicted Crashes	
Total Crashes	**0.27**
Fatal and Injury Crashes	**0.13**
Property-Damage-Only Crashes	**0.14**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**3.2727**
FI Crash Rate (crashes/mi/yr)	**1.5767**
PDO Crash Rate (crashes/mi/yr)	**1.6960**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.29**
Travel Crash Rate (crashes/million veh-mi)	**0.94**
Travel FI Crash Rate (crashes/million veh-mi)	**0.46**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.49**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+24.000	0.0045	0.015	0.0145	0.0067	0.0078	3.1884	0.92
2	1000+24.000	1000+72.000	0.0091	0.030	0.0299	0.0140	0.0159	3.2839	0.95
3	1000+72.000	1000+95.000	0.0044	0.015	0.0147	0.0070	0.0078	3.3812	0.97
4	1000+95.000	1002+55.000	0.0303	0.095	0.0948	0.0455	0.0493	3.1297	0.90
5	1002+55.000	1002+90.000	0.0066	0.022	0.0217	0.0105	0.0112	3.2811	0.95
6	1002+90.000	1004+01.000	0.0210	0.071	0.0710	0.0348	0.0362	3.3789	0.97
7	1004+01.000	1004+10.000	0.0017	0.006	0.0059	0.0029	0.0030	3.4464	0.99
8	1004+10.000	1004+28.000	0.0034	0.012	0.0121	0.0060	0.0061	3.5533	1.02
9	1004+28.000	1004+36.175	0.0015	0.006	0.0057	0.0029	0.0028	3.6605	1.06
Total			0.0826	0.270	0.2704	0.1303	0.1401	3.2727	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+41.914	0.0269	0.087	0.0869	0.0410	0.0459	3.2325	0.93
Tangent	1001+41.914	1001+70.626	0.0054	0.017	0.0170	0.0082	0.0089	3.1297	0.90
Simple Curve 2	1001+70.626	1004+36.175	0.0503	0.167	0.1665	0.0811	0.0853	3.3096	0.95

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.27	0.13	48.178	0.14	51.822
Total	0.27	0.13	48.178	0.14	51.822
Average	0.27	0.13	48.178	0.14	51.822

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0002	0.0006	0.0026	0.0032	0.0078
2	0.0004	0.0013	0.0055	0.0067	0.0159
3	0.0002	0.0007	0.0027	0.0033	0.0078
4	0.0014	0.0043	0.0179	0.0219	0.0493
5	0.0003	0.0010	0.0041	0.0051	0.0112
6	0.0011	0.0033	0.0137	0.0167	0.0362
7	0.0001	0.0003	0.0011	0.0014	0.0030
8	0.0002	0.0006	0.0024	0.0029	0.0061
9	0.0001	0.0003	0.0011	0.0014	0.0028
Total	0.0041	0.0123	0.0513	0.0626	0.1401

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.00	1.0	0.00	1.2
Highway Segment	Collision with Fixed Object	0.09	33.5	0.09	33.8	0.18	67.3
Highway Segment	Collision with Other Object	0.01	2.4	0.02	6.6	0.02	8.9
Highway Segment	Other Single-vehicle Collision	0.03	9.7	0.01	5.1	0.04	14.7
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.8	0.00	1.5
Highway Segment	Total Single Vehicle Crashes	0.12	46.4	0.13	47.2	0.25	93.6
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Rear-end Collision	0.00	1.3	0.01	3.2	0.01	4.5
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.3	0.00	1.2	0.00	1.5
Highway Segment	Total Multiple Vehicle Crashes	0.01	1.8	0.01	4.6	0.02	6.4
Highway Segment	Total Highway Segment Crashes	0.13	48.2	0.14	51.8	0.27	100.0
	Total Crashes	0.13	48.2	0.14	51.8	0.27	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+24.000	for segment #1 (1000+00.000 to 1000+24.000), The ramp type for Ramp Alignment RGPNBXKNG0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+24.000	1000+72.000	for segment #2 (1000+24.000 to 1000+72.000), The ramp type for Ramp Alignment RGPNBXKNG0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+72.000	1000+95.000	for segment #3 (1000+72.000 to 1000+95.000), The ramp type for Ramp Alignment RGPNBXKNG0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+95.000	1002+55.000	for segment #4 (1000+95.000 to 1002+55.000), The ramp type for Ramp Alignment RGPNBXKNG0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+55.000	1002+90.000	for segment #5 (1002+55.000 to 1002+90.000), The ramp type for Ramp Alignment RGPNBXKNG0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+90.000	1004+01.000	for segment #6 (1002+90.000 to 1004+01.000), The ramp type for Ramp Alignment RGPNBXKNG0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+01.000	1004+10.000	for segment #7 (1004+01.000 to 1004+10.000), The ramp type for Ramp Alignment RGPNBXKNG0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+10.000	1004+28.000	for segment #8 (1004+10.000 to 1004+28.000), The ramp type for Ramp Alignment RGPNBXKNG0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+28.000	1004+36.175	for segment #9 (1004+28.000 to 1004+36.175), The ramp type for Ramp Alignment RGPNBXKNG0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

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Evaluation Date: Thu May 27 13:20:22 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBNAIR0
Highway Comment: Imported from RGPNBNAIR0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:20:11 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1004+39.705
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1004+39.705
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

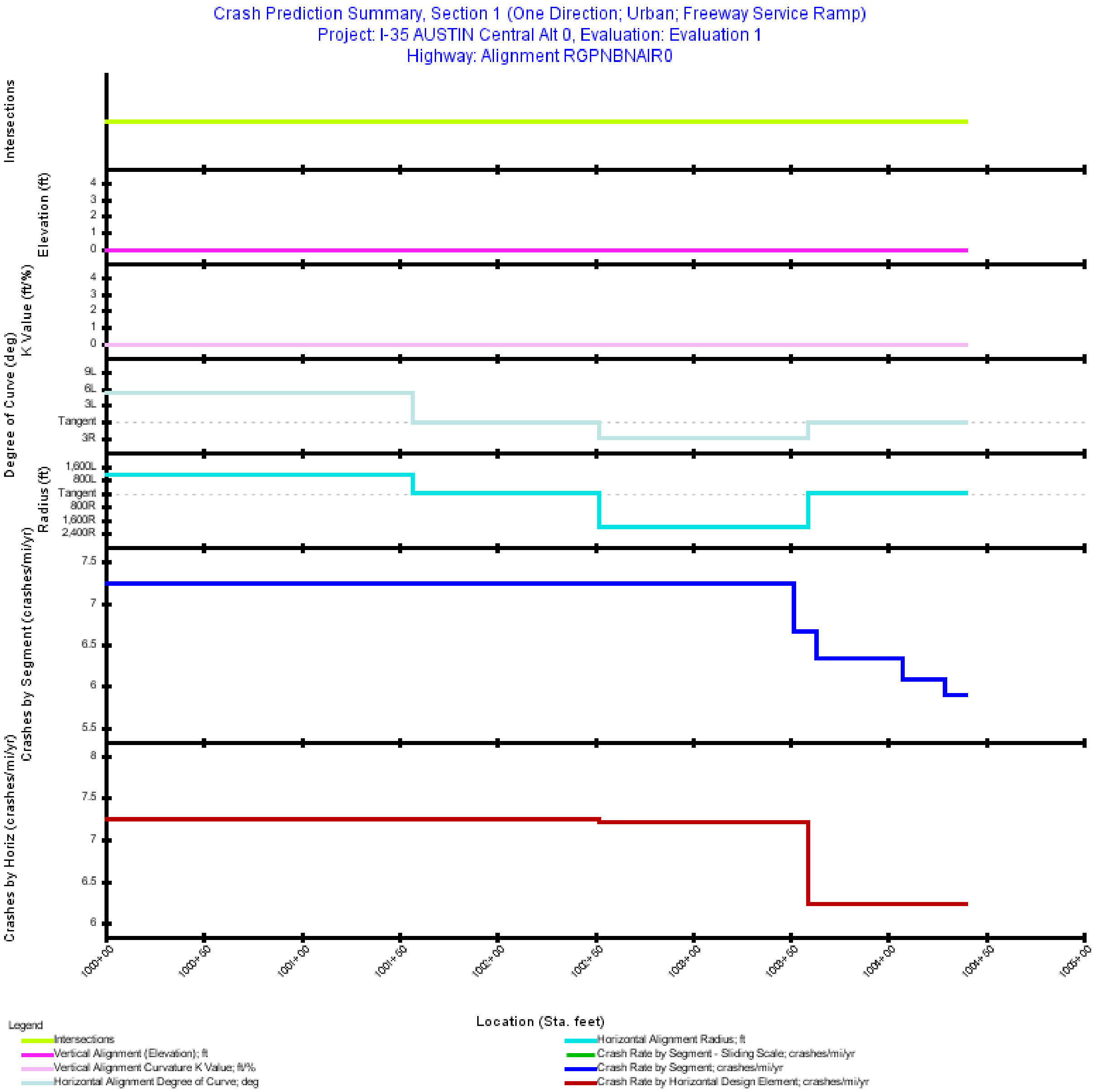

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1003+52.000	352.00	0.0667	2030: 21,350
2	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+52.000	1003+63.000	11.00	0.0021	2030: 21,350
3	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+63.000	1003+85.000	22.00	0.0042	2030: 21,350
4	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+85.000	1004+07.000	22.00	0.0042	2030: 21,350
5	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1004+07.000	1004+29.000	22.00	0.0042	2030: 21,350
6	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1004+29.000	1004+39.705	10.71	0.0020	2030: 21,350

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0833**
Average Future Road AADT (vpd)	**21,350**
Predicted Crashes	
Total Crashes	**0.59**
Fatal and Injury Crashes	**0.30**
Property-Damage-Only Crashes	**0.29**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**51**
Percent Property-Damage-Only Crashes (%)	**49**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**7.0475**
FI Crash Rate (crashes/mi/yr)	**3.5876**
PDO Crash Rate (crashes/mi/yr)	**3.4599**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.65**
Travel Crash Rate (crashes/million veh-mi)	**0.90**
Travel FI Crash Rate (crashes/million veh-mi)	**0.46**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.44**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1003+52.000	0.0667	0.483	0.4829	0.2458	0.2371	7.2440	0.93
2	1003+52.000	1003+63.000	0.0021	0.014	0.0139	0.0071	0.0068	6.6579	0.85
3	1003+63.000	1003+85.000	0.0042	0.026	0.0264	0.0135	0.0129	6.3344	0.81
4	1003+85.000	1004+07.000	0.0042	0.026	0.0264	0.0135	0.0129	6.3327	0.81
5	1004+07.000	1004+29.000	0.0042	0.025	0.0253	0.0128	0.0125	6.0826	0.78
6	1004+29.000	1004+39.705	0.0020	0.012	0.0120	0.0060	0.0060	5.9039	0.76
Total			0.0833	0.587	0.5869	0.2988	0.2881	7.0475	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+56.851	0.0297	0.215	0.2152	0.1095	0.1057	7.2440	0.93
Tangent	1001+56.851	1002+52.107	0.0180	0.131	0.1307	0.0665	0.0642	7.2440	0.93
Simple Curve 2	1002+52.107	1003+58.873	0.0202	0.146	0.1457	0.0742	0.0715	7.2063	0.93
Tangent	1003+58.873	1004+39.705	0.0153	0.095	0.0953	0.0485	0.0468	6.2249	0.80

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.59	0.30	50.907	0.29	49.093
Total	0.59	0.30	50.907	0.29	49.093
Average	0.59	0.30	50.907	0.29	49.093

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0052	0.0159	0.1012	0.1235	0.2371
2	0.0002	0.0005	0.0029	0.0036	0.0068
3	0.0003	0.0009	0.0056	0.0068	0.0129
4	0.0003	0.0009	0.0056	0.0068	0.0129
5	0.0003	0.0008	0.0053	0.0064	0.0125
6	0.0001	0.0004	0.0025	0.0030	0.0060
Total	0.0064	0.0193	0.1230	0.1501	0.2881

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.00	0.7	0.01	0.8
Highway Segment	Collision with Fixed Object	0.15	24.8	0.13	21.9	0.27	46.7
Highway Segment	Collision with Other Object	0.01	1.8	0.03	4.3	0.04	6.0
Highway Segment	Other Single-vehicle Collision	0.04	7.1	0.02	3.3	0.06	10.4
Highway Segment	Collision with Parked Vehicle	0.00	0.5	0.00	0.5	0.01	1.0
Highway Segment	Total Single Vehicle Crashes	0.20	34.3	0.18	30.6	0.38	65.0
Highway Segment	Right-Angle Collision	0.00	0.5	0.00	0.3	0.01	0.8
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.2
Highway Segment	Other Multi-vehicle Collision	0.00	0.5	0.00	0.4	0.01	1.0
Highway Segment	Rear-end Collision	0.07	12.4	0.07	12.7	0.15	25.2
Highway Segment	Sideswipe, Same Direction Collision	0.02	3.0	0.03	4.9	0.05	7.9
Highway Segment	Total Multiple Vehicle Crashes	0.10	16.6	0.11	18.4	0.20	35.0
Highway Segment	Total Highway Segment Crashes	0.30	50.9	0.29	49.1	0.59	100.0
	Total Crashes	0.30	50.9	0.29	49.1	0.59	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1003+52.000	for segment #1 (1000+00.000 to 1003+52.000), The ramp type for Ramp Alignment RGPNBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1003+52.000	for segment #1 (1000+00.000 to 1003+52.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1003+52.000	for segment #1 (1000+00.000 to 1003+52.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+52.000	1003+63.000	for segment #2 (1003+52.000 to 1003+63.000), The ramp type for Ramp Alignment RGPNBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+52.000	1003+63.000	for segment #2 (1003+52.000 to 1003+63.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+52.000	1003+63.000	for segment #2 (1003+52.000 to 1003+63.000), Right shoulder width (0.25 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+63.000	1003+85.000	for segment #3 (1003+63.000 to 1003+85.000), The ramp type for Ramp Alignment RGPNBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+63.000	1003+85.000	for segment #3 (1003+63.000 to 1003+85.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+63.000	1003+85.000	for segment #3 (1003+63.000 to 1003+85.000), Right shoulder width (1.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+85.000	1004+07.000	for segment #4 (1003+85.000 to 1004+07.000), The ramp type for Ramp Alignment RGPNBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+85.000	1004+07.000	for segment #4 (1003+85.000 to 1004+07.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+07.000	1004+29.000	for segment #5 (1004+07.000 to 1004+29.000), The ramp type for Ramp Alignment RGPNBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1004+07.000	1004+29.000	for segment #5 (1004+07.000 to 1004+29.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+29.000	1004+39.705	for segment #6 (1004+29.000 to 1004+39.705), The ramp type for Ramp Alignment RGPNBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1004+29.000	1004+39.705	for segment #6 (1004+29.000 to 1004+39.705), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1003+52.000	for segment #1 (1000+00.000 to 1003+52.000), traffic volume (21,350 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1003+52.000	1003+63.000	for segment #2 (1003+52.000 to 1003+63.000), traffic volume (21,350 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1003+63.000	1003+85.000	for segment #3 (1003+63.000 to 1003+85.000), traffic volume (21,350 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1003+85.000	1004+07.000	for segment #4 (1003+85.000 to 1004+07.000), traffic volume (21,350 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
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IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBX510
Highway Comment: Imported from RGPNBX510.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:26:25 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+33.535
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
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Empirical-Bayes Analysis: None
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Freeway Ramp Evaluation

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Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+33.535
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

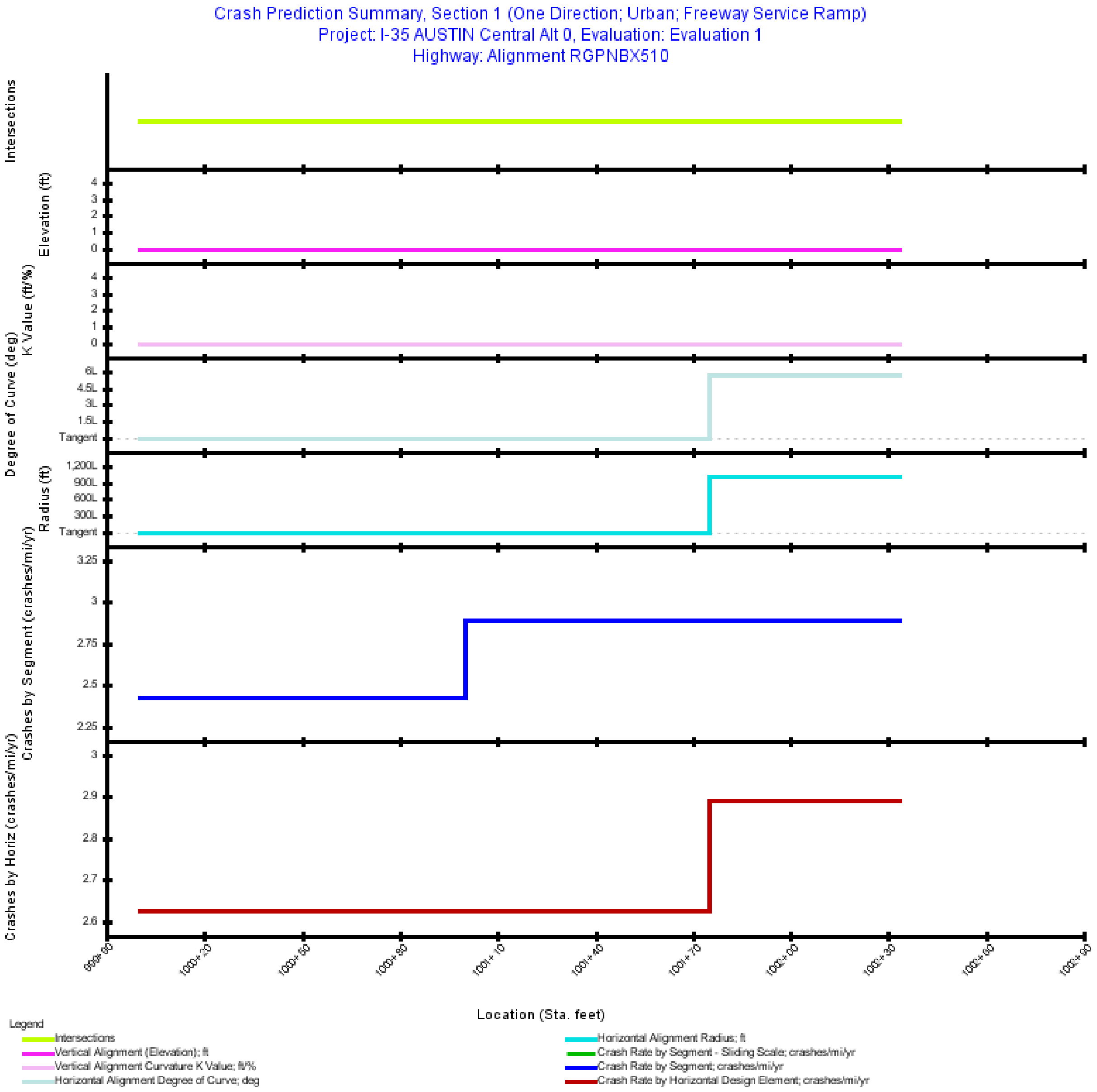

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

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Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1000+73.000	73.00	0.0138	2030: 7,100
2	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+73.000	1000+82.000	9.00	0.0017	2030: 7,100
3	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+82.000	1001+00.000	18.00	0.0034	2030: 7,100
4	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+00.000	1002+33.535	133.53	0.0253	2030: 7,100

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0442**
Average Future Road AADT (vpd)	**7,100**
Predicted Crashes	
Total Crashes	**0.12**
Fatal and Injury Crashes	**0.06**
Property-Damage-Only Crashes	**0.06**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**52**
Percent Property-Damage-Only Crashes (%)	**48**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**2.6911**
FI Crash Rate (crashes/mi/yr)	**1.3865**
PDO Crash Rate (crashes/mi/yr)	**1.3045**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.11**
Travel Crash Rate (crashes/million veh-mi)	**1.04**
Travel FI Crash Rate (crashes/million veh-mi)	**0.54**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.50**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+73.000	0.0138	0.034	0.0335	0.0175	0.0161	2.4263	0.94
2	1000+73.000	1000+82.000	0.0017	0.004	0.0041	0.0022	0.0020	2.4263	0.94
3	1000+82.000	1001+00.000	0.0034	0.008	0.0083	0.0043	0.0040	2.4263	0.94
4	1001+00.000	1002+33.535	0.0253	0.073	0.0731	0.0374	0.0357	2.8893	1.11
Total			0.0442	0.119	0.1190	0.0613	0.0577	2.6911	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1001+74.916	0.0331	0.087	0.0869	0.0449	0.0420	2.6246	1.01
Simple Curve 1	1001+74.916	1002+33.535	0.0111	0.032	0.0321	0.0164	0.0157	2.8893	1.11

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.12	0.06	51.523	0.06	48.477
Total	0.12	0.06	51.523	0.06	48.477
Average	0.12	0.06	51.523	0.06	48.477

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0005	0.0017	0.0069	0.0084	0.0161
2	0.0001	0.0002	0.0008	0.0010	0.0020
3	0.0001	0.0004	0.0017	0.0021	0.0040
4	0.0012	0.0035	0.0147	0.0180	0.0357
Total	0.0019	0.0058	0.0241	0.0295	0.0577

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.00	1.0	0.00	1.2
Highway Segment	Collision with Fixed Object	0.04	35.8	0.04	31.6	0.08	67.5
Highway Segment	Collision with Other Object	0.00	2.5	0.01	6.1	0.01	8.7
Highway Segment	Other Single-vehicle Collision	0.01	10.3	0.01	4.7	0.02	15.1
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.7	0.00	1.5
Highway Segment	Total Single Vehicle Crashes	0.06	49.6	0.05	44.2	0.11	93.8
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Rear-end Collision	0.00	1.4	0.00	3.0	0.01	4.4
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.3	0.00	1.1	0.00	1.5
Highway Segment	Total Multiple Vehicle Crashes	0.00	1.9	0.01	4.3	0.01	6.2
Highway Segment	Total Highway Segment Crashes	0.06	51.5	0.06	48.5	0.12	100.0
	Total Crashes	0.06	51.5	0.06	48.5	0.12	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+73.000	for segment #1 (1000+00.000 to 1000+73.000), The ramp type for Ramp Alignment RGPNBX510 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1000+73.000	for segment #1 (1000+00.000 to 1000+73.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1000+73.000	for segment #1 (1000+00.000 to 1000+73.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+73.000	1000+82.000	for segment #2 (1000+73.000 to 1000+82.000), The ramp type for Ramp Alignment RGPNBX510 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+73.000	1000+82.000	for segment #2 (1000+73.000 to 1000+82.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+73.000	1000+82.000	for segment #2 (1000+73.000 to 1000+82.000), Right shoulder width (0.25 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+82.000	1001+00.000	for segment #3 (1000+82.000 to 1001+00.000), The ramp type for Ramp Alignment RGPNBX510 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+82.000	1001+00.000	for segment #3 (1000+82.000 to 1001+00.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+82.000	1001+00.000	for segment #3 (1000+82.000 to 1001+00.000), Right shoulder width (1.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+00.000	1002+33.535	for segment #4 (1001+00.000 to 1002+33.535), The ramp type for Ramp Alignment RGPNBX510 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+00.000	1002+33.535	for segment #4 (1001+00.000 to 1002+33.535), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+00.000	1002+33.535	for segment #4 (1001+00.000 to 1002+33.535), Right shoulder width (1.75 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:26 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:25:55 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBX410
Highway Comment: Imported from RGPNBX410.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:25:44 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+04.872
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+04.872
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

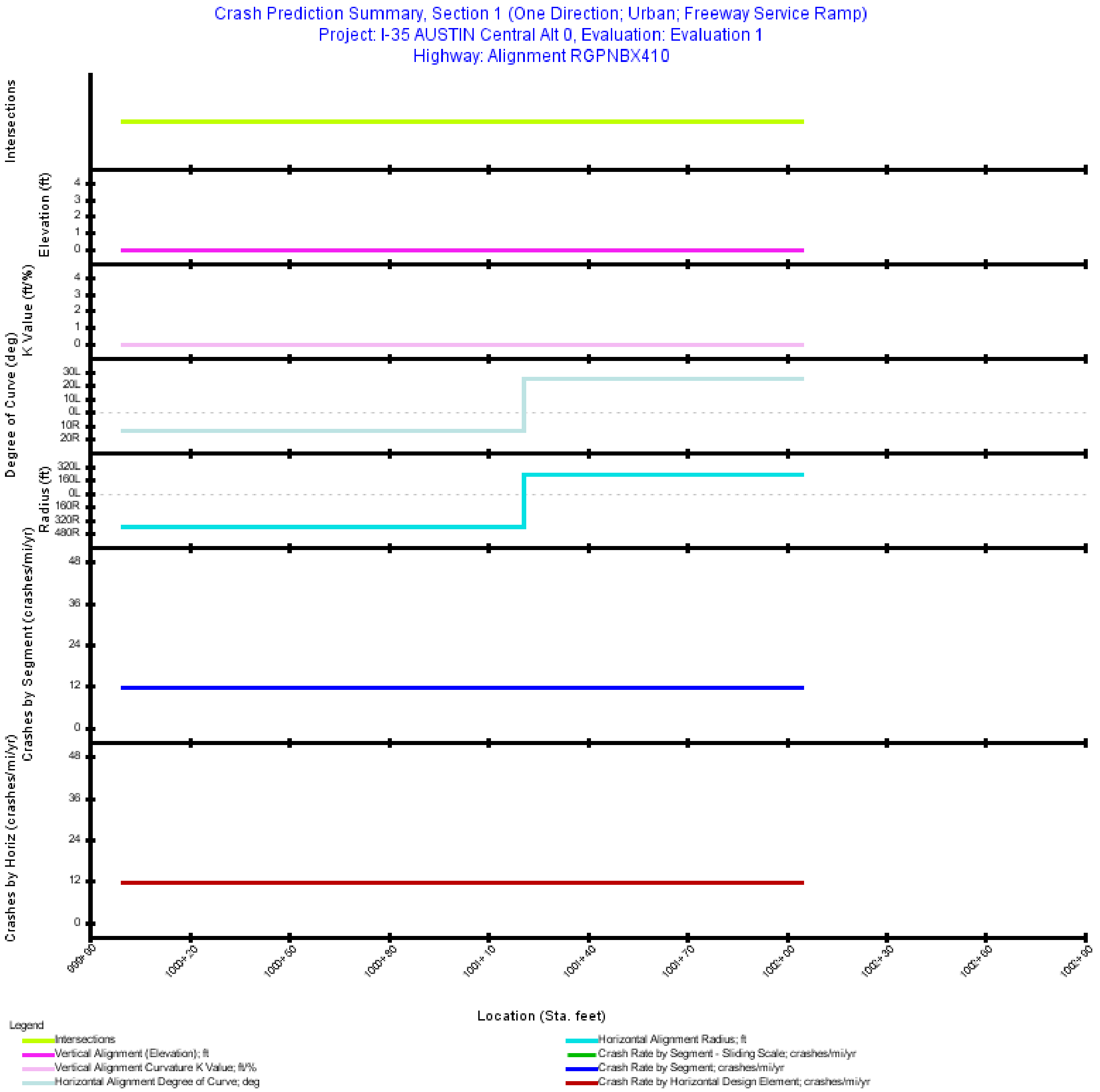

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1002+04.872	204.87	0.0388	2030: 4,100

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0388**
Average Future Road AADT (vpd)	**4,100**
Predicted Crashes	
Total Crashes	**0.44**
Fatal and Injury Crashes	**0.21**
Property-Damage-Only Crashes	**0.23**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**11.4221**
FI Crash Rate (crashes/mi/yr)	**5.4623**
PDO Crash Rate (crashes/mi/yr)	**5.9597**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.06**
Travel Crash Rate (crashes/million veh-mi)	**7.63**
Travel FI Crash Rate (crashes/million veh-mi)	**3.65**
Travel PDO Crash Rate (crashes/million veh-mi)	**3.98**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1002+04.872	0.0388	0.443	0.4432	0.2119	0.2312	11.4221	7.63
Total			0.0388	0.443	0.4432	0.2119	0.2312	11.4221	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+20.865	0.0229	0.262	0.2615	0.1250	0.1364	11.4221	7.63
Simple Curve 2	1001+20.865	1002+04.872	0.0159	0.182	0.1817	0.0869	0.0948	11.4221	7.63

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.44	0.21	47.823	0.23	52.177
Total	0.44	0.21	47.823	0.23	52.177
Average	0.44	0.21	47.823	0.23	52.177

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0062	0.0188	0.0790	0.1079	0.2312

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.1	0.01	1.3
Highway Segment	Collision with Fixed Object	0.15	34.0	0.16	36.5	0.31	70.5
Highway Segment	Collision with Other Object	0.01	2.4	0.03	7.1	0.04	9.5
Highway Segment	Other Single-vehicle Collision	0.04	9.8	0.02	5.5	0.07	15.2
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.8	0.01	1.5
Highway Segment	Total Single Vehicle Crashes	0.21	47.1	0.23	51.0	0.43	98.1
Highway Segment	Right-Angle Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.0	0.00	0.0	0.00	0.1
Highway Segment	Rear-end Collision	0.00	0.6	0.00	0.8	0.01	1.4
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.1	0.00	0.3	0.00	0.4
Highway Segment	Total Multiple Vehicle Crashes	0.00	0.8	0.01	1.2	0.01	1.9
Highway Segment	Total Highway Segment Crashes	0.21	47.8	0.23	52.2	0.44	100.0
	Total Crashes	0.21	47.8	0.23	52.2	0.44	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1002+04.872	for segment #1 (1000+00.000 to 1002+04.872), The ramp type for Ramp Alignment RGPNBX410 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1002+04.872	for segment #1 (1000+00.000 to 1002+04.872), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1002+04.872	for segment #1 (1000+00.000 to 1002+04.872), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:22 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:21:45 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBNDK0
Highway Comment: Imported from RGPNBNDK0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:21:34 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+05.265
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+05.265
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

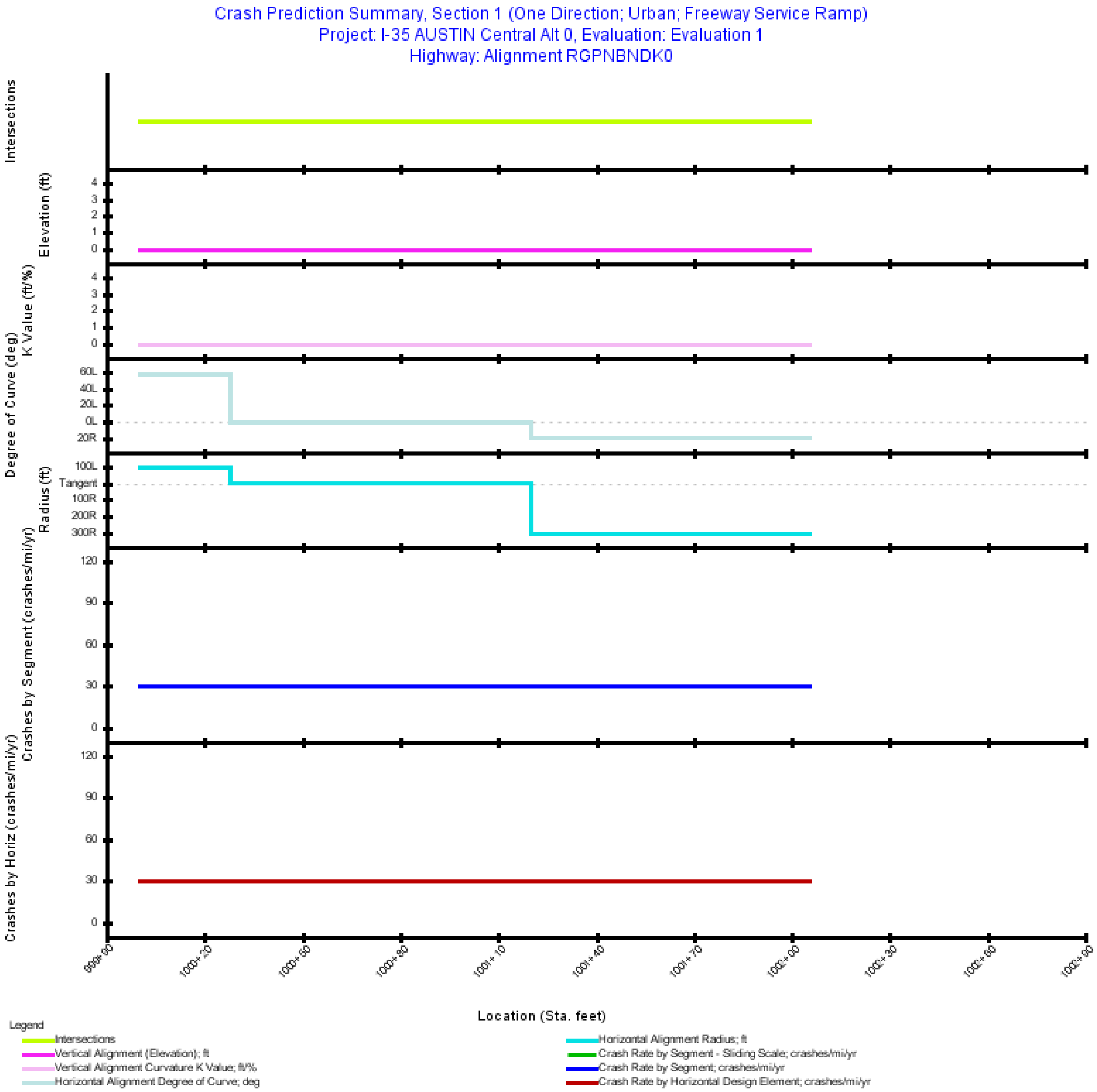

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1002+05.265	205.27	0.0389	2030: 11,000

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0389**
Average Future Road AADT (vpd)	**11,000**
Predicted Crashes	
Total Crashes	**1.16**
Fatal and Injury Crashes	**0.53**
Property-Damage-Only Crashes	**0.63**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**46**
Percent Property-Damage-Only Crashes (%)	**54**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**29.8785**
FI Crash Rate (crashes/mi/yr)	**13.6029**
PDO Crash Rate (crashes/mi/yr)	**16.2757**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.16**
Travel Crash Rate (crashes/million veh-mi)	**7.44**
Travel FI Crash Rate (crashes/million veh-mi)	**3.39**
Travel PDO Crash Rate (crashes/million veh-mi)	**4.05**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1002+05.265	0.0389	1.162	1.1616	0.5288	0.6327	29.8785	7.44
Total			0.0389	1.162	1.1616	0.5288	0.6327	29.8785	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1000+27.823	0.0053	0.157	0.1574	0.0717	0.0858	29.8785	7.44
Tangent	1000+27.823	1001+20.011	0.0175	0.522	0.5217	0.2375	0.2842	29.8785	7.44
Simple Curve 2	1001+20.011	1002+05.265	0.0161	0.482	0.4824	0.2196	0.2628	29.8785	7.44

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.16	0.53	45.527	0.63	54.473
Total	1.16	0.53	45.527	0.63	54.473
Average	1.16	0.53	45.527	0.63	54.473

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0103	0.0312	0.2022	0.2850	0.6327

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.1	0.01	1.2
Highway Segment	Collision with Fixed Object	0.34	29.4	0.41	34.8	0.75	64.2
Highway Segment	Collision with Other Object	0.02	2.1	0.08	6.8	0.10	8.8
Highway Segment	Other Single-vehicle Collision	0.10	8.5	0.06	5.2	0.16	13.7
Highway Segment	Collision with Parked Vehicle	0.01	0.6	0.01	0.8	0.02	1.4
Highway Segment	Total Single Vehicle Crashes	0.47	40.7	0.56	48.6	1.04	89.4
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.3
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.3
Highway Segment	Rear-end Collision	0.04	3.6	0.05	4.0	0.09	7.6
Highway Segment	Sideswipe, Same Direction Collision	0.01	0.9	0.02	1.6	0.03	2.4
Highway Segment	Total Multiple Vehicle Crashes	0.06	4.8	0.07	5.8	0.12	10.6
Highway Segment	Total Highway Segment Crashes	0.53	45.5	0.63	54.5	1.16	100.0
	Total Crashes	0.53	45.5	0.63	54.5	1.16	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1002+05.265	for segment #1 (1000+00.000 to 1002+05.265), The ramp type for Ramp Alignment RGPNBNDK0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1002+05.265	for segment #1 (1000+00.000 to 1002+05.265), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1002+05.265	for segment #1 (1000+00.000 to 1002+05.265), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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The use of the IHSDM software is being done strictly on a voluntary basis. In exchange for provision of IHSDM, the user agrees that the Federal Highway Administration (FHWA), U.S. Department of Transportation and any other agency of the Federal Government shall not be responsible for any errors, damage or other liability that may result from any and all use of the software, including installation and testing of the software. The user further agrees to hold the FHWA and the Federal Government harmless from any resulting liability. The user agrees that this hold harmless provision shall flow to any person to whom or any entity to which the user provides the IHSDM software. It is the user's full responsibility to inform any person to whom or any entity to which it provides the IHSDM software of this hold harmless provision.

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Report Overview

Report Generated: May 27, 2021 1:28 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:28:40 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBXDK0
Highway Comment: Imported from RGPNBXDK0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:28:30 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1001+70.514
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1001+70.514
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

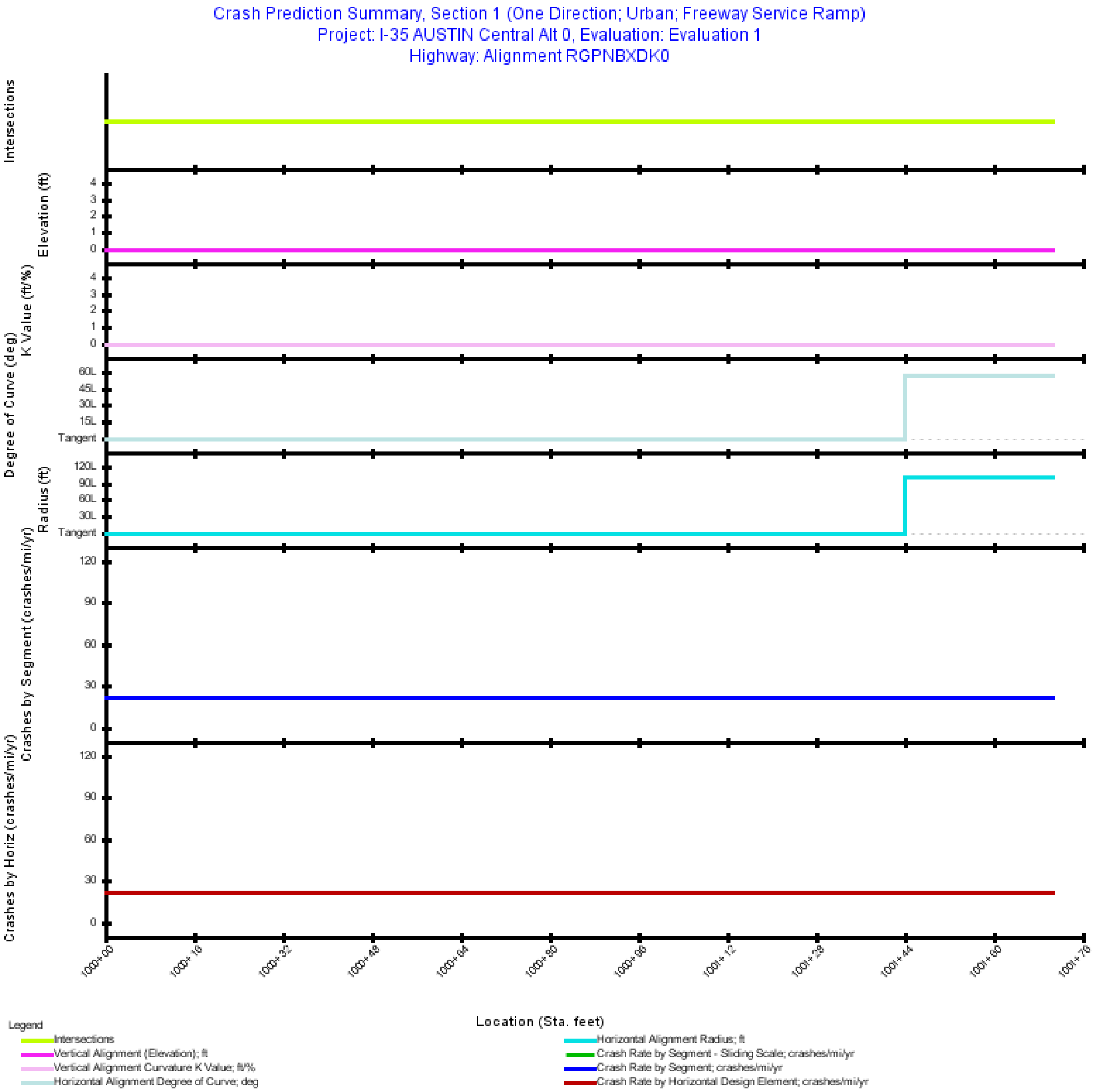

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1001+70.514	170.51	0.0323	2030: 7,400

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0323**
Average Future Road AADT (vpd)	**7,400**
Predicted Crashes	
Total Crashes	**0.70**
Fatal and Injury Crashes	**0.32**
Property-Damage-Only Crashes	**0.38**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**46**
Percent Property-Damage-Only Crashes (%)	**54**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**21.6587**
FI Crash Rate (crashes/mi/yr)	**9.8744**
PDO Crash Rate (crashes/mi/yr)	**11.7843**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.09**
Travel Crash Rate (crashes/million veh-mi)	**8.02**
Travel FI Crash Rate (crashes/million veh-mi)	**3.66**
Travel PDO Crash Rate (crashes/million veh-mi)	**4.36**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1001+70.514	0.0323	0.700	0.6995	0.3189	0.3806	21.6587	8.02
Total			0.0323	0.700	0.6995	0.3189	0.3806	21.6587	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1001+43.903	0.0273	0.590	0.5903	0.2691	0.3212	21.6587	8.02
Simple Curve 1	1001+43.903	1001+70.514	0.0050	0.109	0.1092	0.0498	0.0594	21.6587	8.02

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.70	0.32	45.591	0.38	54.409
Total	0.70	0.32	45.591	0.38	54.409
Average	0.70	0.32	45.591	0.38	54.409

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0093	0.0283	0.1191	0.1622	0.3806

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.2	0.01	1.3
Highway Segment	Collision with Fixed Object	0.23	32.4	0.27	37.9	0.49	70.2
Highway Segment	Collision with Other Object	0.02	2.3	0.05	7.3	0.07	9.6
Highway Segment	Other Single-vehicle Collision	0.07	9.3	0.04	5.7	0.10	15.0
Highway Segment	Collision with Parked Vehicle	0.01	0.7	0.01	0.8	0.01	1.5
Highway Segment	Total Single Vehicle Crashes	0.31	44.8	0.37	52.9	0.68	97.7
Highway Segment	Right-Angle Collision	0.00	0.0	0.00	0.0	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.0	0.00	0.0	0.00	0.1
Highway Segment	Rear-end Collision	0.00	0.6	0.01	1.1	0.01	1.6
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.1	0.00	0.4	0.00	0.5
Highway Segment	Total Multiple Vehicle Crashes	0.01	0.8	0.01	1.5	0.02	2.3
Highway Segment	Total Highway Segment Crashes	0.32	45.6	0.38	54.4	0.70	100.0
	Total Crashes	0.32	45.6	0.38	54.4	0.70	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1001+70.514	for segment #1 (1000+00.000 to 1001+70.514), The ramp type for Ramp Alignment RGPNBXDK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1001+70.514	for segment #1 (1000+00.000 to 1001+70.514), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1001+70.514	for segment #1 (1000+00.000 to 1001+70.514), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

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Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:30:43 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBXMAN0
Highway Comment: Imported from RGPNBXMAN0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:30:33 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+73.820
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+73.820
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

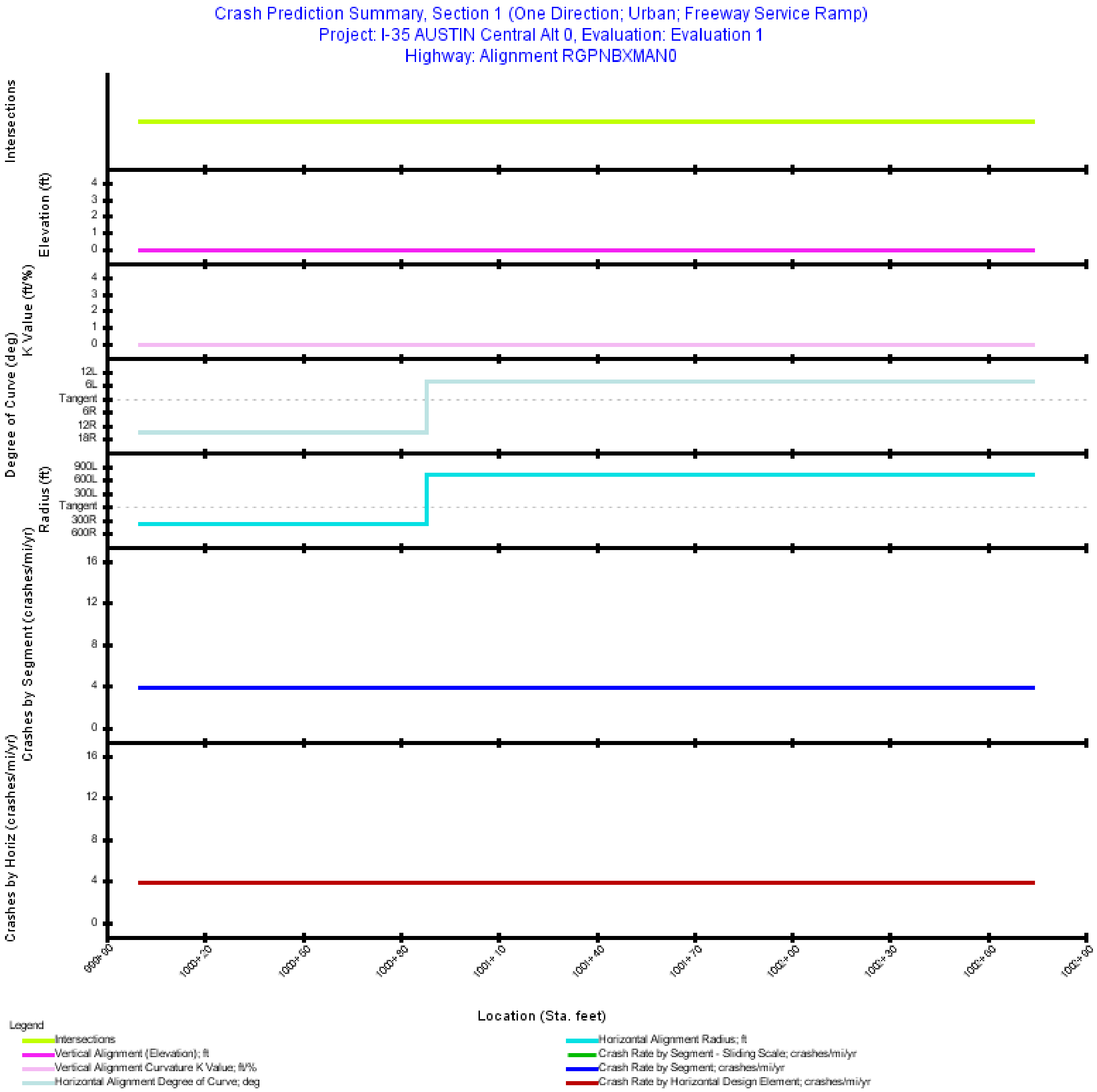

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1002+73.820	273.82	0.0519	2030: 2,500

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0519**
Average Future Road AADT (vpd)	**2,500**
Predicted Crashes	
Total Crashes	**0.20**
Fatal and Injury Crashes	**0.10**
Property-Damage-Only Crashes	**0.10**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**49**
Percent Property-Damage-Only Crashes (%)	**51**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**3.8886**
FI Crash Rate (crashes/mi/yr)	**1.9159**
PDO Crash Rate (crashes/mi/yr)	**1.9727**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.05**
Travel Crash Rate (crashes/million veh-mi)	**4.26**
Travel FI Crash Rate (crashes/million veh-mi)	**2.10**
Travel PDO Crash Rate (crashes/million veh-mi)	**2.16**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1002+73.820	0.0519	0.202	0.2017	0.0994	0.1023	3.8886	4.26
Total			0.0519	0.202	0.2017	0.0994	0.1023	3.8886	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1000+88.011	0.0167	0.065	0.0648	0.0319	0.0329	3.8886	4.26
Simple Curve 2	1000+88.011	1002+73.820	0.0352	0.137	0.1368	0.0674	0.0694	3.8886	4.26

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.20	0.10	49.269	0.10	50.731
Total	0.20	0.10	49.269	0.10	50.731
Average	0.20	0.10	49.269	0.10	50.731

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0027	0.0082	0.0351	0.0534	0.1023

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.00	1.1	0.00	1.3
Highway Segment	Collision with Fixed Object	0.07	34.8	0.07	35.3	0.14	70.2
Highway Segment	Collision with Other Object	0.01	2.5	0.01	6.9	0.02	9.3
Highway Segment	Other Single-vehicle Collision	0.02	10.0	0.01	5.3	0.03	15.3
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.8	0.00	1.5
Highway Segment	Total Single Vehicle Crashes	0.10	48.2	0.10	49.4	0.20	97.6
Highway Segment	Right-Angle Collision	0.00	0.0	0.00	0.0	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.0	0.00	0.0	0.00	0.1
Highway Segment	Rear-end Collision	0.00	0.8	0.00	0.9	0.00	1.7
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.2	0.00	0.4	0.00	0.6
Highway Segment	Total Multiple Vehicle Crashes	0.00	1.0	0.00	1.4	0.01	2.4
Highway Segment	Total Highway Segment Crashes	0.10	49.3	0.10	50.7	0.20	100.0
	Total Crashes	0.10	49.3	0.10	50.7	0.20	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1002+73.820	for segment #1 (1000+00.000 to 1002+73.820), The ramp type for Ramp Alignment RGPNBXMAN0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1002+73.820	for segment #1 (1000+00.000 to 1002+73.820), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1002+73.820	for segment #1 (1000+00.000 to 1002+73.820), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:18 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:18:17 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBN120
Highway Comment: Imported from RGPNBN120.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:18:06 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1012+49.425
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1012+49.425
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

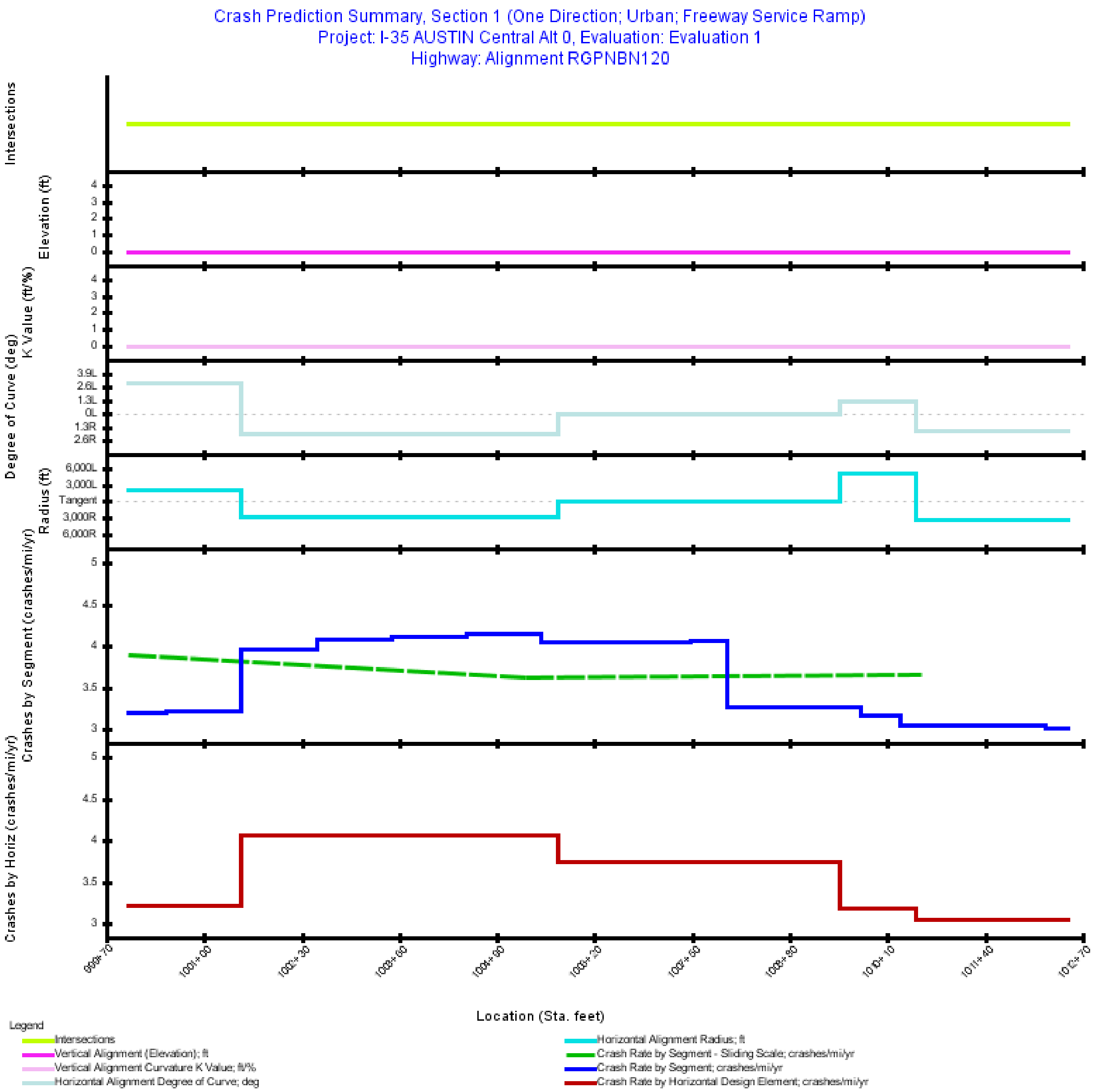

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1000+50.000	50.00	0.0095	2030: 10,500
2	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+50.000	1001+50.000	100.00	0.0189	2030: 10,500
3	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1001+50.000	1002+50.000	100.00	0.0189	2030: 10,500
4	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+50.000	1003+49.000	99.00	0.0187	2030: 10,500
5	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+49.000	1004+49.000	100.00	0.0189	2030: 10,500
6	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1004+49.000	1005+48.000	99.00	0.0187	2030: 10,500
7	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1005+48.000	1006+48.000	100.00	0.0189	2030: 10,500
8	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1006+48.000	1007+48.000	100.00	0.0189	2030: 10,500
9	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1007+48.000	1007+97.000	49.00	0.0093	2030: 10,500
10	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1007+97.000	1009+47.000	150.00	0.0284	2030: 10,500
11	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1009+47.000	1009+74.000	27.00	0.0051	2030: 10,500
12	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1009+74.000	1010+28.000	54.00	0.0102	2030: 10,500
13	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1010+28.000	1012+20.000	192.00	0.0364	2030: 10,500
14	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1012+20.000	1012+49.425	29.42	0.0056	2030: 10,500

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2366**
Average Future Road AADT (vpd)	**10,500**
Predicted Crashes	
Total Crashes	**0.86**
Fatal and Injury Crashes	**0.35**
Property-Damage-Only Crashes	**0.51**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**41**
Percent Property-Damage-Only Crashes (%)	**59**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**3.6249**
FI Crash Rate (crashes/mi/yr)	**1.4907**
PDO Crash Rate (crashes/mi/yr)	**2.1342**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.91**
Travel Crash Rate (crashes/million veh-mi)	**0.95**
Travel FI Crash Rate (crashes/million veh-mi)	**0.39**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.56**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+50.000	0.0095	0.030	0.0302	0.0113	0.0189	3.1925	0.83
2	1000+50.000	1001+50.000	0.0189	0.061	0.0608	0.0230	0.0378	3.2126	0.84
3	1001+50.000	1002+50.000	0.0189	0.075	0.0750	0.0292	0.0457	3.9578	1.03
4	1002+50.000	1003+49.000	0.0187	0.076	0.0763	0.0302	0.0461	4.0696	1.06
5	1003+49.000	1004+49.000	0.0189	0.078	0.0778	0.0312	0.0466	4.1068	1.07
6	1004+49.000	1005+48.000	0.0187	0.078	0.0777	0.0316	0.0461	4.1450	1.08
7	1005+48.000	1006+48.000	0.0189	0.076	0.0765	0.0316	0.0449	4.0390	1.05
8	1006+48.000	1007+48.000	0.0189	0.076	0.0764	0.0320	0.0444	4.0347	1.05
9	1007+48.000	1007+97.000	0.0093	0.038	0.0377	0.0160	0.0218	4.0639	1.06
10	1007+97.000	1009+47.000	0.0284	0.093	0.0926	0.0409	0.0517	3.2581	0.85
11	1009+47.000	1009+74.000	0.0051	0.017	0.0167	0.0073	0.0093	3.2608	0.85
12	1009+74.000	1010+28.000	0.0102	0.032	0.0324	0.0141	0.0183	3.1680	0.83
13	1010+28.000	1012+20.000	0.0364	0.111	0.1109	0.0473	0.0636	3.0492	0.80
14	1012+20.000	1012+49.425	0.0056	0.017	0.0168	0.0071	0.0097	3.0155	0.79
Total			0.2366	0.858	0.8578	0.3528	0.5050	3.6249	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+49.570	0.0283	0.091	0.0908	0.0342	0.0566	3.2059	0.84
Simple Curve 2	1001+49.570	1005+70.804	0.0798	0.325	0.3245	0.1295	0.1950	4.0671	1.06
Tangent	1005+70.804	1009+46.889	0.0712	0.266	0.2657	0.1132	0.1524	3.7298	0.97
Simple Curve 3	1009+46.889	1010+47.372	0.0190	0.060	0.0603	0.0262	0.0341	3.1701	0.83
Simple Curve 4	1010+47.372	1012+49.425	0.0383	0.117	0.1165	0.0496	0.0669	3.0443	0.79

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.86	0.35	41.124	0.51	58.876
Total	0.86	0.35	41.124	0.51	58.876
Average	0.86	0.35	41.124	0.51	58.876

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0002	0.0006	0.0042	0.0063	0.0189
2	0.0004	0.0013	0.0085	0.0128	0.0378
3	0.0005	0.0014	0.0096	0.0177	0.0457
4	0.0005	0.0015	0.0098	0.0184	0.0461
5	0.0005	0.0015	0.0101	0.0190	0.0466
6	0.0005	0.0015	0.0103	0.0193	0.0461
7	0.0005	0.0015	0.0103	0.0193	0.0449
8	0.0005	0.0016	0.0104	0.0195	0.0444
9	0.0003	0.0008	0.0052	0.0097	0.0218
10	0.0008	0.0023	0.0150	0.0228	0.0517
11	0.0001	0.0004	0.0027	0.0041	0.0093
12	0.0003	0.0008	0.0052	0.0078	0.0183
13	0.0009	0.0027	0.0174	0.0263	0.0636
14	0.0001	0.0004	0.0026	0.0039	0.0097
Total	0.0060	0.0183	0.1212	0.2072	0.5050

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.9	0.01	1.0
Highway Segment	Collision with Fixed Object	0.20	23.3	0.25	29.2	0.45	52.4
Highway Segment	Collision with Other Object	0.01	1.6	0.05	5.7	0.06	7.3
Highway Segment	Other Single-vehicle Collision	0.06	6.7	0.04	4.4	0.10	11.1
Highway Segment	Collision with Parked Vehicle	0.00	0.5	0.01	0.7	0.01	1.1
Highway Segment	Total Single Vehicle Crashes	0.28	32.2	0.35	40.7	0.63	72.9
Highway Segment	Right-Angle Collision	0.00	0.3	0.00	0.3	0.01	0.6
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.3	0.00	0.4	0.01	0.7
Highway Segment	Rear-end Collision	0.06	6.7	0.11	12.5	0.17	19.2
Highway Segment	Sideswipe, Same Direction Collision	0.01	1.6	0.04	4.8	0.06	6.4
Highway Segment	Total Multiple Vehicle Crashes	0.08	8.9	0.16	18.1	0.23	27.1
Highway Segment	Total Highway Segment Crashes	0.35	41.1	0.51	58.9	0.86	100.0
	Total Crashes	0.35	41.1	0.51	58.9	0.86	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+50.000	for segment #1 (1000+00.000 to 1000+50.000), The ramp type for Ramp Alignment RGPNBN120 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1000+50.000	for segment #1 (1000+00.000 to 1000+50.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+50.000	1001+50.000	for segment #2 (1000+50.000 to 1001+50.000), The ramp type for Ramp Alignment RGPNBN120 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+50.000	1001+50.000	for segment #2 (1000+50.000 to 1001+50.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+50.000	1002+50.000	for segment #3 (1001+50.000 to 1002+50.000), The ramp type for Ramp Alignment RGPNBN120 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1001+50.000	1002+50.000	for segment #3 (1001+50.000 to 1002+50.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+50.000	1003+49.000	for segment #4 (1002+50.000 to 1003+49.000), The ramp type for Ramp Alignment RGPNBN120 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+50.000	1003+49.000	for segment #4 (1002+50.000 to 1003+49.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+49.000	1004+49.000	for segment #5 (1003+49.000 to 1004+49.000), The ramp type for Ramp Alignment RGPNBN120 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+49.000	1004+49.000	for segment #5 (1003+49.000 to 1004+49.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+49.000	1005+48.000	for segment #6 (1004+49.000 to 1005+48.000), The ramp type for Ramp Alignment RGPNBN120 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1004+49.000	1005+48.000	for segment #6 (1004+49.000 to 1005+48.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+48.000	1006+48.000	for segment #7 (1005+48.000 to 1006+48.000), The ramp type for Ramp Alignment RGPNBN120 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1005+48.000	1006+48.000	for segment #7 (1005+48.000 to 1006+48.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1006+48.000	1007+48.000	for segment #8 (1006+48.000 to 1007+48.000), The ramp type for Ramp Alignment RGPNBN120 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1006+48.000	1007+48.000	for segment #8 (1006+48.000 to 1007+48.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1007+48.000	1007+97.000	for segment #9 (1007+48.000 to 1007+97.000), The ramp type for Ramp Alignment RGPNBN120 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1007+48.000	1007+97.000	for segment #9 (1007+48.000 to 1007+97.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1007+97.000	1009+47.000	for segment #10 (1007+97.000 to 1009+47.000), The ramp type for Ramp Alignment RGPNBN120 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1007+97.000	1009+47.000	for segment #10 (1007+97.000 to 1009+47.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1009+47.000	1009+74.000	for segment #11 (1009+47.000 to 1009+74.000), The ramp type for Ramp Alignment RGPNBN120 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1009+47.000	1009+74.000	for segment #11 (1009+47.000 to 1009+74.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1009+74.000	1010+28.000	for segment #12 (1009+74.000 to 1010+28.000), The ramp type for Ramp Alignment RGPNBN120 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1009+74.000	1010+28.000	for segment #12 (1009+74.000 to 1010+28.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1010+28.000	1012+20.000	for segment #13 (1010+28.000 to 1012+20.000), The ramp type for Ramp Alignment RGPNBN120 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1010+28.000	1012+20.000	for segment #13 (1010+28.000 to 1012+20.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1012+20.000	1012+49.425	for segment #14 (1012+20.000 to 1012+49.425), The ramp type for Ramp Alignment RGPNBN120 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1012+20.000	1012+49.425	for segment #14 (1012+20.000 to 1012+49.425), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:24 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:24:31 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBX150
Highway Comment: Imported from RGPNBX150.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:24:20 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1007+02.360
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1007+02.360
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

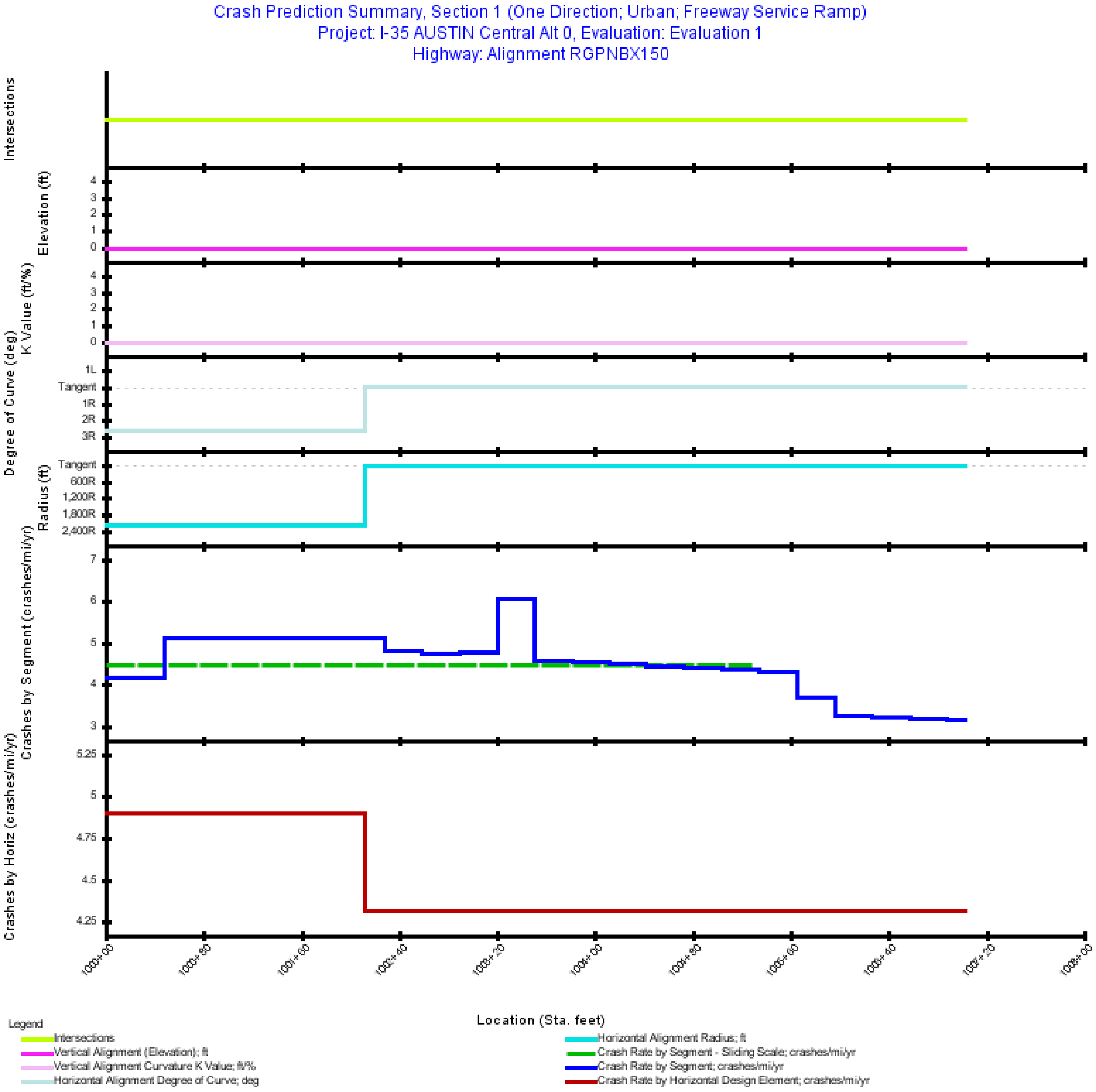

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1000+48.000	48.00	0.0091	2030: 13,350
2	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+48.000	1001+43.000	95.00	0.0180	2030: 13,350
3	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+43.000	1001+90.000	47.00	0.0089	2030: 13,350
4	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+90.000	1002+28.000	38.00	0.0072	2030: 13,350
5	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+28.000	1002+58.000	30.00	0.0057	2030: 13,350
6	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+58.000	1002+89.000	31.00	0.0059	2030: 13,350
7	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+89.000	1003+20.000	31.00	0.0059	2030: 13,350
8	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+20.000	1003+50.000	30.00	0.0057	2030: 13,350
9	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+50.000	1003+81.000	31.00	0.0059	2030: 13,350
10	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+81.000	1004+12.000	31.00	0.0059	2030: 13,350
11	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+12.000	1004+42.000	30.00	0.0057	2030: 13,350
12	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+42.000	1004+73.000	31.00	0.0059	2030: 13,350
13	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+73.000	1005+04.000	31.00	0.0059	2030: 13,350
14	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1005+04.000	1005+34.000	30.00	0.0057	2030: 13,350
15	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1005+34.000	1005+65.000	31.00	0.0059	2030: 13,350
16	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1005+65.000	1005+96.000	31.00	0.0059	2030: 13,350
17	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1005+96.000	1006+26.000	30.00	0.0057	2030: 13,350
18	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1006+26.000	1006+57.000	31.00	0.0059	2030: 13,350
19	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1006+57.000	1006+88.000	31.00	0.0059	2030: 13,350
20	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1006+88.000	1007+02.360	14.36	0.0027	2030: 13,350

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1330**
Average Future Road AADT (vpd)	**13,350**
Predicted Crashes	
Total Crashes	**0.60**
Fatal and Injury Crashes	**0.29**
Property-Damage-Only Crashes	**0.31**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**4.4904**
FI Crash Rate (crashes/mi/yr)	**2.1624**
PDO Crash Rate (crashes/mi/yr)	**2.3280**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.65**
Travel Crash Rate (crashes/million veh-mi)	**0.92**
Travel FI Crash Rate (crashes/million veh-mi)	**0.44**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.48**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+48.000	0.0091	0.038	0.0378	0.0201	0.0177	4.1581	0.85
2	1000+48.000	1001+43.000	0.0180	0.092	0.0921	0.0491	0.0431	5.1216	1.05
3	1001+43.000	1001+90.000	0.0089	0.046	0.0456	0.0241	0.0215	5.1206	1.05
4	1001+90.000	1002+28.000	0.0072	0.037	0.0367	0.0183	0.0184	5.1046	1.05
5	1002+28.000	1002+58.000	0.0057	0.027	0.0273	0.0135	0.0138	4.8001	0.98
6	1002+58.000	1002+89.000	0.0059	0.028	0.0279	0.0136	0.0142	4.7465	0.97
7	1002+89.000	1003+20.000	0.0059	0.028	0.0281	0.0136	0.0145	4.7865	0.98
8	1003+20.000	1003+50.000	0.0057	0.035	0.0345	0.0167	0.0178	6.0703	1.25
9	1003+50.000	1003+81.000	0.0059	0.027	0.0270	0.0127	0.0142	4.5922	0.94
10	1003+81.000	1004+12.000	0.0059	0.027	0.0267	0.0124	0.0142	4.5425	0.93
11	1004+12.000	1004+42.000	0.0057	0.025	0.0255	0.0118	0.0138	4.4947	0.92
12	1004+42.000	1004+73.000	0.0059	0.026	0.0261	0.0119	0.0142	4.4480	0.91
13	1004+73.000	1005+04.000	0.0059	0.026	0.0258	0.0116	0.0142	4.4017	0.90
14	1005+04.000	1005+34.000	0.0057	0.025	0.0248	0.0110	0.0138	4.3571	0.89
15	1005+34.000	1005+65.000	0.0059	0.025	0.0253	0.0111	0.0142	4.3135	0.89
16	1005+65.000	1005+96.000	0.0059	0.022	0.0217	0.0093	0.0124	3.6891	0.76
17	1005+96.000	1006+26.000	0.0057	0.018	0.0184	0.0078	0.0106	3.2379	0.66
18	1006+26.000	1006+57.000	0.0059	0.019	0.0188	0.0078	0.0110	3.2071	0.66
19	1006+57.000	1006+88.000	0.0059	0.019	0.0187	0.0077	0.0110	3.1766	0.65
20	1006+88.000	1007+02.360	0.0027	0.009	0.0086	0.0035	0.0051	3.1547	0.65
Total			0.1330	0.597	0.5973	0.2876	0.3097	4.4904	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1002+12.039	0.0402	0.197	0.1968	0.1039	0.0929	4.9015	1.01
Tangent	1002+12.039	1007+02.360	0.0929	0.401	0.4005	0.1837	0.2168	4.3127	0.89

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.60	0.29	48.156	0.31	51.844
Total	0.60	0.29	48.156	0.31	51.844
Average	0.60	0.29	48.156	0.31	51.844

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0006	0.0019	0.0079	0.0097	0.0177
2	0.0014	0.0041	0.0176	0.0260	0.0431
3	0.0007	0.0020	0.0085	0.0129	0.0215
4	0.0005	0.0015	0.0065	0.0098	0.0184
5	0.0004	0.0011	0.0048	0.0072	0.0138
6	0.0004	0.0011	0.0048	0.0073	0.0142
7	0.0004	0.0011	0.0048	0.0073	0.0145
8	0.0004	0.0012	0.0052	0.0098	0.0178
9	0.0003	0.0011	0.0045	0.0068	0.0142
10	0.0003	0.0010	0.0044	0.0067	0.0142
11	0.0003	0.0010	0.0042	0.0063	0.0138
12	0.0003	0.0010	0.0042	0.0064	0.0142
13	0.0003	0.0010	0.0041	0.0062	0.0142
14	0.0003	0.0009	0.0039	0.0059	0.0138
15	0.0003	0.0009	0.0039	0.0059	0.0142
16	0.0003	0.0008	0.0035	0.0047	0.0124
17	0.0002	0.0007	0.0031	0.0037	0.0106
18	0.0002	0.0007	0.0031	0.0038	0.0110
19	0.0002	0.0007	0.0030	0.0037	0.0110
20	0.0001	0.0003	0.0014	0.0017	0.0051
Total	0.0080	0.0244	0.1034	0.1518	0.3097

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.20	33.0	0.19	32.3	0.39	65.3
Highway Segment	Collision with Other Object	0.01	2.3	0.04	6.3	0.05	8.6
Highway Segment	Other Single-vehicle Collision	0.06	9.5	0.03	4.8	0.09	14.3
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.7	0.01	1.4
Highway Segment	Total Single Vehicle Crashes	0.27	45.7	0.27	45.1	0.54	90.8
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.2	0.00	0.2
Highway Segment	Rear-end Collision	0.01	1.9	0.03	4.7	0.04	6.5
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.4	0.01	1.8	0.01	2.2
Highway Segment	Total Multiple Vehicle Crashes	0.01	2.5	0.04	6.8	0.06	9.2
Highway Segment	Total Highway Segment Crashes	0.29	48.2	0.31	51.8	0.60	100.0
	Total Crashes	0.29	48.2	0.31	51.8	0.60	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+48.000	for segment #1 (1000+00.000 to 1000+48.000), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1000+48.000	for segment #1 (1000+00.000 to 1000+48.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+48.000	1001+43.000	for segment #2 (1000+48.000 to 1001+43.000), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+48.000	1001+43.000	for segment #2 (1000+48.000 to 1001+43.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+43.000	1001+90.000	for segment #3 (1001+43.000 to 1001+90.000), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+43.000	1001+90.000	for segment #3 (1001+43.000 to 1001+90.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+90.000	1002+28.000	for segment #4 (1001+90.000 to 1002+28.000), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+90.000	1002+28.000	for segment #4 (1001+90.000 to 1002+28.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+90.000	1002+28.000	for segment #4 (1001+90.000 to 1002+28.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+28.000	1002+58.000	for segment #5 (1002+28.000 to 1002+58.000), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+28.000	1002+58.000	for segment #5 (1002+28.000 to 1002+58.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+28.000	1002+58.000	for segment #5 (1002+28.000 to 1002+58.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+58.000	1002+89.000	for segment #6 (1002+58.000 to 1002+89.000), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+58.000	1002+89.000	for segment #6 (1002+58.000 to 1002+89.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+58.000	1002+89.000	for segment #6 (1002+58.000 to 1002+89.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+89.000	1003+20.000	for segment #7 (1002+89.000 to 1003+20.000), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+89.000	1003+20.000	for segment #7 (1002+89.000 to 1003+20.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+89.000	1003+20.000	for segment #7 (1002+89.000 to 1003+20.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+20.000	1003+50.000	for segment #8 (1003+20.000 to 1003+50.000), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+20.000	1003+50.000	for segment #8 (1003+20.000 to 1003+50.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+20.000	1003+50.000	for segment #8 (1003+20.000 to 1003+50.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+50.000	1003+81.000	for segment #9 (1003+50.000 to 1003+81.000), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+50.000	1003+81.000	for segment #9 (1003+50.000 to 1003+81.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+50.000	1003+81.000	for segment #9 (1003+50.000 to 1003+81.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+81.000	1004+12.000	for segment #10 (1003+81.000 to 1004+12.000), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+81.000	1004+12.000	for segment #10 (1003+81.000 to 1004+12.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+81.000	1004+12.000	for segment #10 (1003+81.000 to 1004+12.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+12.000	1004+42.000	for segment #11 (1004+12.000 to 1004+42.000), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1004+12.000	1004+42.000	for segment #11 (1004+12.000 to 1004+42.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+12.000	1004+42.000	for segment #11 (1004+12.000 to 1004+42.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+42.000	1004+73.000	for segment #12 (1004+42.000 to 1004+73.000), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+42.000	1004+73.000	for segment #12 (1004+42.000 to 1004+73.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+42.000	1004+73.000	for segment #12 (1004+42.000 to 1004+73.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+73.000	1005+04.000	for segment #13 (1004+73.000 to 1005+04.000), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+73.000	1005+04.000	for segment #13 (1004+73.000 to 1005+04.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+73.000	1005+04.000	for segment #13 (1004+73.000 to 1005+04.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+04.000	1005+34.000	for segment #14 (1005+04.000 to 1005+34.000), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+04.000	1005+34.000	for segment #14 (1005+04.000 to 1005+34.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+04.000	1005+34.000	for segment #14 (1005+04.000 to 1005+34.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+34.000	1005+65.000	for segment #15 (1005+34.000 to 1005+65.000), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+34.000	1005+65.000	for segment #15 (1005+34.000 to 1005+65.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+34.000	1005+65.000	for segment #15 (1005+34.000 to 1005+65.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+65.000	1005+96.000	for segment #16 (1005+65.000 to 1005+96.000), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+65.000	1005+96.000	for segment #16 (1005+65.000 to 1005+96.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+65.000	1005+96.000	for segment #16 (1005+65.000 to 1005+96.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+96.000	1006+26.000	for segment #17 (1005+96.000 to 1006+26.000), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+96.000	1006+26.000	for segment #17 (1005+96.000 to 1006+26.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+96.000	1006+26.000	for segment #17 (1005+96.000 to 1006+26.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1006+26.000	1006+57.000	for segment #18 (1006+26.000 to 1006+57.000), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1006+26.000	1006+57.000	for segment #18 (1006+26.000 to 1006+57.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1006+26.000	1006+57.000	for segment #18 (1006+26.000 to 1006+57.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1006+57.000	1006+88.000	for segment #19 (1006+57.000 to 1006+88.000), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1006+57.000	1006+88.000	for segment #19 (1006+57.000 to 1006+88.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1006+57.000	1006+88.000	for segment #19 (1006+57.000 to 1006+88.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1006+88.000	1007+02.360	for segment #20 (1006+88.000 to 1007+02.360), The ramp type for Ramp Alignment RGPNBX150 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1006+88.000	1007+02.360	for segment #20 (1006+88.000 to 1007+02.360), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1006+88.000	1007+02.360	for segment #20 (1006+88.000 to 1007+02.360), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:19 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:18:59 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBN70
Highway Comment: Imported from RGPNBN70.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:18:48 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1003+76.312
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1003+76.312
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

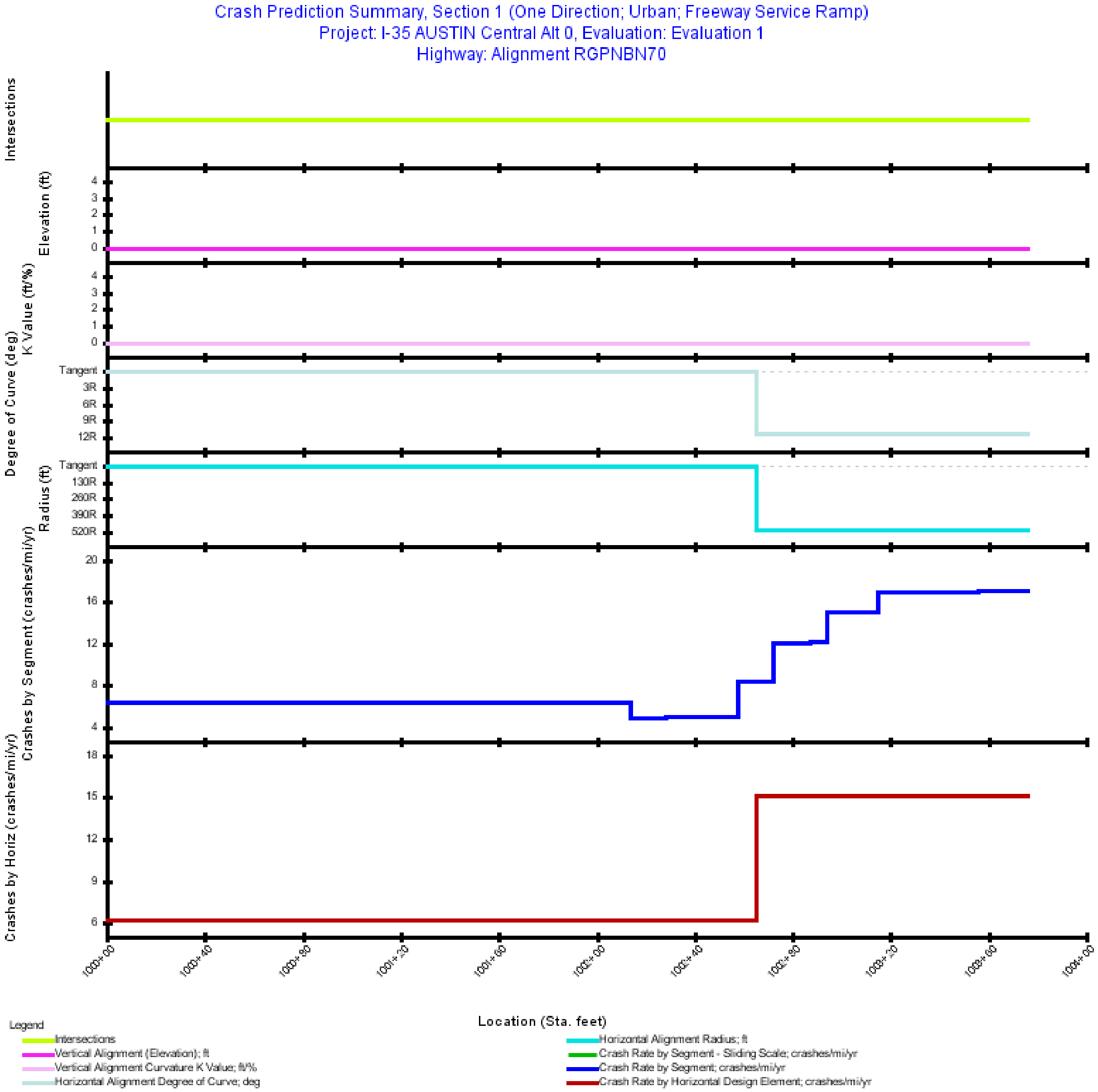

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1002+14.000	214.00	0.0405	2030: 18,400
2	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+14.000	1002+28.000	14.00	0.0027	2030: 18,400
3	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+28.000	1002+43.000	15.00	0.0028	2030: 18,400
4	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+43.000	1002+58.000	15.00	0.0028	2030: 18,400
5	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+58.000	1002+72.000	14.00	0.0027	2030: 18,400
6	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+72.000	1002+87.000	15.00	0.0028	2030: 18,400
7	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+87.000	1002+94.000	7.00	0.0013	2030: 18,400
8	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+94.000	1003+15.000	21.00	0.0040	2030: 18,400
9	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+15.000	1003+56.000	41.00	0.0078	2030: 18,400
10	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+56.000	1003+76.312	20.31	0.0038	2030: 18,400

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0713**
Average Future Road AADT (vpd)	**18,400**
Predicted Crashes	
Total Crashes	**0.63**
Fatal and Injury Crashes	**0.30**
Property-Damage-Only Crashes	**0.33**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**47**
Percent Property-Damage-Only Crashes (%)	**53**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**8.8028**
FI Crash Rate (crashes/mi/yr)	**4.1777**
PDO Crash Rate (crashes/mi/yr)	**4.6251**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.48**
Travel Crash Rate (crashes/million veh-mi)	**1.31**
Travel FI Crash Rate (crashes/million veh-mi)	**0.62**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.69**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1002+14.000	0.0405	0.256	0.2556	0.1161	0.1396	6.3075	0.94
2	1002+14.000	1002+28.000	0.0027	0.013	0.0131	0.0059	0.0071	4.9371	0.73
3	1002+28.000	1002+43.000	0.0028	0.014	0.0142	0.0065	0.0077	4.9885	0.74
4	1002+43.000	1002+58.000	0.0028	0.014	0.0143	0.0067	0.0077	5.0429	0.75
5	1002+58.000	1002+72.000	0.0027	0.022	0.0224	0.0103	0.0121	8.4639	1.26
6	1002+72.000	1002+87.000	0.0028	0.034	0.0344	0.0159	0.0185	12.1152	1.80
7	1002+87.000	1002+94.000	0.0013	0.016	0.0162	0.0075	0.0087	12.2120	1.82
8	1002+94.000	1003+15.000	0.0040	0.060	0.0600	0.0297	0.0303	15.0866	2.25
9	1003+15.000	1003+56.000	0.0078	0.131	0.1314	0.0659	0.0655	16.9253	2.52
10	1003+56.000	1003+76.312	0.0038	0.066	0.0657	0.0332	0.0325	17.0713	2.54
Total			0.0713	0.627	0.6274	0.2977	0.3296	8.8028	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1002+65.161	0.0502	0.309	0.3087	0.1405	0.1682	6.1472	0.92
Simple Curve 1	1002+65.161	1003+76.312	0.0211	0.319	0.3187	0.1573	0.1614	15.1380	2.25

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.63	0.30	47.459	0.33	52.541
Total	0.63	0.30	47.459	0.33	52.541
Average	0.63	0.30	47.459	0.33	52.541

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0022	0.0066	0.0430	0.0643	0.1396
2	0.0001	0.0004	0.0024	0.0030	0.0071
3	0.0001	0.0004	0.0027	0.0033	0.0077
4	0.0001	0.0004	0.0027	0.0034	0.0077
5	0.0002	0.0007	0.0043	0.0052	0.0121
6	0.0003	0.0010	0.0065	0.0080	0.0185
7	0.0002	0.0005	0.0031	0.0038	0.0087
8	0.0006	0.0018	0.0115	0.0158	0.0303
9	0.0012	0.0037	0.0242	0.0367	0.0655
10	0.0006	0.0019	0.0122	0.0185	0.0325
Total	0.0057	0.0174	0.1127	0.1619	0.3296

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.8	0.01	0.9
Highway Segment	Collision with Fixed Object	0.16	25.6	0.16	26.2	0.33	51.8
Highway Segment	Collision with Other Object	0.01	1.8	0.03	5.1	0.04	6.9
Highway Segment	Other Single-vehicle Collision	0.05	7.4	0.03	3.9	0.07	11.3
Highway Segment	Collision with Parked Vehicle	0.00	0.5	0.00	0.6	0.01	1.1
Highway Segment	Total Single Vehicle Crashes	0.22	35.5	0.23	36.6	0.45	72.1
Highway Segment	Right-Angle Collision	0.00	0.4	0.00	0.3	0.00	0.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.4	0.00	0.4	0.01	0.8
Highway Segment	Rear-end Collision	0.06	9.0	0.07	11.0	0.12	20.0
Highway Segment	Sideswipe, Same Direction Collision	0.01	2.2	0.03	4.3	0.04	6.4
Highway Segment	Total Multiple Vehicle Crashes	0.07	12.0	0.10	16.0	0.17	27.9
Highway Segment	Total Highway Segment Crashes	0.30	47.5	0.33	52.5	0.63	100.0
	Total Crashes	0.30	47.5	0.33	52.5	0.63	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1002+14.000	for segment #1 (1000+00.000 to 1002+14.000), The ramp type for Ramp Alignment RGPNBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1002+14.000	for segment #1 (1000+00.000 to 1002+14.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1002+14.000	for segment #1 (1000+00.000 to 1002+14.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+14.000	1002+28.000	for segment #2 (1002+14.000 to 1002+28.000), The ramp type for Ramp Alignment RGPNBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+14.000	1002+28.000	for segment #2 (1002+14.000 to 1002+28.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+14.000	1002+28.000	for segment #2 (1002+14.000 to 1002+28.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+28.000	1002+43.000	for segment #3 (1002+28.000 to 1002+43.000), The ramp type for Ramp Alignment RGPNBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+28.000	1002+43.000	for segment #3 (1002+28.000 to 1002+43.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+28.000	1002+43.000	for segment #3 (1002+28.000 to 1002+43.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+43.000	1002+58.000	for segment #4 (1002+43.000 to 1002+58.000), The ramp type for Ramp Alignment RGPNBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+43.000	1002+58.000	for segment #4 (1002+43.000 to 1002+58.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+43.000	1002+58.000	for segment #4 (1002+43.000 to 1002+58.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+58.000	1002+72.000	for segment #5 (1002+58.000 to 1002+72.000), The ramp type for Ramp Alignment RGPNBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+58.000	1002+72.000	for segment #5 (1002+58.000 to 1002+72.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+58.000	1002+72.000	for segment #5 (1002+58.000 to 1002+72.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+72.000	1002+87.000	for segment #6 (1002+72.000 to 1002+87.000), The ramp type for Ramp Alignment RGPNBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+72.000	1002+87.000	for segment #6 (1002+72.000 to 1002+87.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+72.000	1002+87.000	for segment #6 (1002+72.000 to 1002+87.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+87.000	1002+94.000	for segment #7 (1002+87.000 to 1002+94.000), The ramp type for Ramp Alignment RGPNBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+87.000	1002+94.000	for segment #7 (1002+87.000 to 1002+94.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+87.000	1002+94.000	for segment #7 (1002+87.000 to 1002+94.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+94.000	1003+15.000	for segment #8 (1002+94.000 to 1003+15.000), The ramp type for Ramp Alignment RGPNBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+94.000	1003+15.000	for segment #8 (1002+94.000 to 1003+15.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+94.000	1003+15.000	for segment #8 (1002+94.000 to 1003+15.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+15.000	1003+56.000	for segment #9 (1003+15.000 to 1003+56.000), The ramp type for Ramp Alignment RGPNBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+15.000	1003+56.000	for segment #9 (1003+15.000 to 1003+56.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+15.000	1003+56.000	for segment #9 (1003+15.000 to 1003+56.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+56.000	1003+76.312	for segment #10 (1003+56.000 to 1003+76.312), The ramp type for Ramp Alignment RGPNBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+56.000	1003+76.312	for segment #10 (1003+56.000 to 1003+76.312), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1003+56.000	1003+76.312	for segment #10 (1003+56.000 to 1003+76.312), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1002+14.000	for segment #1 (1000+00.000 to 1002+14.000), traffic volume (18,400 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1002+14.000	1002+28.000	for segment #2 (1002+14.000 to 1002+28.000), traffic volume (18,400 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1002+28.000	1002+43.000	for segment #3 (1002+28.000 to 1002+43.000), traffic volume (18,400 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1002+43.000	1002+58.000	for segment #4 (1002+43.000 to 1002+58.000), traffic volume (18,400 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1002+58.000	1002+72.000	for segment #5 (1002+58.000 to 1002+72.000), traffic volume (18,400 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1002+72.000	1002+87.000	for segment #6 (1002+72.000 to 1002+87.000), traffic volume (18,400 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1002+87.000	1002+94.000	for segment #7 (1002+87.000 to 1002+94.000), traffic volume (18,400 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1002+94.000	1003+15.000	for segment #8 (1002+94.000 to 1003+15.000), traffic volume (18,400 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1003+15.000	1003+56.000	for segment #9 (1003+15.000 to 1003+56.000), traffic volume (18,400 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1003+56.000	1003+76.312	for segment #10 (1003+56.000 to 1003+76.312), traffic volume (18,400 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:27 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:27:17 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBX70
Highway Comment: Imported from RGPNBX70.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:27:07 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1004+39.198
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1004+39.198
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

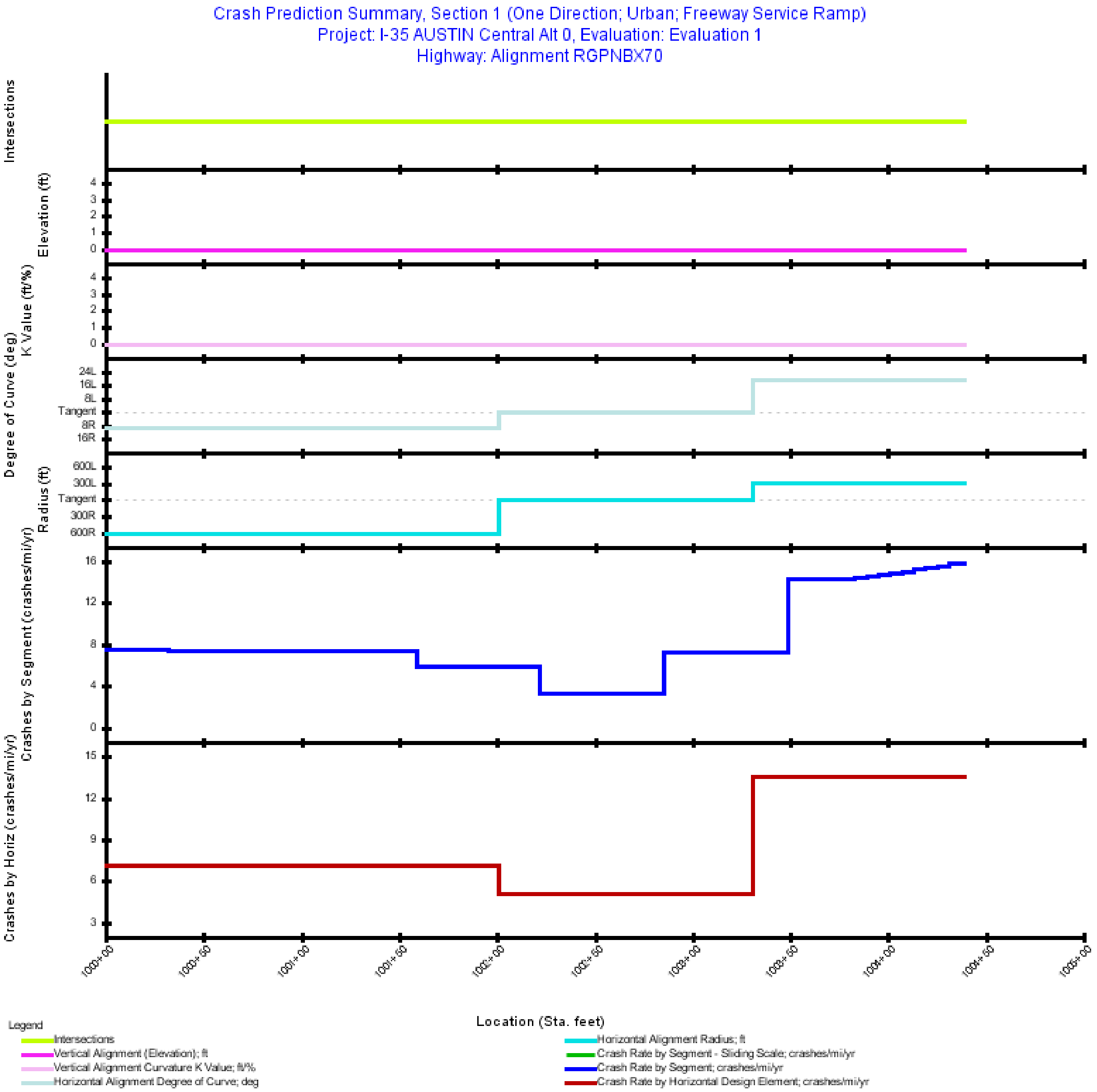

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1000+32.000	32.00	0.0061	2030: 7,850
2	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+32.000	1000+95.000	63.00	0.0119	2030: 7,850
3	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+95.000	1001+59.000	64.00	0.0121	2030: 7,850
4	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+59.000	1002+22.000	63.00	0.0119	2030: 7,850
5	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+22.000	1002+85.000	63.00	0.0119	2030: 7,850
6	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+85.000	1003+49.000	64.00	0.0121	2030: 7,850
7	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+49.000	1003+83.000	34.00	0.0064	2030: 7,850
8	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+83.000	1003+89.000	6.00	0.0011	2030: 7,850
9	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+89.000	1003+95.000	6.00	0.0011	2030: 7,850
10	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+95.000	1004+01.000	6.00	0.0011	2030: 7,850
11	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+01.000	1004+07.000	6.00	0.0011	2030: 7,850
12	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+07.000	1004+13.000	6.00	0.0011	2030: 7,850
13	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+13.000	1004+19.000	6.00	0.0011	2030: 7,850
14	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+19.000	1004+25.000	6.00	0.0011	2030: 7,850
15	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+25.000	1004+31.000	6.00	0.0011	2030: 7,850
16	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+31.000	1004+39.198	8.20	0.0016	2030: 7,850

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0832**
Average Future Road AADT (vpd)	**7,850**
Predicted Crashes	
Total Crashes	**0.67**
Fatal and Injury Crashes	**0.32**
Property-Damage-Only Crashes	**0.35**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**8.1060**
FI Crash Rate (crashes/mi/yr)	**3.8698**
PDO Crash Rate (crashes/mi/yr)	**4.2362**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.24**
Travel Crash Rate (crashes/million veh-mi)	**2.83**
Travel FI Crash Rate (crashes/million veh-mi)	**1.35**
Travel PDO Crash Rate (crashes/million veh-mi)	**1.48**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+32.000	0.0061	0.045	0.0455	0.0226	0.0229	7.5119	2.62
2	1000+32.000	1000+95.000	0.0119	0.089	0.0889	0.0437	0.0451	7.4484	2.60
3	1000+95.000	1001+59.000	0.0121	0.089	0.0893	0.0434	0.0459	7.3653	2.57
4	1001+59.000	1002+22.000	0.0119	0.071	0.0712	0.0346	0.0366	5.9642	2.08
5	1002+22.000	1002+85.000	0.0119	0.039	0.0389	0.0196	0.0194	3.2626	1.14
6	1002+85.000	1003+49.000	0.0121	0.088	0.0878	0.0409	0.0469	7.2433	2.53
7	1003+49.000	1003+83.000	0.0064	0.092	0.0921	0.0410	0.0511	14.3020	4.99
8	1003+83.000	1003+89.000	0.0011	0.016	0.0164	0.0074	0.0090	14.4149	5.03
9	1003+89.000	1003+95.000	0.0011	0.017	0.0166	0.0075	0.0090	14.5670	5.08
10	1003+95.000	1004+01.000	0.0011	0.017	0.0167	0.0077	0.0090	14.7227	5.14
11	1004+01.000	1004+07.000	0.0011	0.017	0.0169	0.0079	0.0090	14.8820	5.19
12	1004+07.000	1004+13.000	0.0011	0.017	0.0171	0.0081	0.0090	15.0451	5.25
13	1004+13.000	1004+19.000	0.0011	0.017	0.0173	0.0083	0.0090	15.2120	5.31
14	1004+19.000	1004+25.000	0.0011	0.018	0.0175	0.0085	0.0090	15.3828	5.37
15	1004+25.000	1004+31.000	0.0011	0.018	0.0177	0.0087	0.0090	15.5576	5.43
16	1004+31.000	1004+39.198	0.0016	0.025	0.0245	0.0122	0.0123	15.7698	5.50
Total			0.0832	0.674	0.6743	0.3219	0.3524	8.1060	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1002+01.128	0.0381	0.271	0.2713	0.1329	0.1384	7.1212	2.48
Tangent	1002+01.128	1003+30.548	0.0245	0.125	0.1250	0.0601	0.0648	5.0993	1.78
Simple Curve 2	1003+30.548	1004+39.198	0.0206	0.278	0.2780	0.1289	0.1491	13.5104	4.71

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.67	0.32	47.740	0.35	52.260
Total	0.67	0.32	47.740	0.35	52.260
Average	0.67	0.32	47.740	0.35	52.260

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0006	0.0019	0.0080	0.0121	0.0229
2	0.0012	0.0036	0.0155	0.0234	0.0451
3	0.0012	0.0036	0.0154	0.0233	0.0459
4	0.0009	0.0029	0.0122	0.0185	0.0366
5	0.0005	0.0016	0.0069	0.0105	0.0194
6	0.0012	0.0035	0.0149	0.0213	0.0469
7	0.0013	0.0039	0.0161	0.0197	0.0511
8	0.0002	0.0007	0.0029	0.0035	0.0090
9	0.0002	0.0007	0.0030	0.0036	0.0090
10	0.0002	0.0007	0.0030	0.0037	0.0090
11	0.0002	0.0007	0.0031	0.0038	0.0090
12	0.0003	0.0008	0.0032	0.0039	0.0090
13	0.0003	0.0008	0.0033	0.0040	0.0090
14	0.0003	0.0008	0.0033	0.0041	0.0090
15	0.0003	0.0008	0.0034	0.0042	0.0090
16	0.0004	0.0012	0.0048	0.0058	0.0123
Total	0.0093	0.0282	0.1190	0.1654	0.3524

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.1	0.01	1.3
Highway Segment	Collision with Fixed Object	0.23	33.6	0.24	35.6	0.47	69.2
Highway Segment	Collision with Other Object	0.02	2.4	0.05	6.9	0.06	9.3
Highway Segment	Other Single-vehicle Collision	0.07	9.7	0.04	5.3	0.10	15.0
Highway Segment	Collision with Parked Vehicle	0.01	0.7	0.01	0.8	0.01	1.5
Highway Segment	Total Single Vehicle Crashes	0.31	46.6	0.34	49.7	0.65	96.3
Highway Segment	Right-Angle Collision	0.00	0.0	0.00	0.0	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.0	0.00	0.1	0.00	0.1
Highway Segment	Rear-end Collision	0.01	0.9	0.01	1.8	0.02	2.6
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.2	0.01	0.7	0.01	0.9
Highway Segment	Total Multiple Vehicle Crashes	0.01	1.2	0.02	2.6	0.03	3.7
Highway Segment	Total Highway Segment Crashes	0.32	47.7	0.35	52.3	0.67	100.0
	Total Crashes	0.32	47.7	0.35	52.3	0.67	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+32.000	for segment #1 (1000+00.000 to 1000+32.000), The ramp type for Ramp Alignment RGPNBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1000+32.000	for segment #1 (1000+00.000 to 1000+32.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1000+32.000	for segment #1 (1000+00.000 to 1000+32.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+32.000	1000+95.000	for segment #2 (1000+32.000 to 1000+95.000), The ramp type for Ramp Alignment RGPNBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+32.000	1000+95.000	for segment #2 (1000+32.000 to 1000+95.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+32.000	1000+95.000	for segment #2 (1000+32.000 to 1000+95.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+95.000	1001+59.000	for segment #3 (1000+95.000 to 1001+59.000), The ramp type for Ramp Alignment RGPNBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+95.000	1001+59.000	for segment #3 (1000+95.000 to 1001+59.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+95.000	1001+59.000	for segment #3 (1000+95.000 to 1001+59.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+59.000	1002+22.000	for segment #4 (1001+59.000 to 1002+22.000), The ramp type for Ramp Alignment RGPNBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+59.000	1002+22.000	for segment #4 (1001+59.000 to 1002+22.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+59.000	1002+22.000	for segment #4 (1001+59.000 to 1002+22.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+22.000	1002+85.000	for segment #5 (1002+22.000 to 1002+85.000), The ramp type for Ramp Alignment RGPNBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+22.000	1002+85.000	for segment #5 (1002+22.000 to 1002+85.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+22.000	1002+85.000	for segment #5 (1002+22.000 to 1002+85.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+85.000	1003+49.000	for segment #6 (1002+85.000 to 1003+49.000), The ramp type for Ramp Alignment RGPNBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+85.000	1003+49.000	for segment #6 (1002+85.000 to 1003+49.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+85.000	1003+49.000	for segment #6 (1002+85.000 to 1003+49.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+49.000	1003+83.000	for segment #7 (1003+49.000 to 1003+83.000), The ramp type for Ramp Alignment RGPNBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+49.000	1003+83.000	for segment #7 (1003+49.000 to 1003+83.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+49.000	1003+83.000	for segment #7 (1003+49.000 to 1003+83.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+83.000	1003+89.000	for segment #8 (1003+83.000 to 1003+89.000), The ramp type for Ramp Alignment RGPNBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+83.000	1003+89.000	for segment #8 (1003+83.000 to 1003+89.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+83.000	1003+89.000	for segment #8 (1003+83.000 to 1003+89.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+89.000	1003+95.000	for segment #9 (1003+89.000 to 1003+95.000), The ramp type for Ramp Alignment RGPNBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+89.000	1003+95.000	for segment #9 (1003+89.000 to 1003+95.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+89.000	1003+95.000	for segment #9 (1003+89.000 to 1003+95.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+95.000	1004+01.000	for segment #10 (1003+95.000 to 1004+01.000), The ramp type for Ramp Alignment RGPNBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+95.000	1004+01.000	for segment #10 (1003+95.000 to 1004+01.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1003+95.000	1004+01.000	for segment #10 (1003+95.000 to 1004+01.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+01.000	1004+07.000	for segment #11 (1004+01.000 to 1004+07.000), The ramp type for Ramp Alignment RGPNBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+01.000	1004+07.000	for segment #11 (1004+01.000 to 1004+07.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+01.000	1004+07.000	for segment #11 (1004+01.000 to 1004+07.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+07.000	1004+13.000	for segment #12 (1004+07.000 to 1004+13.000), The ramp type for Ramp Alignment RGPNBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+07.000	1004+13.000	for segment #12 (1004+07.000 to 1004+13.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+07.000	1004+13.000	for segment #12 (1004+07.000 to 1004+13.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+13.000	1004+19.000	for segment #13 (1004+13.000 to 1004+19.000), The ramp type for Ramp Alignment RGPNBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+13.000	1004+19.000	for segment #13 (1004+13.000 to 1004+19.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+13.000	1004+19.000	for segment #13 (1004+13.000 to 1004+19.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+19.000	1004+25.000	for segment #14 (1004+19.000 to 1004+25.000), The ramp type for Ramp Alignment RGPNBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+19.000	1004+25.000	for segment #14 (1004+19.000 to 1004+25.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+19.000	1004+25.000	for segment #14 (1004+19.000 to 1004+25.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+25.000	1004+31.000	for segment #15 (1004+25.000 to 1004+31.000), The ramp type for Ramp Alignment RGPNBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+25.000	1004+31.000	for segment #15 (1004+25.000 to 1004+31.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+25.000	1004+31.000	for segment #15 (1004+25.000 to 1004+31.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+31.000	1004+39.198	for segment #16 (1004+31.000 to 1004+39.198), The ramp type for Ramp Alignment RGPNBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+31.000	1004+39.198	for segment #16 (1004+31.000 to 1004+39.198), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+31.000	1004+39.198	for segment #16 (1004+31.000 to 1004+39.198), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:21 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:21:03 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBNCHZ0
Highway Comment: Imported from RGPNBNCHZ0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:20:53 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1006+80.239
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1006+80.239
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

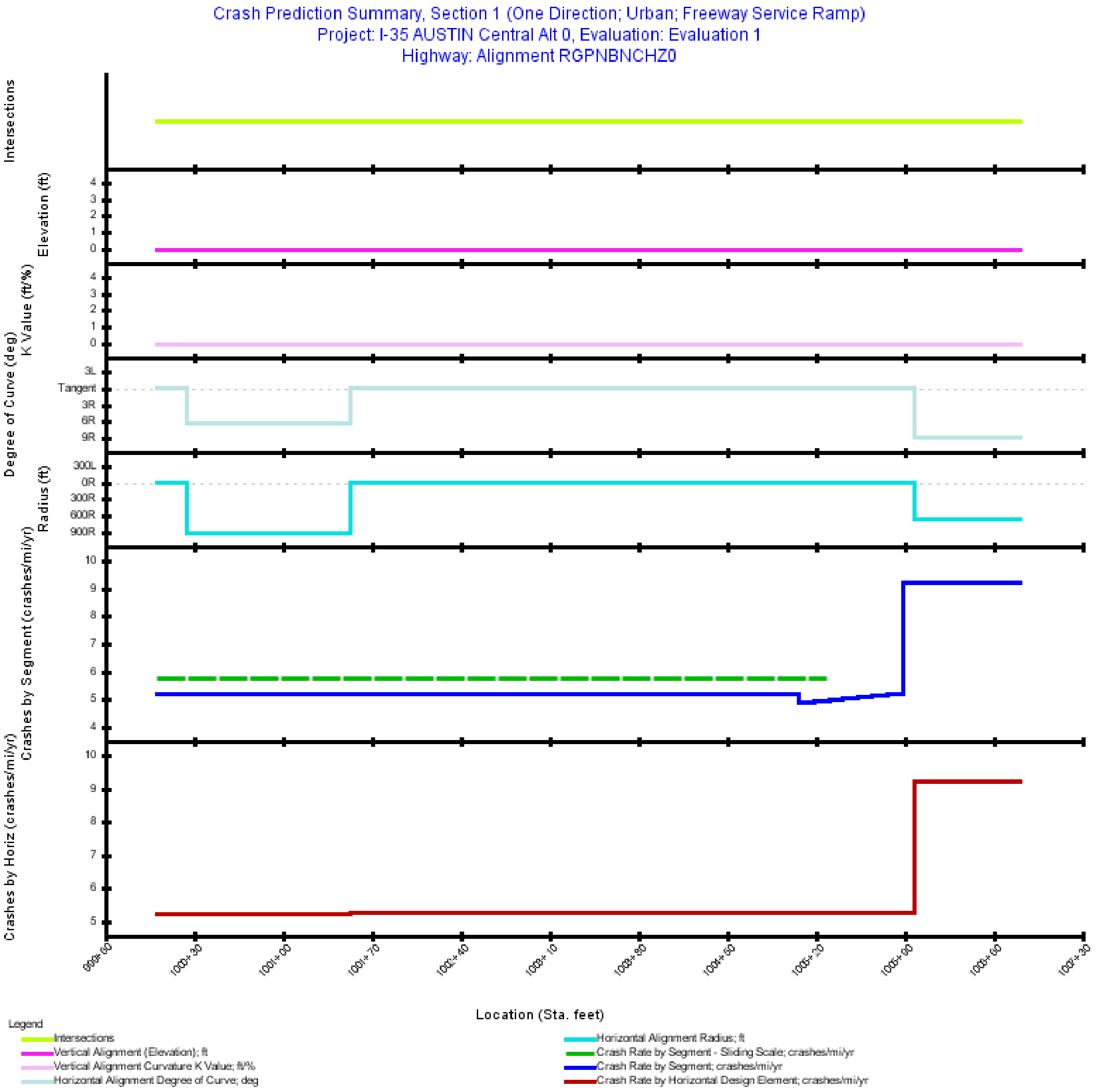

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1005+06.000	506.00	0.0958	2030: 13,300
2	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1005+06.000	1005+18.000	12.00	0.0023	2030: 13,300
3	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1005+18.000	1005+30.000	12.00	0.0023	2030: 13,300
4	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1005+30.000	1005+41.000	11.00	0.0021	2030: 13,300
5	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1005+41.000	1005+53.000	12.00	0.0023	2030: 13,300
6	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1005+53.000	1005+64.000	11.00	0.0021	2030: 13,300
7	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1005+64.000	1005+76.000	12.00	0.0023	2030: 13,300
8	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1005+76.000	1005+88.000	12.00	0.0023	2030: 13,300
9	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1005+88.000	1006+80.239	92.24	0.0175	2030: 13,300

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1288**
Average Future Road AADT (vpd)	**13,300**
Predicted Crashes	
Total Crashes	**0.74**
Fatal and Injury Crashes	**0.34**
Property-Damage-Only Crashes	**0.39**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**47**
Percent Property-Damage-Only Crashes (%)	**53**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.7369**
FI Crash Rate (crashes/mi/yr)	**2.6817**
PDO Crash Rate (crashes/mi/yr)	**3.0551**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.63**
Travel Crash Rate (crashes/million veh-mi)	**1.18**
Travel FI Crash Rate (crashes/million veh-mi)	**0.55**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.63**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1005+06.000	0.0958	0.500	0.4999	0.2282	0.2716	5.2162	1.07
2	1005+06.000	1005+18.000	0.0023	0.011	0.0111	0.0052	0.0059	4.8742	1.00
3	1005+18.000	1005+30.000	0.0023	0.011	0.0112	0.0053	0.0059	4.9285	1.01
4	1005+30.000	1005+41.000	0.0021	0.010	0.0104	0.0050	0.0054	4.9817	1.03
5	1005+41.000	1005+53.000	0.0023	0.011	0.0114	0.0055	0.0059	5.0362	1.04
6	1005+53.000	1005+64.000	0.0021	0.011	0.0106	0.0052	0.0054	5.0919	1.05
7	1005+64.000	1005+76.000	0.0023	0.012	0.0117	0.0058	0.0059	5.1489	1.06
8	1005+76.000	1005+88.000	0.0023	0.012	0.0118	0.0059	0.0059	5.2098	1.07
9	1005+88.000	1006+80.239	0.0175	0.161	0.1610	0.0794	0.0815	9.2140	1.90
Total			0.1288	0.739	0.7391	0.3455	0.3936	5.7369	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1000+24.345	0.0046	0.024	0.0241	0.0110	0.0131	5.2162	1.07
Simple Curve 1	1000+24.345	1001+52.528	0.0243	0.127	0.1266	0.0578	0.0688	5.2162	1.07
Tangent	1001+52.528	1005+97.727	0.0843	0.444	0.4444	0.2056	0.2388	5.2709	1.09
Simple Curve 2	1005+97.727	1006+80.239	0.0156	0.144	0.1440	0.0711	0.0729	9.2140	1.90

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.74	0.34	46.745	0.39	53.255
Total	0.74	0.34	46.745	0.39	53.255
Average	0.74	0.34	46.745	0.39	53.255

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0043	0.0131	0.0851	0.1257	0.2716
2	0.0001	0.0003	0.0019	0.0029	0.0059
3	0.0001	0.0003	0.0019	0.0029	0.0059
4	0.0001	0.0003	0.0018	0.0028	0.0054
5	0.0001	0.0003	0.0020	0.0031	0.0059
6	0.0001	0.0003	0.0019	0.0029	0.0054
7	0.0001	0.0003	0.0021	0.0032	0.0059
8	0.0001	0.0003	0.0022	0.0033	0.0059
9	0.0015	0.0045	0.0292	0.0443	0.0815
Total	0.0065	0.0197	0.1283	0.1911	0.3936

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.8	0.01	1.0
Highway Segment	Collision with Fixed Object	0.19	26.2	0.20	26.6	0.39	52.8
Highway Segment	Collision with Other Object	0.01	1.9	0.04	5.2	0.05	7.0
Highway Segment	Other Single-vehicle Collision	0.06	7.5	0.03	4.0	0.09	11.5
Highway Segment	Collision with Parked Vehicle	0.00	0.5	0.00	0.6	0.01	1.1
Highway Segment	Total Single Vehicle Crashes	0.27	36.3	0.27	37.1	0.54	73.4
Highway Segment	Right-Angle Collision	0.00	0.3	0.00	0.3	0.01	0.6
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.3	0.00	0.4	0.01	0.7
Highway Segment	Rear-end Collision	0.06	7.8	0.08	11.1	0.14	19.0
Highway Segment	Sideswipe, Same Direction Collision	0.01	1.9	0.03	4.3	0.05	6.2
Highway Segment	Total Multiple Vehicle Crashes	0.08	10.5	0.12	16.1	0.20	26.6
Highway Segment	Total Highway Segment Crashes	0.34	46.7	0.39	53.3	0.74	100.0
	Total Crashes	0.34	46.7	0.39	53.3	0.74	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1005+06.000	for segment #1 (1000+00.000 to 1005+06.000), The ramp type for Ramp Alignment RGPNBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1005+06.000	for segment #1 (1000+00.000 to 1005+06.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1005+06.000	for segment #1 (1000+00.000 to 1005+06.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+06.000	1005+18.000	for segment #2 (1005+06.000 to 1005+18.000), The ramp type for Ramp Alignment RGPNBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1005+06.000	1005+18.000	for segment #2 (1005+06.000 to 1005+18.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+06.000	1005+18.000	for segment #2 (1005+06.000 to 1005+18.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+18.000	1005+30.000	for segment #3 (1005+18.000 to 1005+30.000), The ramp type for Ramp Alignment RGPNBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1005+18.000	1005+30.000	for segment #3 (1005+18.000 to 1005+30.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+18.000	1005+30.000	for segment #3 (1005+18.000 to 1005+30.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+30.000	1005+41.000	for segment #4 (1005+30.000 to 1005+41.000), The ramp type for Ramp Alignment RGPNBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1005+30.000	1005+41.000	for segment #4 (1005+30.000 to 1005+41.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+30.000	1005+41.000	for segment #4 (1005+30.000 to 1005+41.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+41.000	1005+53.000	for segment #5 (1005+41.000 to 1005+53.000), The ramp type for Ramp Alignment RGPNBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1005+41.000	1005+53.000	for segment #5 (1005+41.000 to 1005+53.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+41.000	1005+53.000	for segment #5 (1005+41.000 to 1005+53.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+53.000	1005+64.000	for segment #6 (1005+53.000 to 1005+64.000), The ramp type for Ramp Alignment RGPNBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1005+53.000	1005+64.000	for segment #6 (1005+53.000 to 1005+64.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+53.000	1005+64.000	for segment #6 (1005+53.000 to 1005+64.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+64.000	1005+76.000	for segment #7 (1005+64.000 to 1005+76.000), The ramp type for Ramp Alignment RGPNBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1005+64.000	1005+76.000	for segment #7 (1005+64.000 to 1005+76.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+64.000	1005+76.000	for segment #7 (1005+64.000 to 1005+76.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+76.000	1005+88.000	for segment #8 (1005+76.000 to 1005+88.000), The ramp type for Ramp Alignment RGPNBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1005+76.000	1005+88.000	for segment #8 (1005+76.000 to 1005+88.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+76.000	1005+88.000	for segment #8 (1005+76.000 to 1005+88.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+88.000	1006+80.239	for segment #9 (1005+88.000 to 1006+80.239), The ramp type for Ramp Alignment RGPNBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1005+88.000	1006+80.239	for segment #9 (1005+88.000 to 1006+80.239), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+88.000	1006+80.239	for segment #9 (1005+88.000 to 1006+80.239), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:28 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:27:59 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBXCHZ0
Highway Comment: Imported from RGPNBXCHZ0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:27:48 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1006+20.152
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1006+20.152
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

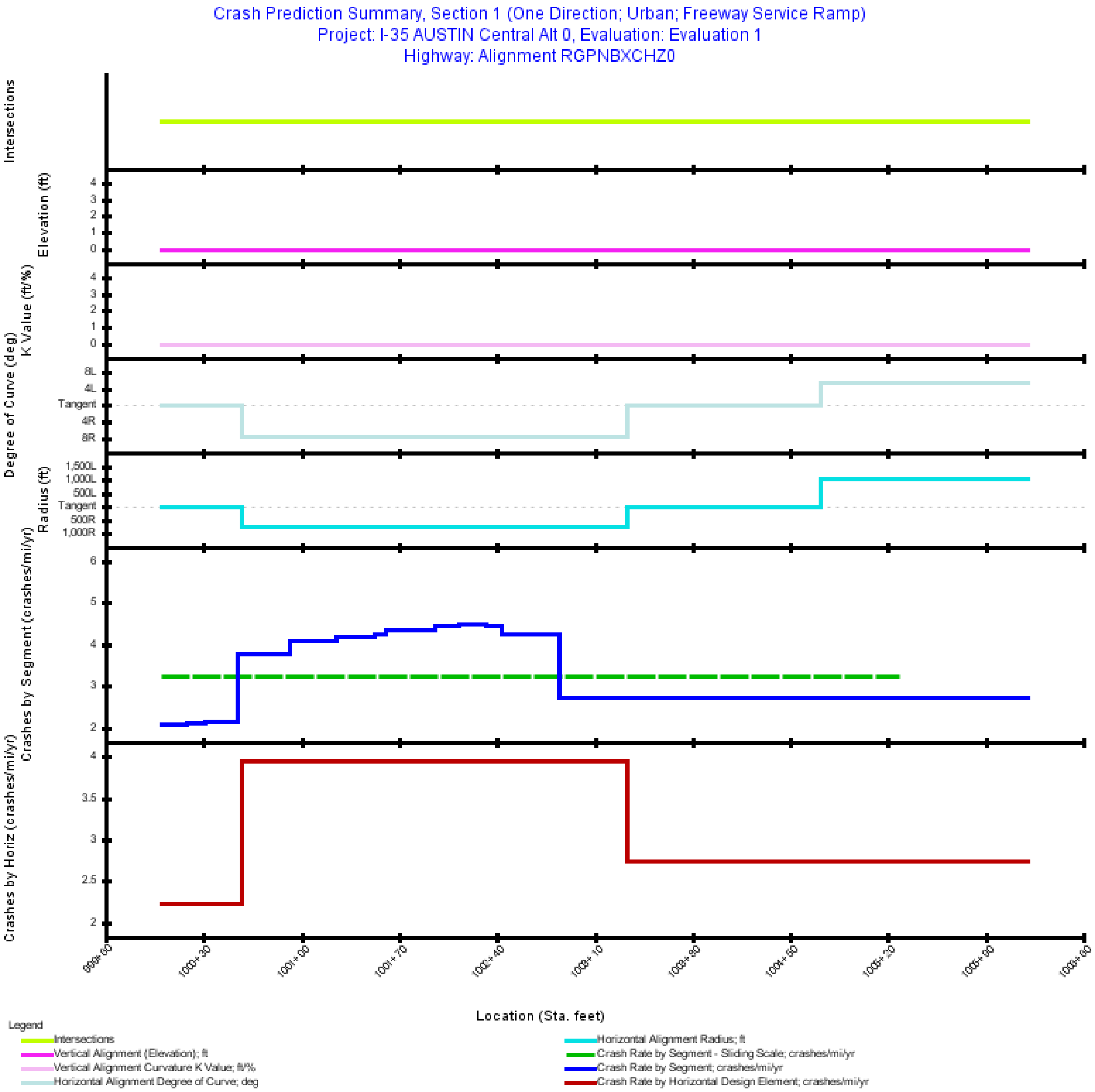

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1000+18.000	18.00	0.0034	2030: 5,150
2	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+18.000	1000+31.000	13.00	0.0025	2030: 5,150
3	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+31.000	1000+54.000	23.00	0.0044	2030: 5,150
4	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+54.000	1000+92.000	38.00	0.0072	2030: 5,150
5	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+92.000	1001+25.000	33.00	0.0063	2030: 5,150
6	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+25.000	1001+52.000	27.00	0.0051	2030: 5,150
7	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+52.000	1001+61.000	9.00	0.0017	2030: 5,150
8	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+61.000	1001+96.000	35.00	0.0066	2030: 5,150
9	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+96.000	1002+13.000	17.00	0.0032	2030: 5,150
10	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+13.000	1002+32.000	19.00	0.0036	2030: 5,150
11	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+32.000	1002+43.000	11.00	0.0021	2030: 5,150
12	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+43.000	1002+68.000	25.00	0.0047	2030: 5,150
13	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+68.000	1002+85.000	17.00	0.0032	2030: 5,150
14	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+85.000	1006+20.152	335.15	0.0635	2030: 5,150

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1175**
Average Future Road AADT (vpd)	**5,150**
Predicted Crashes	
Total Crashes	**0.38**
Fatal and Injury Crashes	**0.19**
Property-Damage-Only Crashes	**0.19**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**49**
Percent Property-Damage-Only Crashes (%)	**51**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**3.2238**
FI Crash Rate (crashes/mi/yr)	**1.5913**
PDO Crash Rate (crashes/mi/yr)	**1.6326**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.22**
Travel Crash Rate (crashes/million veh-mi)	**1.72**
Travel FI Crash Rate (crashes/million veh-mi)	**0.85**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.87**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+18.000	0.0034	0.007	0.0071	0.0036	0.0035	2.0828	1.11
2	1000+18.000	1000+31.000	0.0025	0.005	0.0052	0.0027	0.0025	2.1133	1.12
3	1000+31.000	1000+54.000	0.0044	0.009	0.0094	0.0048	0.0046	2.1492	1.14
4	1000+54.000	1000+92.000	0.0072	0.027	0.0272	0.0134	0.0138	3.7736	2.01
5	1000+92.000	1001+25.000	0.0063	0.025	0.0254	0.0126	0.0128	4.0679	2.16
6	1001+25.000	1001+52.000	0.0051	0.021	0.0214	0.0107	0.0107	4.1830	2.23
7	1001+52.000	1001+61.000	0.0017	0.007	0.0073	0.0036	0.0036	4.2537	2.26
8	1001+61.000	1001+96.000	0.0066	0.029	0.0288	0.0145	0.0143	4.3419	2.31
9	1001+96.000	1002+13.000	0.0032	0.014	0.0143	0.0072	0.0071	4.4485	2.37
10	1002+13.000	1002+32.000	0.0036	0.016	0.0161	0.0081	0.0080	4.4796	2.38
11	1002+32.000	1002+43.000	0.0021	0.009	0.0093	0.0047	0.0046	4.4668	2.38
12	1002+43.000	1002+68.000	0.0047	0.020	0.0202	0.0097	0.0105	4.2657	2.27
13	1002+68.000	1002+85.000	0.0032	0.014	0.0137	0.0066	0.0071	4.2657	2.27
14	1002+85.000	1006+20.152	0.0635	0.173	0.1733	0.0848	0.0885	2.7301	1.45
Total			0.1175	0.379	0.3786	0.1869	0.1917	3.2238	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1000+57.579	0.0109	0.024	0.0242	0.0123	0.0119	2.2213	1.18
Simple Curve 1	1000+57.579	1003+33.038	0.0522	0.206	0.2060	0.1019	0.1040	3.9480	2.10
Tangent	1003+33.038	1004+72.109	0.0263	0.072	0.0719	0.0352	0.0367	2.7301	1.45
Simple Curve 2	1004+72.109	1006+20.152	0.0280	0.076	0.0765	0.0374	0.0391	2.7301	1.45

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.38	0.19	49.360	0.19	50.640
Total	0.38	0.19	49.360	0.19	50.640
Average	0.38	0.19	49.360	0.19	50.640

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0001	0.0003	0.0013	0.0019	0.0035
2	0.0001	0.0002	0.0009	0.0014	0.0025
3	0.0001	0.0004	0.0017	0.0026	0.0046
4	0.0004	0.0011	0.0047	0.0072	0.0138
5	0.0003	0.0010	0.0045	0.0067	0.0128
6	0.0003	0.0009	0.0038	0.0057	0.0107
7	0.0001	0.0003	0.0013	0.0019	0.0036
8	0.0004	0.0012	0.0051	0.0077	0.0143
9	0.0002	0.0006	0.0026	0.0039	0.0071
10	0.0002	0.0007	0.0029	0.0044	0.0080
11	0.0001	0.0004	0.0017	0.0025	0.0046
12	0.0003	0.0008	0.0034	0.0052	0.0105
13	0.0002	0.0005	0.0023	0.0035	0.0071
14	0.0025	0.0075	0.0317	0.0430	0.0885
Total	0.0053	0.0160	0.0679	0.0977	0.1917

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.00	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.13	34.6	0.13	34.1	0.26	68.7
Highway Segment	Collision with Other Object	0.01	2.4	0.03	6.6	0.03	9.1
Highway Segment	Other Single-vehicle Collision	0.04	10.0	0.02	5.1	0.06	15.1
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.8	0.01	1.5
Highway Segment	Total Single Vehicle Crashes	0.18	47.9	0.18	47.6	0.36	95.5
Highway Segment	Right-Angle Collision	0.00	0.0	0.00	0.1	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.0	0.00	0.1	0.00	0.1
Highway Segment	Rear-end Collision	0.00	1.1	0.01	2.1	0.01	3.2
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.3	0.00	0.8	0.00	1.1
Highway Segment	Total Multiple Vehicle Crashes	0.01	1.4	0.01	3.0	0.02	4.5
Highway Segment	Total Highway Segment Crashes	0.19	49.4	0.19	50.6	0.38	100.0
	Total Crashes	0.19	49.4	0.19	50.6	0.38	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+18.000	for segment #1 (1000+00.000 to 1000+18.000), The ramp type for Ramp Alignment RGPNBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1000+18.000	for segment #1 (1000+00.000 to 1000+18.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+18.000	1000+31.000	for segment #2 (1000+18.000 to 1000+31.000), The ramp type for Ramp Alignment RGPNBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+18.000	1000+31.000	for segment #2 (1000+18.000 to 1000+31.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+31.000	1000+54.000	for segment #3 (1000+31.000 to 1000+54.000), The ramp type for Ramp Alignment RGPNBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+31.000	1000+54.000	for segment #3 (1000+31.000 to 1000+54.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+54.000	1000+92.000	for segment #4 (1000+54.000 to 1000+92.000), The ramp type for Ramp Alignment RGPNBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+54.000	1000+92.000	for segment #4 (1000+54.000 to 1000+92.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+92.000	1001+25.000	for segment #5 (1000+92.000 to 1001+25.000), The ramp type for Ramp Alignment RGPNBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+92.000	1001+25.000	for segment #5 (1000+92.000 to 1001+25.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+25.000	1001+52.000	for segment #6 (1001+25.000 to 1001+52.000), The ramp type for Ramp Alignment RGPNBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+25.000	1001+52.000	for segment #6 (1001+25.000 to 1001+52.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+52.000	1001+61.000	for segment #7 (1001+52.000 to 1001+61.000), The ramp type for Ramp Alignment RGPNBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+52.000	1001+61.000	for segment #7 (1001+52.000 to 1001+61.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+61.000	1001+96.000	for segment #8 (1001+61.000 to 1001+96.000), The ramp type for Ramp Alignment RGPNBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+61.000	1001+96.000	for segment #8 (1001+61.000 to 1001+96.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+96.000	1002+13.000	for segment #9 (1001+96.000 to 1002+13.000), The ramp type for Ramp Alignment RGPNBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+96.000	1002+13.000	for segment #9 (1001+96.000 to 1002+13.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+13.000	1002+32.000	for segment #10 (1002+13.000 to 1002+32.000), The ramp type for Ramp Alignment RGPNBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+13.000	1002+32.000	for segment #10 (1002+13.000 to 1002+32.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+13.000	1002+32.000	for segment #10 (1002+13.000 to 1002+32.000), Right shoulder width (1.75 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+32.000	1002+43.000	for segment #11 (1002+32.000 to 1002+43.000), The ramp type for Ramp Alignment RGPNBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+32.000	1002+43.000	for segment #11 (1002+32.000 to 1002+43.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+32.000	1002+43.000	for segment #11 (1002+32.000 to 1002+43.000), Right shoulder width (1.33 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+43.000	1002+68.000	for segment #12 (1002+43.000 to 1002+68.000), The ramp type for Ramp Alignment RGPNBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+43.000	1002+68.000	for segment #12 (1002+43.000 to 1002+68.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+43.000	1002+68.000	for segment #12 (1002+43.000 to 1002+68.000), Right shoulder width (0.83 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1002+68.000	1002+85.000	for segment #13 (1002+68.000 to 1002+85.000), The ramp type for Ramp Alignment RGPNBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+68.000	1002+85.000	for segment #13 (1002+68.000 to 1002+85.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+68.000	1002+85.000	for segment #13 (1002+68.000 to 1002+85.000), Right shoulder width (0.24 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+85.000	1006+20.152	for segment #14 (1002+85.000 to 1006+20.152), The ramp type for Ramp Alignment RGPNBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+85.000	1006+20.152	for segment #14 (1002+85.000 to 1006+20.152), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+85.000	1006+20.152	for segment #14 (1002+85.000 to 1006+20.152), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:23 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:23:07 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBNRVS0
Highway Comment: Imported from RGPNBNRVS0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:22:57 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1003+51.925
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1003+51.925
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

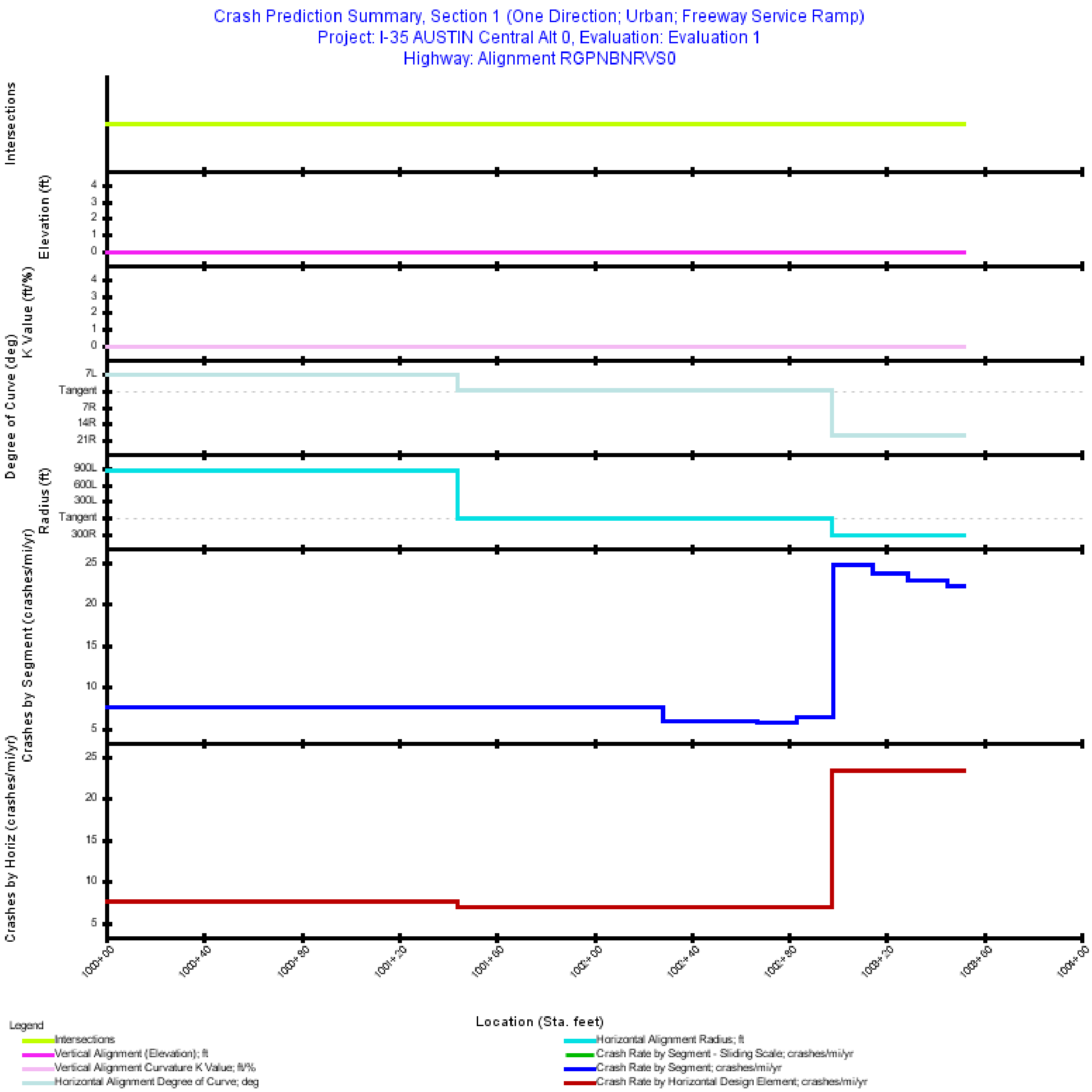

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1002+28.000	228.00	0.0432	2030: 21,050
2	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+28.000	1002+36.000	8.00	0.0015	2030: 21,050
3	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+36.000	1002+52.000	16.00	0.0030	2030: 21,050
4	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+52.000	1002+67.000	15.00	0.0028	2030: 21,050
5	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+67.000	1002+83.000	16.00	0.0030	2030: 21,050
6	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+83.000	1002+98.000	15.00	0.0028	2030: 21,050
7	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+98.000	1003+14.000	16.00	0.0030	2030: 21,050
8	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+14.000	1003+29.000	15.00	0.0028	2030: 21,050
9	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+29.000	1003+45.000	16.00	0.0030	2030: 21,050
10	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+45.000	1003+51.925	6.93	0.0013	2030: 21,050

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0667**
Average Future Road AADT (vpd)	**21,050**
Predicted Crashes	
Total Crashes	**0.65**
Fatal and Injury Crashes	**0.30**
Property-Damage-Only Crashes	**0.35**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**47**
Percent Property-Damage-Only Crashes (%)	**53**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**9.7528**
FI Crash Rate (crashes/mi/yr)	**4.5416**
PDO Crash Rate (crashes/mi/yr)	**5.2112**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.51**
Travel Crash Rate (crashes/million veh-mi)	**1.27**
Travel FI Crash Rate (crashes/million veh-mi)	**0.59**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.68**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1002+28.000	0.0432	0.330	0.3297	0.1591	0.1706	7.6345	0.99
2	1002+28.000	1002+36.000	0.0015	0.009	0.0090	0.0044	0.0046	5.9620	0.78
3	1002+36.000	1002+52.000	0.0030	0.018	0.0181	0.0088	0.0092	5.9620	0.78
4	1002+52.000	1002+67.000	0.0028	0.017	0.0169	0.0083	0.0086	5.9541	0.78
5	1002+67.000	1002+83.000	0.0030	0.017	0.0173	0.0084	0.0090	5.7234	0.74
6	1002+83.000	1002+98.000	0.0028	0.018	0.0184	0.0086	0.0097	6.4669	0.84
7	1002+98.000	1003+14.000	0.0030	0.075	0.0748	0.0333	0.0415	24.6731	3.21
8	1003+14.000	1003+29.000	0.0028	0.068	0.0675	0.0296	0.0379	23.7463	3.09
9	1003+29.000	1003+45.000	0.0030	0.069	0.0693	0.0299	0.0394	22.8588	2.98
10	1003+45.000	1003+51.925	0.0013	0.029	0.0292	0.0124	0.0167	22.2266	2.89
Total			0.0667	0.650	0.6501	0.3027	0.3473	9.7528	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+43.864	0.0272	0.208	0.2080	0.1004	0.1076	7.6345	0.99
Tangent	1001+43.864	1002+97.282	0.0291	0.201	0.2005	0.0968	0.1037	6.9005	0.90
Simple Curve 2	1002+97.282	1003+51.925	0.0103	0.241	0.2415	0.1055	0.1360	23.3381	3.04

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.65	0.30	46.567	0.35	53.433
Total	0.65	0.30	46.567	0.35	53.433
Average	0.65	0.30	46.567	0.35	53.433

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0034	0.0103	0.0655	0.0799	0.1706
2	0.0001	0.0003	0.0018	0.0022	0.0046
3	0.0002	0.0006	0.0036	0.0044	0.0092
4	0.0002	0.0005	0.0034	0.0042	0.0086
5	0.0002	0.0005	0.0034	0.0042	0.0090
6	0.0002	0.0006	0.0036	0.0043	0.0097
7	0.0007	0.0022	0.0137	0.0167	0.0415
8	0.0006	0.0019	0.0122	0.0148	0.0379
9	0.0006	0.0019	0.0123	0.0150	0.0394
10	0.0003	0.0008	0.0051	0.0062	0.0167
Total	0.0065	0.0196	0.1246	0.1521	0.3473

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.8	0.01	1.0
Highway Segment	Collision with Fixed Object	0.16	24.7	0.18	27.6	0.34	52.3
Highway Segment	Collision with Other Object	0.01	1.7	0.04	5.4	0.05	7.1
Highway Segment	Other Single-vehicle Collision	0.05	7.1	0.03	4.1	0.07	11.2
Highway Segment	Collision with Parked Vehicle	0.00	0.5	0.00	0.6	0.01	1.1
Highway Segment	Total Single Vehicle Crashes	0.22	34.2	0.25	38.5	0.47	72.7
Highway Segment	Right-Angle Collision	0.00	0.4	0.00	0.3	0.00	0.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.4	0.00	0.4	0.01	0.7
Highway Segment	Rear-end Collision	0.06	9.3	0.07	10.3	0.13	19.6
Highway Segment	Sideswipe, Same Direction Collision	0.01	2.2	0.03	4.0	0.04	6.2
Highway Segment	Total Multiple Vehicle Crashes	0.08	12.4	0.10	14.9	0.18	27.3
Highway Segment	Total Highway Segment Crashes	0.30	46.6	0.35	53.4	0.65	100.0
	Total Crashes	0.30	46.6	0.35	53.4	0.65	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1002+28.000	for segment #1 (1000+00.000 to 1002+28.000), The ramp type for Ramp Alignment RGPNBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1002+28.000	for segment #1 (1000+00.000 to 1002+28.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1002+28.000	for segment #1 (1000+00.000 to 1002+28.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+28.000	1002+36.000	for segment #2 (1002+28.000 to 1002+36.000), The ramp type for Ramp Alignment RGPNBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+28.000	1002+36.000	for segment #2 (1002+28.000 to 1002+36.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+28.000	1002+36.000	for segment #2 (1002+28.000 to 1002+36.000), Right shoulder width (0.26 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+36.000	1002+52.000	for segment #3 (1002+36.000 to 1002+52.000), The ramp type for Ramp Alignment RGPNBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+36.000	1002+52.000	for segment #3 (1002+36.000 to 1002+52.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+36.000	1002+52.000	for segment #3 (1002+36.000 to 1002+52.000), Right shoulder width (1.03 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+52.000	1002+67.000	for segment #4 (1002+52.000 to 1002+67.000), The ramp type for Ramp Alignment RGPNBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+52.000	1002+67.000	for segment #4 (1002+52.000 to 1002+67.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+67.000	1002+83.000	for segment #5 (1002+67.000 to 1002+83.000), The ramp type for Ramp Alignment RGPNBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+67.000	1002+83.000	for segment #5 (1002+67.000 to 1002+83.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+83.000	1002+98.000	for segment #6 (1002+83.000 to 1002+98.000), The ramp type for Ramp Alignment RGPNBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+83.000	1002+98.000	for segment #6 (1002+83.000 to 1002+98.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+98.000	1003+14.000	for segment #7 (1002+98.000 to 1003+14.000), The ramp type for Ramp Alignment RGPNBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+98.000	1003+14.000	for segment #7 (1002+98.000 to 1003+14.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+14.000	1003+29.000	for segment #8 (1003+14.000 to 1003+29.000), The ramp type for Ramp Alignment RGPNBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+14.000	1003+29.000	for segment #8 (1003+14.000 to 1003+29.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+29.000	1003+45.000	for segment #9 (1003+29.000 to 1003+45.000), The ramp type for Ramp Alignment RGPNBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+29.000	1003+45.000	for segment #9 (1003+29.000 to 1003+45.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+45.000	1003+51.925	for segment #10 (1003+45.000 to 1003+51.925), The ramp type for Ramp Alignment RGPNBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+45.000	1003+51.925	for segment #10 (1003+45.000 to 1003+51.925), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1002+28.000	for segment #1 (1000+00.000 to 1002+28.000), traffic volume (21,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1002+28.000	1002+36.000	for segment #2 (1002+28.000 to 1002+36.000), traffic volume (21,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1002+36.000	1002+52.000	for segment #3 (1002+36.000 to 1002+52.000), traffic volume (21,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1002+52.000	1002+67.000	for segment #4 (1002+52.000 to 1002+67.000), traffic volume (21,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1002+67.000	1002+83.000	for segment #5 (1002+67.000 to 1002+83.000), traffic volume (21,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1002+83.000	1002+98.000	for segment #6 (1002+83.000 to 1002+98.000), traffic volume (21,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1002+98.000	1003+14.000	for segment #7 (1002+98.000 to 1003+14.000), traffic volume (21,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1003+14.000	1003+29.000	for segment #8 (1003+14.000 to 1003+29.000), traffic volume (21,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1003+29.000	1003+45.000	for segment #9 (1003+29.000 to 1003+45.000), traffic volume (21,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1003+45.000	1003+51.925	for segment #10 (1003+45.000 to 1003+51.925), traffic volume (21,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Evaluation Date: Thu May 27 13:29:21 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBXHLY0
Highway Comment: Imported from RGPNBXHLY0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:29:11 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1003+18.866
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1003+18.866
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

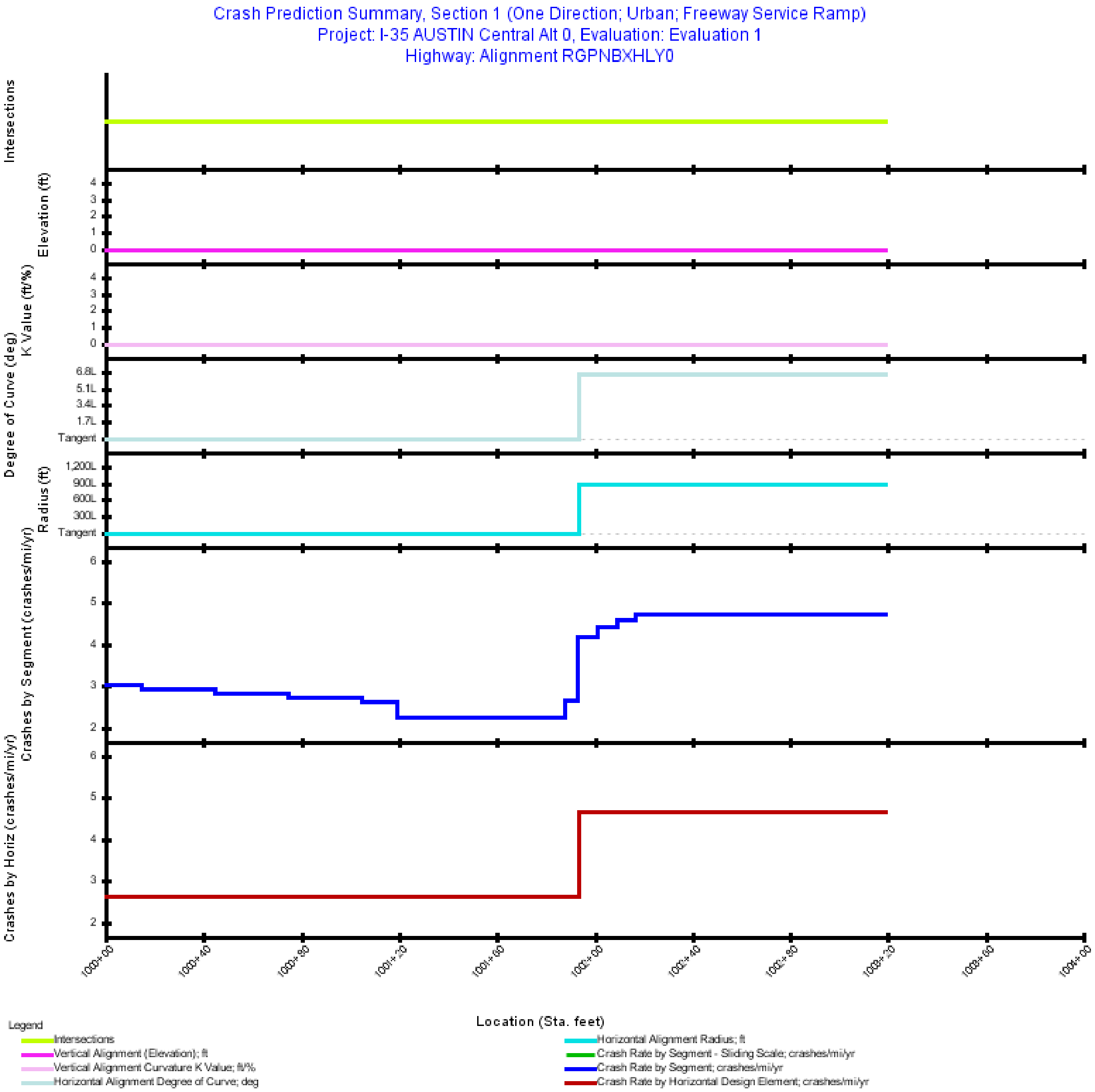

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1000+15.000	15.00	0.0028	2030: 8,400
2	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+15.000	1000+45.000	30.00	0.0057	2030: 8,400
3	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+45.000	1000+75.000	30.00	0.0057	2030: 8,400
4	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+75.000	1001+05.000	30.00	0.0057	2030: 8,400
5	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+05.000	1001+19.000	14.00	0.0027	2030: 8,400
6	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+19.000	1001+88.000	69.00	0.0131	2030: 8,400
7	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+88.000	1001+93.000	5.00	0.0009	2030: 8,400
8	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+93.000	1002+01.000	8.00	0.0015	2030: 8,400
9	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+01.000	1002+09.000	8.00	0.0015	2030: 8,400
10	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+09.000	1002+17.000	8.00	0.0015	2030: 8,400
11	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+17.000	1003+18.866	101.87	0.0193	2030: 8,400

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0604**
Average Future Road AADT (vpd)	**8,400**
Predicted Crashes	
Total Crashes	**0.21**
Fatal and Injury Crashes	**0.10**
Property-Damage-Only Crashes	**0.11**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**3.4286**
FI Crash Rate (crashes/mi/yr)	**1.6347**
PDO Crash Rate (crashes/mi/yr)	**1.7939**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.19**
Travel Crash Rate (crashes/million veh-mi)	**1.12**
Travel FI Crash Rate (crashes/million veh-mi)	**0.53**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.58**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+15.000	0.0028	0.009	0.0086	0.0043	0.0043	3.0309	0.99
2	1000+15.000	1000+45.000	0.0057	0.017	0.0167	0.0082	0.0085	2.9412	0.96
3	1000+45.000	1000+75.000	0.0057	0.016	0.0161	0.0078	0.0083	2.8263	0.92
4	1000+75.000	1001+05.000	0.0057	0.015	0.0154	0.0074	0.0081	2.7164	0.89
5	1001+05.000	1001+19.000	0.0027	0.007	0.0070	0.0033	0.0037	2.6389	0.86
6	1001+19.000	1001+88.000	0.0131	0.029	0.0294	0.0137	0.0157	2.2496	0.73
7	1001+88.000	1001+93.000	0.0009	0.003	0.0025	0.0012	0.0013	2.6458	0.86
8	1001+93.000	1002+01.000	0.0015	0.006	0.0063	0.0029	0.0034	4.1732	1.36
9	1002+01.000	1002+09.000	0.0015	0.007	0.0067	0.0031	0.0036	4.4302	1.45
10	1002+09.000	1002+17.000	0.0015	0.007	0.0070	0.0033	0.0037	4.6011	1.50
11	1002+17.000	1003+18.866	0.0193	0.091	0.0913	0.0436	0.0477	4.7342	1.54
Total			0.0604	0.207	0.2071	0.0987	0.1083	3.4286	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1001+93.485	0.0366	0.096	0.0961	0.0459	0.0502	2.6224	0.86
Simple Curve 1	1001+93.485	1003+18.866	0.0237	0.111	0.1110	0.0528	0.0582	4.6727	1.52

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.21	0.10	47.678	0.11	52.322
Total	0.21	0.10	47.678	0.11	52.322
Average	0.21	0.10	47.678	0.11	52.322

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0001	0.0004	0.0015	0.0023	0.0043
2	0.0002	0.0007	0.0029	0.0044	0.0085
3	0.0002	0.0006	0.0027	0.0042	0.0083
4	0.0002	0.0006	0.0026	0.0039	0.0081
5	0.0001	0.0003	0.0012	0.0018	0.0037
6	0.0004	0.0012	0.0052	0.0069	0.0157
7	0.0000	0.0001	0.0004	0.0006	0.0013
8	0.0001	0.0002	0.0010	0.0016	0.0034
9	0.0001	0.0003	0.0011	0.0017	0.0036
10	0.0001	0.0003	0.0012	0.0018	0.0037
11	0.0012	0.0036	0.0154	0.0234	0.0477
Total	0.0027	0.0083	0.0353	0.0524	0.1083

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.00	1.1	0.00	1.2
Highway Segment	Collision with Fixed Object	0.07	33.2	0.07	34.2	0.14	67.3
Highway Segment	Collision with Other Object	0.01	2.3	0.01	6.6	0.02	9.0
Highway Segment	Other Single-vehicle Collision	0.02	9.6	0.01	5.1	0.03	14.7
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.8	0.00	1.5
Highway Segment	Total Single Vehicle Crashes	0.10	46.0	0.10	47.7	0.19	93.7
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Rear-end Collision	0.00	1.3	0.01	3.2	0.01	4.5
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.3	0.00	1.2	0.00	1.5
Highway Segment	Total Multiple Vehicle Crashes	0.00	1.7	0.01	4.6	0.01	6.3
Highway Segment	Total Highway Segment Crashes	0.10	47.7	0.11	52.3	0.21	100.0
	Total Crashes	0.10	47.7	0.11	52.3	0.21	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+15.000	for segment #1 (1000+00.000 to 1000+15.000), The ramp type for Ramp Alignment RGPNBXHLY0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+15.000	1000+45.000	for segment #2 (1000+15.000 to 1000+45.000), The ramp type for Ramp Alignment RGPNBXHLY0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+45.000	1000+75.000	for segment #3 (1000+45.000 to 1000+75.000), The ramp type for Ramp Alignment RGPNBXHLY0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+75.000	1001+05.000	for segment #4 (1000+75.000 to 1001+05.000), The ramp type for Ramp Alignment RGPNBXHLY0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+05.000	1001+19.000	for segment #5 (1001+05.000 to 1001+19.000), The ramp type for Ramp Alignment RGPNBXHLY0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+19.000	1001+88.000	for segment #6 (1001+19.000 to 1001+88.000), The ramp type for Ramp Alignment RGPNBXHLY0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+88.000	1001+93.000	for segment #7 (1001+88.000 to 1001+93.000), The ramp type for Ramp Alignment RGPNBXHLY0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+93.000	1002+01.000	for segment #8 (1001+93.000 to 1002+01.000), The ramp type for Ramp Alignment RGPNBXHLY0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+01.000	1002+09.000	for segment #9 (1002+01.000 to 1002+09.000), The ramp type for Ramp Alignment RGPNBXHLY0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+09.000	1002+17.000	for segment #10 (1002+09.000 to 1002+17.000), The ramp type for Ramp Alignment RGPNBXHLY0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+17.000	1003+18.866	for segment #11 (1002+17.000 to 1003+18.866), The ramp type for Ramp Alignment RGPNBXHLY0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

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Evaluation Date: Thu May 27 13:31:24 CDT 2021
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User Name: chmeyer
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Project Comment: Created Fri May 14 16:42:30 CDT 2021
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Highway Title: Alignment RGPNBXRVS0
Highway Comment: Imported from RGPNBXRVS0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:31:14 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1006+21.668
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
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Last Year of Analysis: 2030
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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1006+21.668
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

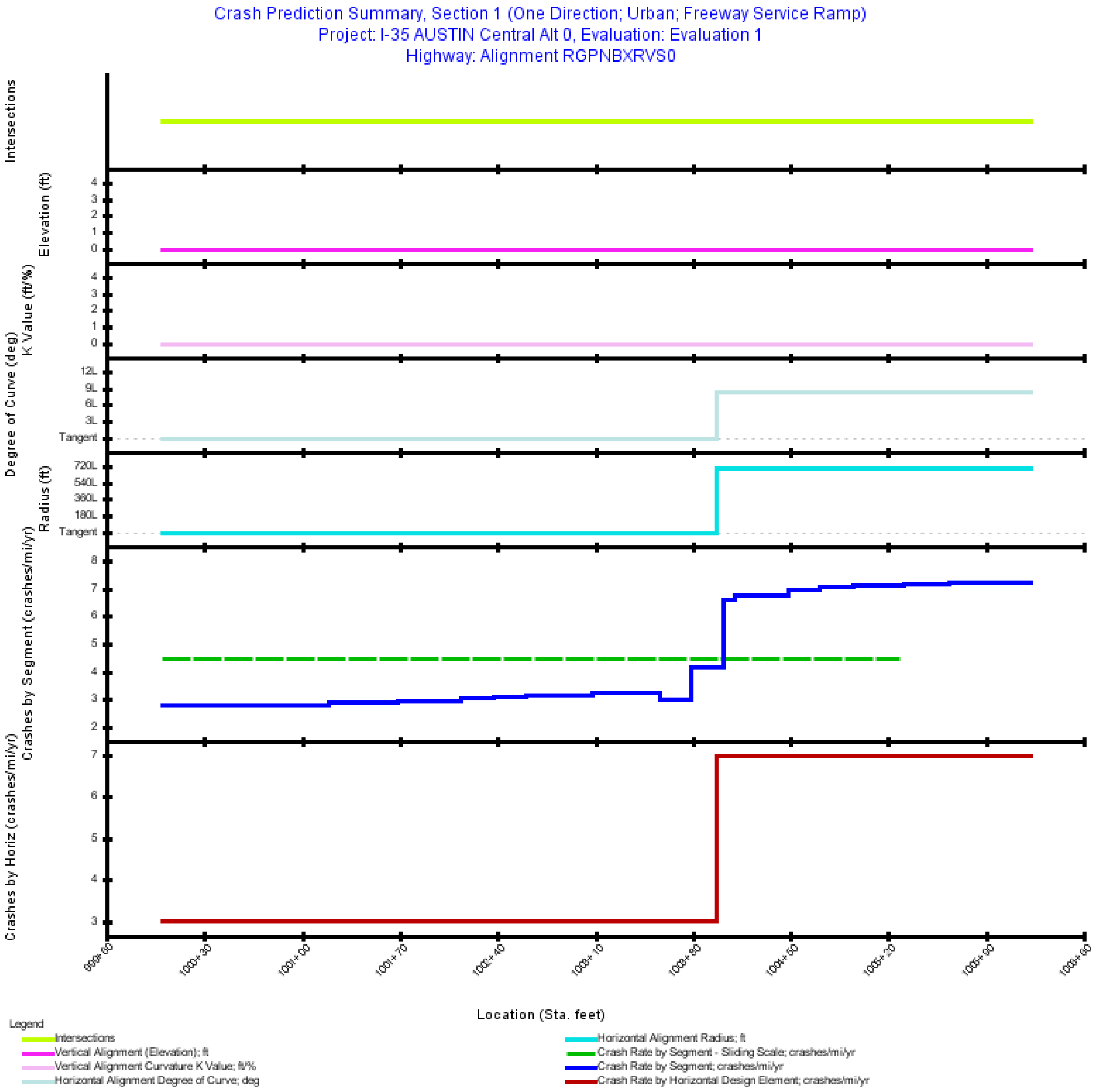

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1000+24.000	24.00	0.0045	2030: 10,800
2	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+24.000	1000+34.000	10.00	0.0019	2030: 10,800
3	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+34.000	1000+72.000	38.00	0.0072	2030: 10,800
4	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+72.000	1001+02.000	30.00	0.0057	2030: 10,800
5	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+02.000	1001+19.000	17.00	0.0032	2030: 10,800
6	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+19.000	1001+69.000	50.00	0.0095	2030: 10,800
7	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+69.000	1002+14.000	45.00	0.0085	2030: 10,800
8	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+14.000	1002+37.000	23.00	0.0044	2030: 10,800
9	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+37.000	1002+61.000	24.00	0.0045	2030: 10,800
10	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+61.000	1003+08.000	47.00	0.0089	2030: 10,800
11	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+08.000	1003+56.000	48.00	0.0091	2030: 10,800
12	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+56.000	1003+79.000	23.00	0.0044	2030: 10,800
13	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+79.000	1004+02.000	23.00	0.0044	2030: 10,800
14	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+02.000	1004+10.000	8.00	0.0015	2030: 10,800
15	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+10.000	1004+48.000	38.00	0.0072	2030: 10,800
16	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+48.000	1004+71.000	23.00	0.0044	2030: 10,800
17	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+71.000	1004+95.000	24.00	0.0045	2030: 10,800
18	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+95.000	1005+31.000	36.00	0.0068	2030: 10,800
19	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1005+31.000	1005+41.000	10.00	0.0019	2030: 10,800
20	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1005+41.000	1005+64.000	23.00	0.0044	2030: 10,800
21	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1005+64.000	1005+92.000	28.00	0.0053	2030: 10,800
22	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1005+92.000	1006+21.668	29.67	0.0056	2030: 10,800

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1177**
Average Future Road AADT (vpd)	**10,800**
Predicted Crashes	
Total Crashes	**0.52**
Fatal and Injury Crashes	**0.25**
Property-Damage-Only Crashes	**0.28**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**4.4544**
FI Crash Rate (crashes/mi/yr)	**2.1229**
PDO Crash Rate (crashes/mi/yr)	**2.3316**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.46**
Travel Crash Rate (crashes/million veh-mi)	**1.13**
Travel FI Crash Rate (crashes/million veh-mi)	**0.54**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.59**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+24.000	0.0045	0.013	0.0128	0.0059	0.0069	2.8114	0.71
2	1000+24.000	1000+34.000	0.0019	0.005	0.0053	0.0024	0.0029	2.8039	0.71
3	1000+34.000	1000+72.000	0.0072	0.020	0.0201	0.0092	0.0109	2.7934	0.71
4	1000+72.000	1001+02.000	0.0057	0.016	0.0158	0.0072	0.0086	2.7787	0.70
5	1001+02.000	1001+19.000	0.0032	0.009	0.0090	0.0041	0.0049	2.8045	0.71
6	1001+19.000	1001+69.000	0.0095	0.027	0.0272	0.0125	0.0147	2.8673	0.73
7	1001+69.000	1002+14.000	0.0085	0.025	0.0252	0.0116	0.0136	2.9590	0.75
8	1002+14.000	1002+37.000	0.0044	0.013	0.0132	0.0061	0.0071	3.0265	0.77
9	1002+37.000	1002+61.000	0.0045	0.014	0.0140	0.0065	0.0075	3.0741	0.78
10	1002+61.000	1003+08.000	0.0089	0.028	0.0281	0.0132	0.0149	3.1551	0.80
11	1003+08.000	1003+56.000	0.0091	0.029	0.0295	0.0140	0.0155	3.2487	0.82
12	1003+56.000	1003+79.000	0.0044	0.013	0.0131	0.0063	0.0068	3.0000	0.76
13	1003+79.000	1004+02.000	0.0044	0.018	0.0181	0.0086	0.0094	4.1455	1.05
14	1004+02.000	1004+10.000	0.0015	0.010	0.0100	0.0047	0.0053	6.6024	1.68
15	1004+10.000	1004+48.000	0.0072	0.049	0.0486	0.0230	0.0257	6.7587	1.72
16	1004+48.000	1004+71.000	0.0044	0.030	0.0304	0.0146	0.0158	6.9730	1.77
17	1004+71.000	1004+95.000	0.0045	0.032	0.0321	0.0156	0.0166	7.0714	1.79
18	1004+95.000	1005+31.000	0.0068	0.049	0.0485	0.0236	0.0249	7.1104	1.80
19	1005+31.000	1005+41.000	0.0019	0.013	0.0135	0.0066	0.0069	7.1406	1.81
20	1005+41.000	1005+64.000	0.0044	0.031	0.0312	0.0153	0.0159	7.1624	1.82
21	1005+64.000	1005+92.000	0.0053	0.038	0.0382	0.0188	0.0194	7.1964	1.83
22	1005+92.000	1006+21.668	0.0056	0.041	0.0407	0.0201	0.0205	7.2352	1.83
Total			0.1177	0.524	0.5245	0.2499	0.2745	4.4544	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1003+96.784	0.0751	0.227	0.2272	0.1057	0.1215	3.0232	0.77
Simple Curve 1	1003+96.784	1006+21.668	0.0426	0.297	0.2973	0.1442	0.1531	6.9797	1.77

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.52	0.25	47.657	0.28	52.343
Total	0.52	0.25	47.657	0.28	52.343
Average	0.52	0.25	47.657	0.28	52.343

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0002	0.0005	0.0021	0.0032	0.0069
2	0.0001	0.0002	0.0009	0.0013	0.0029
3	0.0003	0.0008	0.0033	0.0049	0.0109
4	0.0002	0.0006	0.0025	0.0039	0.0086
5	0.0001	0.0003	0.0015	0.0022	0.0049
6	0.0003	0.0010	0.0044	0.0067	0.0147
7	0.0003	0.0010	0.0041	0.0062	0.0136
8	0.0002	0.0005	0.0022	0.0033	0.0071
9	0.0002	0.0005	0.0023	0.0035	0.0075
10	0.0004	0.0011	0.0047	0.0071	0.0149
11	0.0004	0.0012	0.0050	0.0075	0.0155
12	0.0002	0.0006	0.0023	0.0032	0.0068
13	0.0002	0.0007	0.0031	0.0046	0.0094
14	0.0001	0.0004	0.0017	0.0025	0.0053
15	0.0006	0.0019	0.0081	0.0123	0.0257
16	0.0004	0.0012	0.0052	0.0078	0.0158
17	0.0004	0.0013	0.0055	0.0083	0.0166
18	0.0006	0.0020	0.0084	0.0126	0.0249
19	0.0002	0.0005	0.0023	0.0035	0.0069
20	0.0004	0.0013	0.0054	0.0082	0.0159
21	0.0005	0.0016	0.0067	0.0101	0.0194
22	0.0006	0.0017	0.0071	0.0108	0.0205
Total	0.0069	0.0208	0.0886	0.1337	0.2745

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.17	33.1	0.18	34.0	0.35	67.1
Highway Segment	Collision with Other Object	0.01	2.3	0.04	6.6	0.05	8.9
Highway Segment	Other Single-vehicle Collision	0.05	9.5	0.03	5.1	0.08	14.6
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.8	0.01	1.4
Highway Segment	Total Single Vehicle Crashes	0.24	45.8	0.25	47.5	0.49	93.3
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Rear-end Collision	0.01	1.4	0.02	3.4	0.03	4.7
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.3	0.01	1.3	0.01	1.6
Highway Segment	Total Multiple Vehicle Crashes	0.01	1.8	0.03	4.9	0.04	6.7
Highway Segment	Total Highway Segment Crashes	0.25	47.7	0.28	52.3	0.52	100.0
	Total Crashes	0.25	47.7	0.28	52.3	0.52	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+24.000	for segment #1 (1000+00.000 to 1000+24.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1000+24.000	for segment #1 (1000+00.000 to 1000+24.000), Right shoulder width (13.75 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
1000+24.000	1000+34.000	for segment #2 (1000+24.000 to 1000+34.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+24.000	1000+34.000	for segment #2 (1000+24.000 to 1000+34.000), Right shoulder width (13.39 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
1000+34.000	1000+72.000	for segment #3 (1000+34.000 to 1000+72.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+34.000	1000+72.000	for segment #3 (1000+34.000 to 1000+72.000), Right shoulder width (12.88 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
1000+72.000	1001+02.000	for segment #4 (1000+72.000 to 1001+02.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+72.000	1001+02.000	for segment #4 (1000+72.000 to 1001+02.000), Right shoulder width (12.16 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
1001+02.000	1001+19.000	for segment #5 (1001+02.000 to 1001+19.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+19.000	1001+69.000	for segment #6 (1001+19.000 to 1001+69.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+69.000	1002+14.000	for segment #7 (1001+69.000 to 1002+14.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+14.000	1002+37.000	for segment #8 (1002+14.000 to 1002+37.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+37.000	1002+61.000	for segment #9 (1002+37.000 to 1002+61.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+61.000	1003+08.000	for segment #10 (1002+61.000 to 1003+08.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+08.000	1003+56.000	for segment #11 (1003+08.000 to 1003+56.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+56.000	1003+79.000	for segment #12 (1003+56.000 to 1003+79.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+79.000	1004+02.000	for segment #13 (1003+79.000 to 1004+02.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+02.000	1004+10.000	for segment #14 (1004+02.000 to 1004+10.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+10.000	1004+48.000	for segment #15 (1004+10.000 to 1004+48.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+48.000	1004+71.000	for segment #16 (1004+48.000 to 1004+71.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+71.000	1004+95.000	for segment #17 (1004+71.000 to 1004+95.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+71.000	1004+95.000	for segment #17 (1004+71.000 to 1004+95.000), Left shoulder width (1.74 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+95.000	1005+31.000	for segment #18 (1004+95.000 to 1005+31.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+95.000	1005+31.000	for segment #18 (1004+95.000 to 1005+31.000), Left shoulder width (1.10 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1005+31.000	1005+41.000	for segment #19 (1005+31.000 to 1005+41.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+31.000	1005+41.000	for segment #19 (1005+31.000 to 1005+41.000), Left shoulder width (0.60 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+41.000	1005+64.000	for segment #20 (1005+41.000 to 1005+64.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+41.000	1005+64.000	for segment #20 (1005+41.000 to 1005+64.000), Left shoulder width (0.25 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+64.000	1005+92.000	for segment #21 (1005+64.000 to 1005+92.000), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+64.000	1005+92.000	for segment #21 (1005+64.000 to 1005+92.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+92.000	1006+21.668	for segment #22 (1005+92.000 to 1006+21.668), The ramp type for Ramp Alignment RGPNBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+92.000	1006+21.668	for segment #22 (1005+92.000 to 1006+21.668), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:22 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:22:26 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBNOLF0
Highway Comment: Imported from RGPNBNOLF0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:22:16 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1004+65.450
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1004+65.450
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

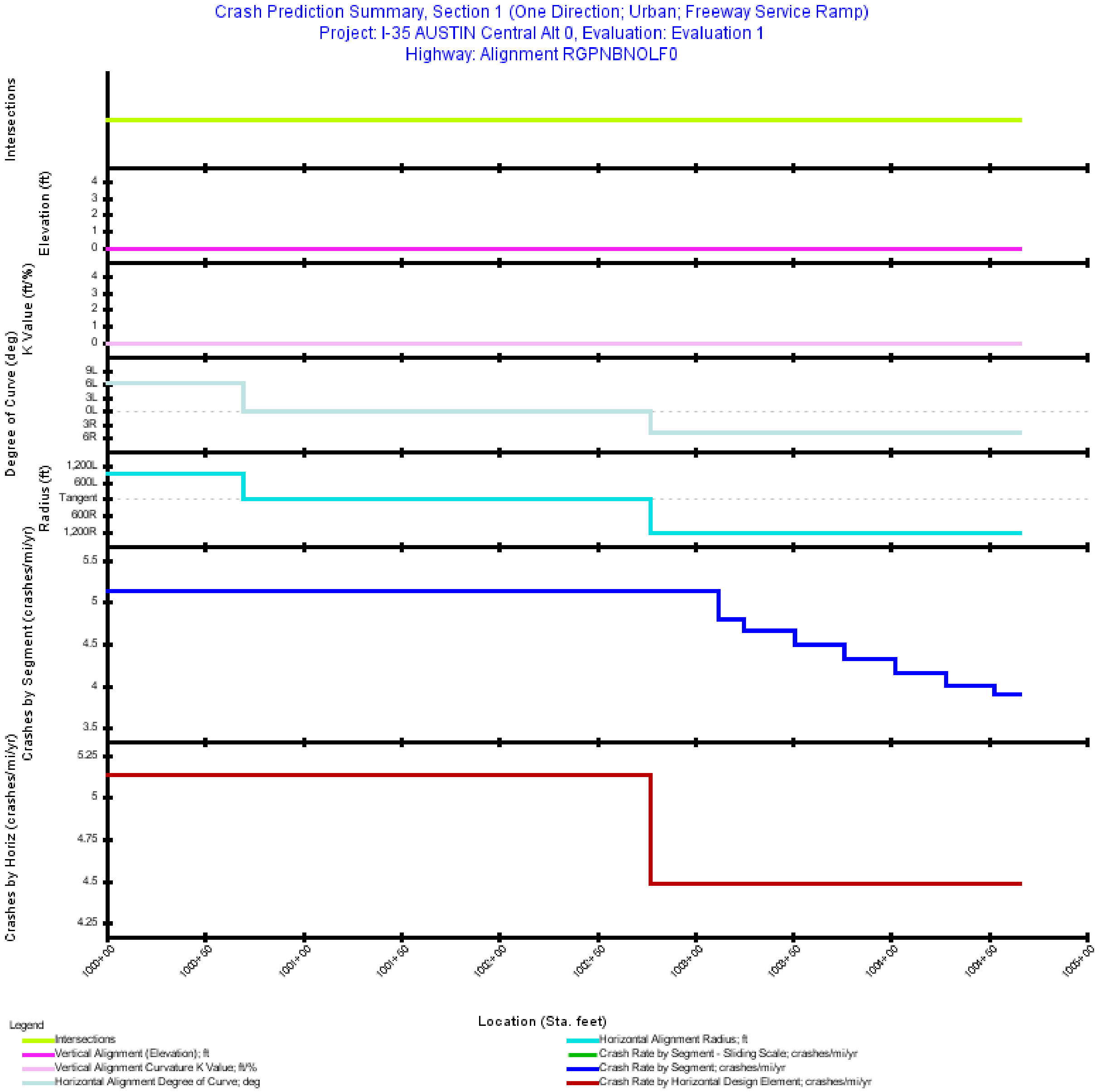

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1003+12.000	312.00	0.0591	2030: 17,400
2	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+12.000	1003+25.000	13.00	0.0025	2030: 17,400
3	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+25.000	1003+51.000	26.00	0.0049	2030: 17,400
4	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+51.000	1003+76.000	25.00	0.0047	2030: 17,400
5	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+76.000	1004+02.000	26.00	0.0049	2030: 17,400
6	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1004+02.000	1004+28.000	26.00	0.0049	2030: 17,400
7	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1004+28.000	1004+53.000	25.00	0.0047	2030: 17,400
8	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1004+53.000	1004+65.450	12.45	0.0024	2030: 17,400

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0882**
Average Future Road AADT (vpd)	**17,400**
Predicted Crashes	
Total Crashes	**0.43**
Fatal and Injury Crashes	**0.19**
Property-Damage-Only Crashes	**0.24**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**43**
Percent Property-Damage-Only Crashes (%)	**57**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**4.8728**
FI Crash Rate (crashes/mi/yr)	**2.1071**
PDO Crash Rate (crashes/mi/yr)	**2.7657**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.56**
Travel Crash Rate (crashes/million veh-mi)	**0.77**
Travel FI Crash Rate (crashes/million veh-mi)	**0.33**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.43**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1003+12.000	0.0591	0.304	0.3037	0.1336	0.1701	5.1392	0.81
2	1003+12.000	1003+25.000	0.0025	0.012	0.0118	0.0051	0.0067	4.7929	0.76
3	1003+25.000	1003+51.000	0.0049	0.023	0.0229	0.0098	0.0131	4.6563	0.73
4	1003+51.000	1003+76.000	0.0047	0.021	0.0212	0.0089	0.0123	4.4842	0.71
5	1003+76.000	1004+02.000	0.0049	0.021	0.0213	0.0088	0.0125	4.3193	0.68
6	1004+02.000	1004+28.000	0.0049	0.021	0.0205	0.0083	0.0121	4.1582	0.66
7	1004+28.000	1004+53.000	0.0047	0.019	0.0190	0.0076	0.0114	4.0069	0.63
8	1004+53.000	1004+65.450	0.0024	0.009	0.0092	0.0036	0.0056	3.8997	0.61
Total			0.0882	0.430	0.4296	0.1858	0.2438	4.8728	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1000+69.652	0.0132	0.068	0.0678	0.0298	0.0380	5.1392	0.81
Tangent	1000+69.652	1002+77.324	0.0393	0.202	0.2021	0.0889	0.1132	5.1392	0.81
Simple Curve 2	1002+77.324	1004+65.450	0.0356	0.160	0.1596	0.0670	0.0926	4.4801	0.70

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.43	0.19	43.243	0.24	56.757
Total	0.43	0.19	43.243	0.24	56.757
Average	0.43	0.19	43.243	0.24	56.757

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0026	0.0080	0.0517	0.0712	0.1701
2	0.0001	0.0003	0.0021	0.0026	0.0067
3	0.0002	0.0006	0.0040	0.0049	0.0131
4	0.0002	0.0006	0.0037	0.0045	0.0123
5	0.0002	0.0006	0.0036	0.0044	0.0125
6	0.0002	0.0005	0.0034	0.0042	0.0121
7	0.0002	0.0005	0.0031	0.0038	0.0114
8	0.0001	0.0002	0.0015	0.0018	0.0056
Total	0.0038	0.0114	0.0732	0.0974	0.2438

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.00	0.8	0.00	0.9
Highway Segment	Collision with Fixed Object	0.10	22.7	0.12	26.8	0.21	49.5
Highway Segment	Collision with Other Object	0.01	1.6	0.02	5.2	0.03	6.8
Highway Segment	Other Single-vehicle Collision	0.03	6.5	0.02	4.0	0.04	10.5
Highway Segment	Collision with Parked Vehicle	0.00	0.5	0.00	0.6	0.01	1.1
Highway Segment	Total Single Vehicle Crashes	0.14	31.5	0.16	37.4	0.30	68.8
Highway Segment	Right-Angle Collision	0.00	0.4	0.00	0.3	0.00	0.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.4	0.00	0.5	0.00	0.8
Highway Segment	Rear-end Collision	0.04	8.8	0.06	13.4	0.10	22.2
Highway Segment	Sideswipe, Same Direction Collision	0.01	2.1	0.02	5.2	0.03	7.3
Highway Segment	Total Multiple Vehicle Crashes	0.05	11.8	0.08	19.4	0.13	31.2
Highway Segment	Total Highway Segment Crashes	0.19	43.2	0.24	56.8	0.43	100.0
	Total Crashes	0.19	43.2	0.24	56.8	0.43	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1003+12.000	for segment #1 (1000+00.000 to 1003+12.000), The ramp type for Ramp Alignment RGPNBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+12.000	1003+25.000	for segment #2 (1003+12.000 to 1003+25.000), The ramp type for Ramp Alignment RGPNBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+25.000	1003+51.000	for segment #3 (1003+25.000 to 1003+51.000), The ramp type for Ramp Alignment RGPNBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+51.000	1003+76.000	for segment #4 (1003+51.000 to 1003+76.000), The ramp type for Ramp Alignment RGPNBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+76.000	1004+02.000	for segment #5 (1003+76.000 to 1004+02.000), The ramp type for Ramp Alignment RGPNBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1004+02.000	1004+28.000	for segment #6 (1004+02.000 to 1004+28.000), The ramp type for Ramp Alignment RGPNBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1004+28.000	1004+53.000	for segment #7 (1004+28.000 to 1004+53.000), The ramp type for Ramp Alignment RGPNBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1004+53.000	1004+65.450	for segment #8 (1004+53.000 to 1004+65.450), The ramp type for Ramp Alignment RGPNBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:32 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:32:06 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBXWODL0
Highway Comment: Imported from RGPNBXWODL0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:31:55 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1006+25.967
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1006+25.967
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

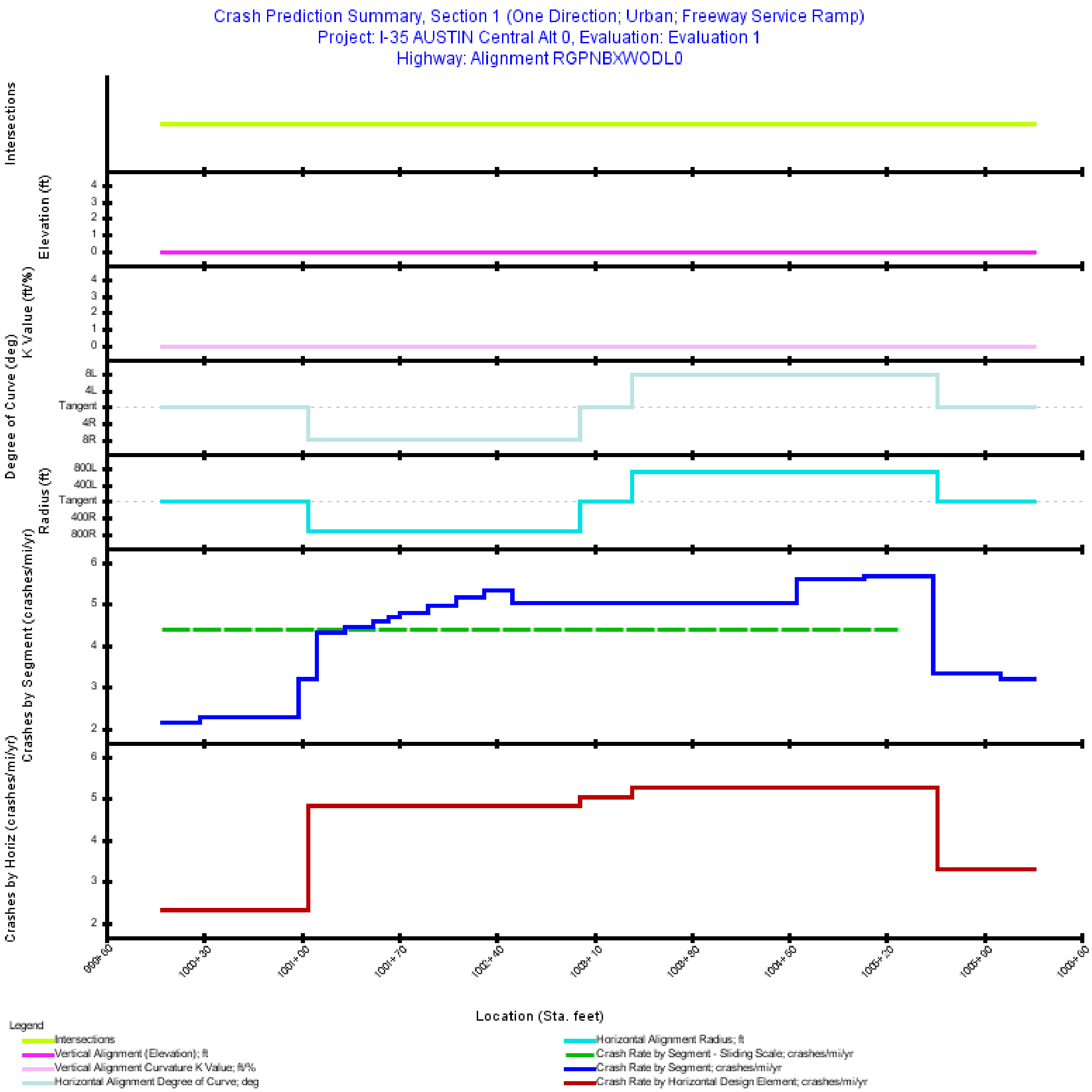

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1000+27.000	27.00	0.0051	2030: 9,650
2	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+27.000	1000+33.000	6.00	0.0011	2030: 9,650
3	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+33.000	1000+98.000	65.00	0.0123	2030: 9,650
4	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+98.000	1001+11.000	13.00	0.0025	2030: 9,650
5	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+11.000	1001+31.000	20.00	0.0038	2030: 9,650
6	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+31.000	1001+51.000	20.00	0.0038	2030: 9,650
7	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+51.000	1001+63.000	12.00	0.0023	2030: 9,650
8	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+63.000	1001+71.000	8.00	0.0015	2030: 9,650
9	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+71.000	1001+91.000	20.00	0.0038	2030: 9,650
10	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+91.000	1002+11.000	20.00	0.0038	2030: 9,650
11	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+11.000	1002+31.000	20.00	0.0038	2030: 9,650
12	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+31.000	1002+51.000	20.00	0.0038	2030: 9,650
13	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+51.000	1004+55.000	204.00	0.0386	2030: 9,650
14	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+55.000	1005+04.000	49.00	0.0093	2030: 9,650
15	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1005+04.000	1005+53.000	49.00	0.0093	2030: 9,650
16	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1005+53.000	1006+02.000	49.00	0.0093	2030: 9,650
17	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1006+02.000	1006+25.967	23.97	0.0045	2030: 9,650

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1186**
Average Future Road AADT (vpd)	**9,650**
Predicted Crashes	
Total Crashes	**0.52**
Fatal and Injury Crashes	**0.26**
Property-Damage-Only Crashes	**0.26**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**50**
Percent Property-Damage-Only Crashes (%)	**50**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**4.4052**
FI Crash Rate (crashes/mi/yr)	**2.1834**
PDO Crash Rate (crashes/mi/yr)	**2.2219**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.42**
Travel Crash Rate (crashes/million veh-mi)	**1.25**
Travel FI Crash Rate (crashes/million veh-mi)	**0.62**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.63**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+27.000	0.0051	0.011	0.0109	0.0051	0.0058	2.1363	0.61
2	1000+27.000	1000+33.000	0.0011	0.003	0.0026	0.0013	0.0014	2.3045	0.65
3	1000+33.000	1000+98.000	0.0123	0.028	0.0282	0.0135	0.0147	2.2906	0.65
4	1000+98.000	1001+11.000	0.0025	0.008	0.0079	0.0037	0.0042	3.2150	0.91
5	1001+11.000	1001+31.000	0.0038	0.016	0.0163	0.0075	0.0088	4.3158	1.23
6	1001+31.000	1001+51.000	0.0038	0.017	0.0169	0.0079	0.0090	4.4711	1.27
7	1001+51.000	1001+63.000	0.0023	0.011	0.0105	0.0049	0.0055	4.5998	1.31
8	1001+63.000	1001+71.000	0.0015	0.007	0.0071	0.0034	0.0037	4.6823	1.33
9	1001+71.000	1001+91.000	0.0038	0.018	0.0182	0.0087	0.0095	4.8004	1.36
10	1001+91.000	1002+11.000	0.0038	0.019	0.0188	0.0091	0.0098	4.9748	1.41
11	1002+11.000	1002+31.000	0.0038	0.019	0.0195	0.0095	0.0100	5.1561	1.46
12	1002+31.000	1002+51.000	0.0038	0.020	0.0202	0.0100	0.0103	5.3446	1.52
13	1002+51.000	1004+55.000	0.0386	0.195	0.1948	0.0970	0.0978	5.0418	1.43
14	1004+55.000	1005+04.000	0.0093	0.052	0.0520	0.0262	0.0259	5.6061	1.59
15	1005+04.000	1005+53.000	0.0093	0.053	0.0526	0.0268	0.0259	5.6714	1.61
16	1005+53.000	1006+02.000	0.0093	0.031	0.0310	0.0166	0.0145	3.3449	0.95
17	1006+02.000	1006+25.967	0.0045	0.015	0.0145	0.0078	0.0066	3.1877	0.91
Total			0.1186	0.522	0.5223	0.2588	0.2634	4.4052	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1001+04.740	0.0198	0.046	0.0458	0.0219	0.0240	2.3111	0.66
Simple Curve 1	1001+04.740	1003+00.069	0.0370	0.178	0.1783	0.0860	0.0923	4.8198	1.37
Tangent	1003+00.069	1003+36.978	0.0070	0.035	0.0352	0.0176	0.0177	5.0418	1.43
Simple Curve 2	1003+36.978	1005+56.539	0.0416	0.220	0.2196	0.1103	0.1093	5.2809	1.50
Tangent	1005+56.539	1006+25.967	0.0131	0.043	0.0433	0.0232	0.0201	3.2906	0.93

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.52	0.26	49.563	0.26	50.437
Total	0.52	0.26	49.563	0.26	50.437
Average	0.52	0.26	49.563	0.26	50.437

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0002	0.0005	0.0020	0.0025	0.0058
2	0.0000	0.0001	0.0005	0.0006	0.0014
3	0.0004	0.0013	0.0053	0.0065	0.0147
4	0.0001	0.0003	0.0014	0.0018	0.0042
5	0.0002	0.0007	0.0030	0.0036	0.0088
6	0.0002	0.0007	0.0031	0.0038	0.0090
7	0.0002	0.0005	0.0019	0.0024	0.0055
8	0.0001	0.0003	0.0013	0.0016	0.0037
9	0.0003	0.0008	0.0034	0.0042	0.0095
10	0.0003	0.0009	0.0036	0.0044	0.0098
11	0.0003	0.0009	0.0037	0.0046	0.0100
12	0.0003	0.0009	0.0039	0.0048	0.0103
13	0.0030	0.0092	0.0382	0.0466	0.0978
14	0.0008	0.0025	0.0103	0.0126	0.0259
15	0.0008	0.0025	0.0105	0.0129	0.0259
16	0.0005	0.0016	0.0065	0.0080	0.0145
17	0.0002	0.0007	0.0031	0.0038	0.0066
Total	0.0081	0.0245	0.1019	0.1243	0.2634

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.18	34.6	0.17	33.3	0.35	67.9
Highway Segment	Collision with Other Object	0.01	2.4	0.03	6.5	0.05	8.9
Highway Segment	Other Single-vehicle Collision	0.05	10.0	0.03	5.0	0.08	14.9
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.7	0.01	1.5
Highway Segment	Total Single Vehicle Crashes	0.25	47.9	0.24	46.5	0.49	94.4
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.1
Highway Segment	Rear-end Collision	0.01	1.3	0.01	2.7	0.02	4.0
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.3	0.01	1.1	0.01	1.4
Highway Segment	Total Multiple Vehicle Crashes	0.01	1.7	0.02	4.0	0.03	5.6
Highway Segment	Total Highway Segment Crashes	0.26	49.6	0.26	50.4	0.52	100.0
	Total Crashes	0.26	49.6	0.26	50.4	0.52	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+27.000	for segment #1 (1000+00.000 to 1000+27.000), The ramp type for Ramp Alignment RGPNBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1000+27.000	for segment #1 (1000+00.000 to 1000+27.000), Right shoulder width (22.00 feet) is greater than specified boundaries (12.00 feet); adjusted in CMF calculations.
1000+27.000	1000+33.000	for segment #2 (1000+27.000 to 1000+33.000), The ramp type for Ramp Alignment RGPNBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+33.000	1000+98.000	for segment #3 (1000+33.000 to 1000+98.000), The ramp type for Ramp Alignment RGPNBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+98.000	1001+11.000	for segment #4 (1000+98.000 to 1001+11.000), The ramp type for Ramp Alignment RGPNBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+11.000	1001+31.000	for segment #5 (1001+11.000 to 1001+31.000), The ramp type for Ramp Alignment RGPNBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+31.000	1001+51.000	for segment #6 (1001+31.000 to 1001+51.000), The ramp type for Ramp Alignment RGPNBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+51.000	1001+63.000	for segment #7 (1001+51.000 to 1001+63.000), The ramp type for Ramp Alignment RGPNBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+63.000	1001+71.000	for segment #8 (1001+63.000 to 1001+71.000), The ramp type for Ramp Alignment RGPNBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+71.000	1001+91.000	for segment #9 (1001+71.000 to 1001+91.000), The ramp type for Ramp Alignment RGPNBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+91.000	1002+11.000	for segment #10 (1001+91.000 to 1002+11.000), The ramp type for Ramp Alignment RGPNBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+11.000	1002+31.000	for segment #11 (1002+11.000 to 1002+31.000), The ramp type for Ramp Alignment RGPNBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+31.000	1002+51.000	for segment #12 (1002+31.000 to 1002+51.000), The ramp type for Ramp Alignment RGPNBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+51.000	1004+55.000	for segment #13 (1002+51.000 to 1004+55.000), The ramp type for Ramp Alignment RGPNBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+55.000	1005+04.000	for segment #14 (1004+55.000 to 1005+04.000), The ramp type for Ramp Alignment RGPNBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+04.000	1005+53.000	for segment #15 (1005+04.000 to 1005+53.000), The ramp type for Ramp Alignment RGPNBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+53.000	1006+02.000	for segment #16 (1005+53.000 to 1006+02.000), The ramp type for Ramp Alignment RGPNBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1006+02.000	1006+25.967	for segment #17 (1006+02.000 to 1006+25.967), The ramp type for Ramp Alignment RGPNBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:24 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:23:49 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBNWODW0
Highway Comment: Imported from RGPNBNWODW0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:23:38 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1023+34.056
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1023+34.056
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

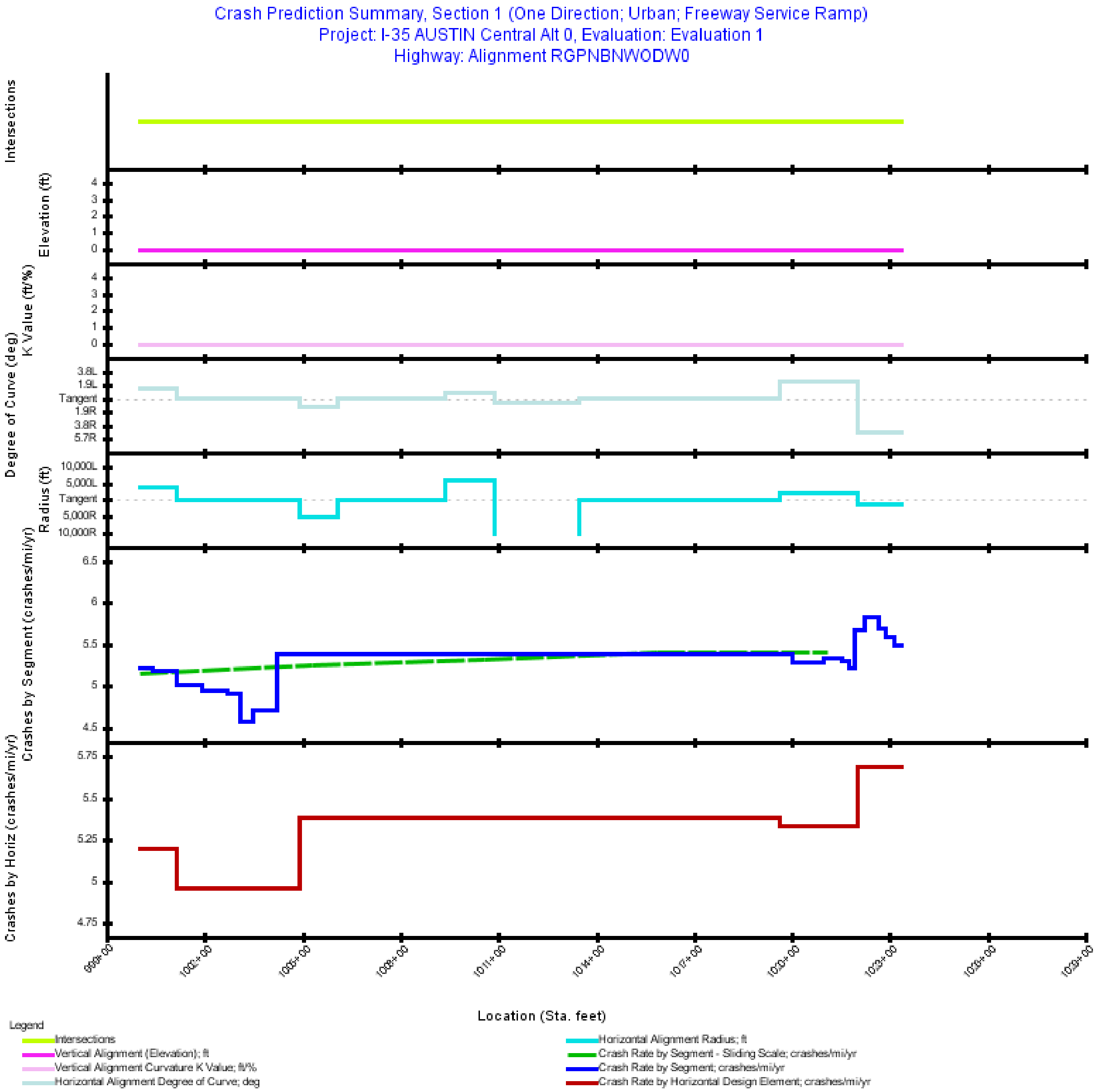
Crash Prediction Summary, Section 1 (One Direction; Urban; Freeway Service Ramp)
Project: I-35 AUSTIN Central Alt 0, Evaluation: Evaluation 1
Highway: Alignment RGPNBNWODW0

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1000+39.000	39.00	0.0074	2030: 14,100
2	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+39.000	1001+16.000	77.00	0.0146	2030: 14,100
3	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1001+16.000	1001+94.000	78.00	0.0148	2030: 14,100
4	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1001+94.000	1002+71.000	77.00	0.0146	2030: 14,100
5	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+71.000	1003+08.000	37.00	0.0070	2030: 14,100
6	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+08.000	1003+46.000	38.00	0.0072	2030: 14,100
7	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+46.000	1004+22.000	76.00	0.0144	2030: 14,100
8	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1004+22.000	1020+02.000	1,580.00	0.2992	2030: 14,100
9	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1020+02.000	1020+97.000	95.00	0.0180	2030: 14,100
10	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1020+97.000	1021+53.000	56.00	0.0106	2030: 14,100
11	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1021+53.000	1021+76.000	23.00	0.0044	2030: 14,100
12	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1021+76.000	1021+92.000	16.00	0.0030	2030: 14,100
13	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1021+92.000	1022+21.000	29.00	0.0055	2030: 14,100
14	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1022+21.000	1022+67.000	46.00	0.0087	2030: 14,100
15	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1022+67.000	1022+87.000	20.00	0.0038	2030: 14,100
16	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1022+87.000	1023+12.000	25.00	0.0047	2030: 14,100
17	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1023+12.000	1023+34.056	22.06	0.0042	2030: 14,100

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.4421**
Average Future Road AADT (vpd)	**14,100**
Predicted Crashes	
Total Crashes	**2.35**
Fatal and Injury Crashes	**1.11**
Property-Damage-Only Crashes	**1.24**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**47**
Percent Property-Damage-Only Crashes (%)	**53**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.3185**
FI Crash Rate (crashes/mi/yr)	**2.5033**
PDO Crash Rate (crashes/mi/yr)	**2.8151**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.27**
Travel Crash Rate (crashes/million veh-mi)	**1.03**
Travel FI Crash Rate (crashes/million veh-mi)	**0.49**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.55**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+39.000	0.0074	0.039	0.0386	0.0189	0.0197	5.2232	1.01
2	1000+39.000	1001+16.000	0.0146	0.075	0.0755	0.0367	0.0388	5.1783	1.01
3	1001+16.000	1001+94.000	0.0148	0.074	0.0740	0.0356	0.0385	5.0122	0.97
4	1001+94.000	1002+71.000	0.0146	0.072	0.0723	0.0343	0.0380	4.9575	0.96
5	1002+71.000	1003+08.000	0.0070	0.035	0.0345	0.0162	0.0182	4.9180	0.96
6	1003+08.000	1003+46.000	0.0072	0.033	0.0330	0.0151	0.0179	4.5822	0.89
7	1003+46.000	1004+22.000	0.0144	0.068	0.0679	0.0314	0.0365	4.7174	0.92
8	1004+22.000	1020+02.000	0.2992	1.612	1.6116	0.7566	0.8549	5.3855	1.05
9	1020+02.000	1020+97.000	0.0180	0.095	0.0952	0.0450	0.0501	5.2886	1.03
10	1020+97.000	1021+53.000	0.0106	0.057	0.0566	0.0270	0.0296	5.3346	1.04
11	1021+53.000	1021+76.000	0.0044	0.023	0.0231	0.0111	0.0121	5.3057	1.03
12	1021+76.000	1021+92.000	0.0030	0.016	0.0158	0.0075	0.0083	5.2284	1.02
13	1021+92.000	1022+21.000	0.0055	0.031	0.0312	0.0147	0.0165	5.6762	1.10
14	1022+21.000	1022+67.000	0.0087	0.051	0.0508	0.0237	0.0271	5.8331	1.13
15	1022+67.000	1022+87.000	0.0038	0.022	0.0216	0.0100	0.0116	5.6908	1.11
16	1022+87.000	1023+12.000	0.0047	0.026	0.0265	0.0122	0.0143	5.5960	1.09
17	1023+12.000	1023+34.056	0.0042	0.023	0.0230	0.0106	0.0124	5.4986	1.07
Total			0.4421	2.351	2.3511	1.1066	1.2444	5.3185	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+15.112	0.0218	0.113	0.1132	0.0551	0.0581	5.1936	1.01
Tangent	1001+15.112	1004+92.688	0.0715	0.355	0.3547	0.1668	0.1878	4.9595	0.96
Simple Curve 2	1004+92.688	1006+08.933	0.0220	0.119	0.1186	0.0557	0.0629	5.3855	1.05
Tangent	1006+08.933	1009+37.852	0.0623	0.336	0.3355	0.1575	0.1780	5.3855	1.05
Simple Curve 3	1009+37.852	1010+88.927	0.0286	0.154	0.1541	0.0723	0.0817	5.3855	1.05
Simple Curve 4	1010+88.927	1013+48.686	0.0492	0.265	0.2649	0.1244	0.1406	5.3855	1.05
Tangent	1013+48.686	1019+60.873	0.1159	0.624	0.6244	0.2932	0.3313	5.3855	1.05
Simple Curve 5	1019+60.873	1022+02.914	0.0458	0.244	0.2444	0.1159	0.1285	5.3308	1.04
Simple Curve 6	1022+02.914	1023+34.056	0.0248	0.141	0.1413	0.0657	0.0756	5.6883	1.10

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.35	1.11	47.069	1.24	52.931
Total	2.35	1.11	47.069	1.24	52.931
Average	2.35	1.11	47.069	1.24	52.931

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0004	0.0011	0.0070	0.0105	0.0197
2	0.0007	0.0021	0.0135	0.0204	0.0388
3	0.0007	0.0020	0.0131	0.0198	0.0385
4	0.0006	0.0019	0.0126	0.0191	0.0380
5	0.0003	0.0009	0.0060	0.0090	0.0182
6	0.0003	0.0008	0.0055	0.0084	0.0179
7	0.0006	0.0018	0.0115	0.0175	0.0365
8	0.0134	0.0406	0.2675	0.4351	0.8549
9	0.0008	0.0025	0.0166	0.0251	0.0501
10	0.0005	0.0015	0.0099	0.0151	0.0296
11	0.0002	0.0006	0.0041	0.0062	0.0121
12	0.0001	0.0004	0.0028	0.0042	0.0083
13	0.0003	0.0008	0.0054	0.0082	0.0165
14	0.0004	0.0013	0.0087	0.0132	0.0271
15	0.0002	0.0006	0.0037	0.0056	0.0116
16	0.0002	0.0007	0.0045	0.0068	0.0143
17	0.0002	0.0006	0.0039	0.0059	0.0124
Total	0.0199	0.0604	0.3963	0.6300	1.2444

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.02	0.8	0.02	0.9
Highway Segment	Collision with Fixed Object	0.60	25.4	0.58	24.7	1.18	50.1
Highway Segment	Collision with Other Object	0.04	1.8	0.11	4.8	0.15	6.6
Highway Segment	Other Single-vehicle Collision	0.17	7.3	0.09	3.7	0.26	11.0
Highway Segment	Collision with Parked Vehicle	0.01	0.5	0.01	0.6	0.03	1.1
Highway Segment	Total Single Vehicle Crashes	0.83	35.2	0.81	34.5	1.64	69.7
Highway Segment	Right-Angle Collision	0.01	0.4	0.01	0.3	0.02	0.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.01	0.4	0.01	0.4	0.02	0.8
Highway Segment	Rear-end Collision	0.21	8.9	0.30	12.7	0.51	21.6
Highway Segment	Sideswipe, Same Direction Collision	0.05	2.1	0.12	4.9	0.17	7.0
Highway Segment	Total Multiple Vehicle Crashes	0.28	11.9	0.43	18.4	0.71	30.3
Highway Segment	Total Highway Segment Crashes	1.11	47.1	1.24	52.9	2.35	100.0
	Total Crashes	1.11	47.1	1.24	52.9	2.35	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+39.000	for segment #1 (1000+00.000 to 1000+39.000), The ramp type for Ramp Alignment RGPNBNWODW0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1000+39.000	for segment #1 (1000+00.000 to 1000+39.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+39.000	1001+16.000	for segment #2 (1000+39.000 to 1001+16.000), The ramp type for Ramp Alignment RGPNBNWODW0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+39.000	1001+16.000	for segment #2 (1000+39.000 to 1001+16.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+16.000	1001+94.000	for segment #3 (1001+16.000 to 1001+94.000), The ramp type for Ramp Alignment RGPNBNWODW0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1001+16.000	1001+94.000	for segment #3 (1001+16.000 to 1001+94.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+94.000	1002+71.000	for segment #4 (1001+94.000 to 1002+71.000), The ramp type for Ramp Alignment RGPNBNWODW0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1001+94.000	1002+71.000	for segment #4 (1001+94.000 to 1002+71.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+71.000	1003+08.000	for segment #5 (1002+71.000 to 1003+08.000), The ramp type for Ramp Alignment RGPNBNWODW0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+71.000	1003+08.000	for segment #5 (1002+71.000 to 1003+08.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+08.000	1003+46.000	for segment #6 (1003+08.000 to 1003+46.000), The ramp type for Ramp Alignment RGPNBNWODW0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+46.000	1004+22.000	for segment #7 (1003+46.000 to 1004+22.000), The ramp type for Ramp Alignment RGPNBNWODW0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1004+22.000	1020+02.000	for segment #8 (1004+22.000 to 1020+02.000), The ramp type for Ramp Alignment RGPNBNWODW0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1020+02.000	1020+97.000	for segment #9 (1020+02.000 to 1020+97.000), The ramp type for Ramp Alignment RGPNBNWODW0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1020+97.000	1021+53.000	for segment #10 (1020+97.000 to 1021+53.000), The ramp type for Ramp Alignment RGPNBNWODW0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1021+53.000	1021+76.000	for segment #11 (1021+53.000 to 1021+76.000), The ramp type for Ramp Alignment RGPNBNWODW0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1021+76.000	1021+92.000	for segment #12 (1021+76.000 to 1021+92.000), The ramp type for Ramp Alignment RGPNBNWODW0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1021+92.000	1022+21.000	for segment #13 (1021+92.000 to 1022+21.000), The ramp type for Ramp Alignment RGPNBNWODW0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1022+21.000	1022+67.000	for segment #14 (1022+21.000 to 1022+67.000), The ramp type for Ramp Alignment RGPNBNWODW0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1022+67.000	1022+87.000	for segment #15 (1022+67.000 to 1022+87.000), The ramp type for Ramp Alignment RGPNBNWODW0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1022+87.000	1023+12.000	for segment #16 (1022+87.000 to 1023+12.000), The ramp type for Ramp Alignment RGPNBNWODW0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1023+12.000	1023+34.056	for segment #17 (1023+12.000 to 1023+34.056), The ramp type for Ramp Alignment RGPNBNWODW0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:58 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:57:46 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBXOLF0
Highway Comment: Imported from RGPNBXOLF0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:57:33 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1005+29.506
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1005+29.506
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

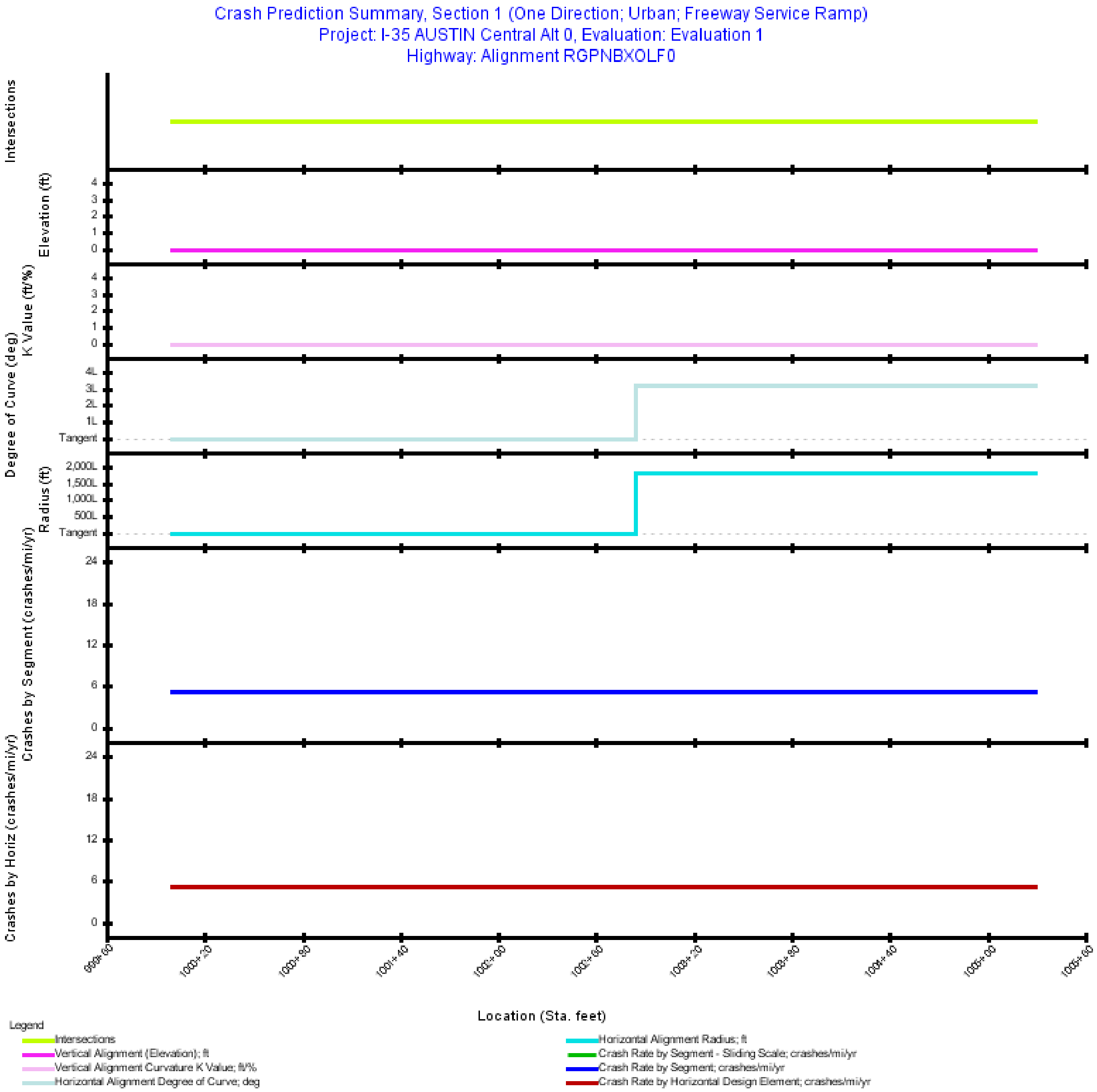

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1005+29.506	529.51	0.1003	2030: 24,050

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1003**
Average Future Road AADT (vpd)	**24,050**
Predicted Crashes	
Total Crashes	**0.52**
Fatal and Injury Crashes	**0.25**
Property-Damage-Only Crashes	**0.27**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.1485**
FI Crash Rate (crashes/mi/yr)	**2.4539**
PDO Crash Rate (crashes/mi/yr)	**2.6946**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.88**
Travel Crash Rate (crashes/million veh-mi)	**0.59**
Travel FI Crash Rate (crashes/million veh-mi)	**0.28**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.31**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1005+29.506	0.1003	0.516	0.5163	0.2461	0.2702	5.1485	0.59
Total			0.1003	0.516	0.5163	0.2461	0.2702	5.1485	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1002+83.865	0.0538	0.277	0.2768	0.1319	0.1449	5.1485	0.59
Simple Curve 1	1002+83.865	1005+29.506	0.0465	0.239	0.2395	0.1142	0.1254	5.1485	0.59

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.52	0.25	47.662	0.27	52.338
Total	0.52	0.25	47.662	0.27	52.338
Average	0.52	0.25	47.662	0.27	52.338

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0077	0.0233	0.0969	0.1182	0.2702

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.1
Highway Segment	Collision with Fixed Object	0.16	31.3	0.16	31.2	0.32	62.4
Highway Segment	Collision with Other Object	0.01	2.2	0.03	6.1	0.04	8.3
Highway Segment	Other Single-vehicle Collision	0.05	9.0	0.02	4.7	0.07	13.7
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.7	0.01	1.3
Highway Segment	Total Single Vehicle Crashes	0.22	43.3	0.23	43.5	0.45	86.9
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.2	0.00	0.3
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.2	0.00	0.3
Highway Segment	Rear-end Collision	0.02	3.3	0.03	6.1	0.05	9.3
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.8	0.01	2.3	0.02	3.1
Highway Segment	Total Multiple Vehicle Crashes	0.02	4.3	0.04	8.8	0.07	13.1
Highway Segment	Total Highway Segment Crashes	0.25	47.7	0.27	52.3	0.52	100.0
	Total Crashes	0.25	47.7	0.27	52.3	0.52	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1005+29.506	for segment #1 (1000+00.000 to 1005+29.506), The ramp type for Ramp Alignment RGPNBXOLF0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1005+29.506	for segment #1 (1000+00.000 to 1005+29.506), traffic volume (24,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

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Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:19:41 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBN710
Highway Comment: Imported from RGPNBN710.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:19:29 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1015+87.612
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1015+87.612
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

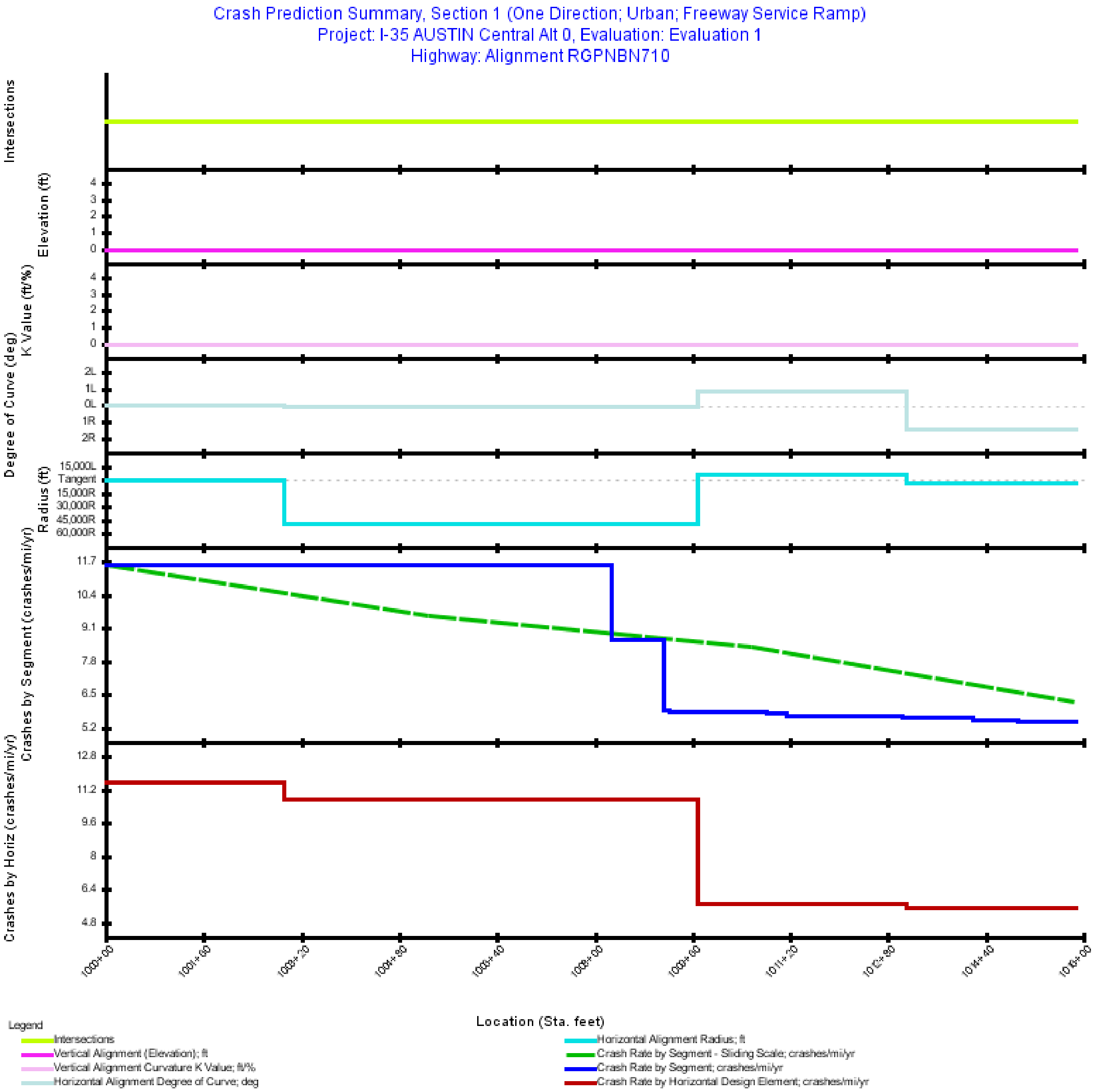

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane Ramp Entrance	Urban	1000+00.000	1008+27.000	827.00	0.1566	2030: 21,000
2	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1008+27.000	1009+13.000	86.00	0.0163	2030: 21,000
3	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1009+13.000	1009+23.000	10.00	0.0019	2030: 21,000
4	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1009+23.000	1010+82.000	159.00	0.0301	2030: 21,000
5	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1010+82.000	1011+13.000	31.00	0.0059	2030: 21,000
6	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1011+13.000	1013+03.000	190.00	0.0360	2030: 21,000
7	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1013+03.000	1014+19.000	116.00	0.0220	2030: 21,000
8	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1014+19.000	1014+93.000	74.00	0.0140	2030: 21,000
9	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1014+93.000	1015+87.612	94.61	0.0179	2030: 21,000

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.3007**
Average Future Road AADT (vpd)	**21,000**
Predicted Crashes	
Total Crashes	**2.67**
Fatal and Injury Crashes	**1.07**
Property-Damage-Only Crashes	**1.60**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**40**
Percent Property-Damage-Only Crashes (%)	**60**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**8.8858**
FI Crash Rate (crashes/mi/yr)	**3.5510**
PDO Crash Rate (crashes/mi/yr)	**5.3348**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.30**
Travel Crash Rate (crashes/million veh-mi)	**1.16**
Travel FI Crash Rate (crashes/million veh-mi)	**0.46**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.70**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1008+27.000	0.1566	1.809	1.8093	0.6752	1.1341	11.5517	1.51
2	1008+27.000	1009+13.000	0.0163	0.141	0.1406	0.0736	0.0670	8.6302	1.13
3	1009+13.000	1009+23.000	0.0019	0.011	0.0112	0.0051	0.0061	5.9029	0.77
4	1009+23.000	1010+82.000	0.0301	0.176	0.1761	0.0800	0.0961	5.8463	0.76
5	1010+82.000	1011+13.000	0.0059	0.034	0.0338	0.0152	0.0186	5.7642	0.75
6	1011+13.000	1013+03.000	0.0360	0.204	0.2036	0.0904	0.1132	5.6585	0.74
7	1013+03.000	1014+19.000	0.0220	0.123	0.1228	0.0535	0.0693	5.5885	0.73
8	1014+19.000	1014+93.000	0.0140	0.077	0.0772	0.0333	0.0439	5.5057	0.72
9	1014+93.000	1015+87.612	0.0179	0.097	0.0973	0.0415	0.0558	5.4301	0.71
Total			0.3007	2.672	2.6718	1.0677	1.6041	8.8858	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1002+92.933	0.0555	0.641	0.6409	0.2392	0.4017	11.5517	1.51
Simple Curve 1	1002+92.933	1009+68.904	0.1280	1.371	1.3710	0.5378	0.8332	10.7090	1.40
Simple Curve 2	1009+68.904	1013+09.228	0.0645	0.369	0.3693	0.1653	0.2039	5.7292	0.75
Simple Curve 3	1013+09.228	1015+87.612	0.0527	0.291	0.2906	0.1254	0.1652	5.5126	0.72

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.67	1.07	39.963	1.60	60.037
Total	2.67	1.07	39.963	1.60	60.037
Average	2.67	1.07	39.963	1.60	60.037

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0099	0.0299	0.1629	0.4725	1.1341
2	0.0012	0.0036	0.0240	0.0448	0.0670
3	0.0001	0.0003	0.0019	0.0029	0.0061
4	0.0015	0.0045	0.0294	0.0445	0.0961
5	0.0003	0.0009	0.0056	0.0085	0.0186
6	0.0017	0.0051	0.0333	0.0503	0.1132
7	0.0010	0.0030	0.0197	0.0298	0.0693
8	0.0006	0.0019	0.0122	0.0185	0.0439
9	0.0008	0.0023	0.0153	0.0231	0.0558
Total	0.0170	0.0515	0.3043	0.6950	1.6041

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.02	0.7	0.02	0.8
Highway Segment	Collision with Fixed Object	0.45	16.8	0.58	21.6	1.03	38.4
Highway Segment	Collision with Other Object	0.03	1.2	0.11	4.2	0.14	5.4
Highway Segment	Other Single-vehicle Collision	0.13	4.8	0.09	3.2	0.22	8.1
Highway Segment	Collision with Parked Vehicle	0.01	0.3	0.01	0.5	0.02	0.8
Highway Segment	Total Single Vehicle Crashes	0.62	23.3	0.81	30.2	1.43	53.5
Highway Segment	Right-Angle Collision	0.01	0.5	0.01	0.5	0.03	1.1
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.1	0.01	0.2
Highway Segment	Other Multi-vehicle Collision	0.01	0.5	0.02	0.7	0.03	1.2
Highway Segment	Rear-end Collision	0.33	12.5	0.55	20.6	0.88	33.1
Highway Segment	Sideswipe, Same Direction Collision	0.08	3.0	0.21	7.9	0.29	10.9
Highway Segment	Total Multiple Vehicle Crashes	0.45	16.7	0.80	29.8	1.24	46.5
Highway Segment	Total Highway Segment Crashes	1.07	40.0	1.60	60.0	2.67	100.0
	Total Crashes	1.07	40.0	1.60	60.0	2.67	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1008+27.000	for segment #1 (1000+00.000 to 1008+27.000), The ramp type for Ramp Alignment RGPNBN710 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1008+27.000	1009+13.000	for segment #2 (1008+27.000 to 1009+13.000), The ramp type for Ramp Alignment RGPNBN710 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1009+13.000	1009+23.000	for segment #3 (1009+13.000 to 1009+23.000), The ramp type for Ramp Alignment RGPNBN710 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1009+23.000	1010+82.000	for segment #4 (1009+23.000 to 1010+82.000), The ramp type for Ramp Alignment RGPNBN710 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1010+82.000	1011+13.000	for segment #5 (1010+82.000 to 1011+13.000), The ramp type for Ramp Alignment RGPNBN710 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1011+13.000	1013+03.000	for segment #6 (1011+13.000 to 1013+03.000), The ramp type for Ramp Alignment RGPNBN710 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1013+03.000	1014+19.000	for segment #7 (1013+03.000 to 1014+19.000), The ramp type for Ramp Alignment RGPNBN710 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1014+19.000	1014+93.000	for segment #8 (1014+19.000 to 1014+93.000), The ramp type for Ramp Alignment RGPNBN710 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1014+93.000	1015+87.612	for segment #9 (1014+93.000 to 1015+87.612), The ramp type for Ramp Alignment RGPNBN710 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1008+27.000	1009+13.000	for segment #2 (1008+27.000 to 1009+13.000), traffic volume (21,000 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1009+13.000	1009+23.000	for segment #3 (1009+13.000 to 1009+23.000), traffic volume (21,000 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1009+23.000	1010+82.000	for segment #4 (1009+23.000 to 1010+82.000), traffic volume (21,000 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1010+82.000	1011+13.000	for segment #5 (1010+82.000 to 1011+13.000), traffic volume (21,000 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1011+13.000	1013+03.000	for segment #6 (1011+13.000 to 1013+03.000), traffic volume (21,000 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1013+03.000	1014+19.000	for segment #7 (1013+03.000 to 1014+19.000), traffic volume (21,000 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1014+19.000	1014+93.000	for segment #8 (1014+19.000 to 1014+93.000), traffic volume (21,000 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1014+93.000	1015+87.612	for segment #9 (1014+93.000 to 1015+87.612), traffic volume (21,000 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:33 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:32:48 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBN2900
Highway Comment: Imported from RGPSBN2900.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:32:37 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1015+34.407
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1015+34.407
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

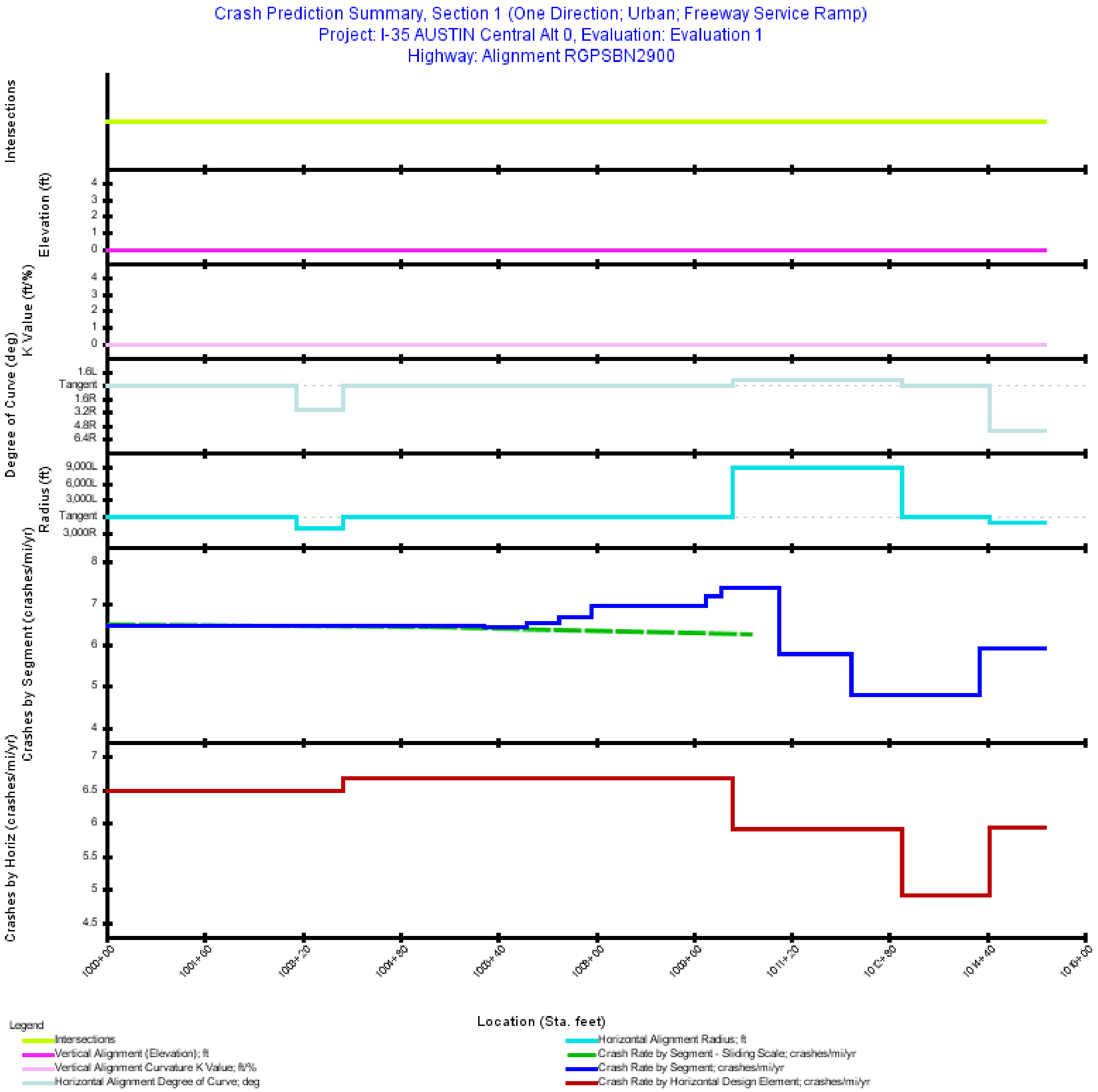

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1006+18.000	618.00	0.1170	2030: 18,050
2	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1006+18.000	1006+87.000	69.00	0.0131	2030: 18,050
3	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1006+87.000	1007+39.000	52.00	0.0098	2030: 18,050
4	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1007+39.000	1007+93.000	54.00	0.0102	2030: 18,050
5	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1007+93.000	1009+80.000	187.00	0.0354	2030: 18,050
6	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1009+80.000	1010+05.000	25.00	0.0047	2030: 18,050
7	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1010+05.000	1011+00.000	95.00	0.0180	2030: 18,050
8	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1011+00.000	1012+17.000	117.00	0.0222	2030: 18,050
9	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1012+17.000	1014+29.000	212.00	0.0402	2030: 18,050
10	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1014+29.000	1015+34.407	105.41	0.0200	2030: 18,050

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2906**
Average Future Road AADT (vpd)	**18,050**
Predicted Crashes	
Total Crashes	**1.82**
Fatal and Injury Crashes	**0.82**
Property-Damage-Only Crashes	**1.01**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**45**
Percent Property-Damage-Only Crashes (%)	**55**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**6.2797**
FI Crash Rate (crashes/mi/yr)	**2.8123**
PDO Crash Rate (crashes/mi/yr)	**3.4675**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.91**
Travel Crash Rate (crashes/million veh-mi)	**0.95**
Travel FI Crash Rate (crashes/million veh-mi)	**0.43**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.53**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1006+18.000	0.1170	0.757	0.7573	0.3313	0.4260	6.4704	0.98
2	1006+18.000	1006+87.000	0.0131	0.084	0.0841	0.0369	0.0472	6.4381	0.98
3	1006+87.000	1007+39.000	0.0098	0.064	0.0643	0.0284	0.0359	6.5307	0.99
4	1007+39.000	1007+93.000	0.0102	0.068	0.0680	0.0302	0.0378	6.6494	1.01
5	1007+93.000	1009+80.000	0.0354	0.245	0.2454	0.1109	0.1345	6.9283	1.05
6	1009+80.000	1010+05.000	0.0047	0.034	0.0340	0.0156	0.0184	7.1847	1.09
7	1010+05.000	1011+00.000	0.0180	0.132	0.1324	0.0612	0.0712	7.3588	1.12
8	1011+00.000	1012+17.000	0.0222	0.128	0.1283	0.0592	0.0691	5.7896	0.88
9	1012+17.000	1014+29.000	0.0402	0.193	0.1927	0.0891	0.1036	4.7994	0.73
10	1014+29.000	1015+34.407	0.0200	0.118	0.1183	0.0545	0.0638	5.9283	0.90
Total			0.2906	1.825	1.8249	0.8173	1.0077	6.2797	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1003+09.382	0.0586	0.379	0.3791	0.1658	0.2133	6.4704	0.98
Simple Curve 1	1003+09.382	1003+85.776	0.0145	0.094	0.0936	0.0410	0.0527	6.4704	0.98
Tangent	1003+85.776	1010+24.956	0.1211	0.808	0.8082	0.3593	0.4489	6.6766	1.01
Simple Curve 2	1010+24.956	1013+01.099	0.0523	0.309	0.3093	0.1428	0.1665	5.9145	0.90
Tangent	1013+01.099	1014+43.125	0.0269	0.132	0.1321	0.0611	0.0711	4.9117	0.75
Simple Curve 3	1014+43.125	1015+34.407	0.0173	0.102	0.1025	0.0472	0.0553	5.9283	0.90

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.82	0.82	44.783	1.01	55.217
Total	1.82	0.82	44.783	1.01	55.217
Average	1.82	0.82	44.783	1.01	55.217

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0053	0.0161	0.1077	0.2022	0.4260
2	0.0006	0.0018	0.0120	0.0225	0.0472
3	0.0005	0.0014	0.0092	0.0173	0.0359
4	0.0005	0.0015	0.0098	0.0185	0.0378
5	0.0018	0.0054	0.0360	0.0677	0.1345
6	0.0002	0.0008	0.0051	0.0095	0.0184
7	0.0010	0.0030	0.0199	0.0373	0.0712
8	0.0011	0.0033	0.0218	0.0330	0.0691
9	0.0019	0.0056	0.0360	0.0456	0.1036
10	0.0012	0.0035	0.0224	0.0274	0.0638
Total	0.0140	0.0423	0.2799	0.4810	1.0077

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.8	0.02	0.9
Highway Segment	Collision with Fixed Object	0.41	22.7	0.45	24.5	0.86	47.2
Highway Segment	Collision with Other Object	0.03	1.6	0.09	4.8	0.12	6.4
Highway Segment	Other Single-vehicle Collision	0.12	6.5	0.07	3.7	0.19	10.2
Highway Segment	Collision with Parked Vehicle	0.01	0.5	0.01	0.5	0.02	1.0
Highway Segment	Total Single Vehicle Crashes	0.57	31.4	0.62	34.2	1.20	65.6
Highway Segment	Right-Angle Collision	0.01	0.4	0.01	0.4	0.01	0.8
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.01	0.4	0.01	0.5	0.02	0.9
Highway Segment	Rear-end Collision	0.18	10.0	0.27	14.5	0.45	24.5
Highway Segment	Sideswipe, Same Direction Collision	0.04	2.4	0.10	5.6	0.15	8.0
Highway Segment	Total Multiple Vehicle Crashes	0.24	13.4	0.38	21.0	0.63	34.4
Highway Segment	Total Highway Segment Crashes	0.82	44.8	1.01	55.2	1.82	100.0
	Total Crashes	0.82	44.8	1.01	55.2	1.82	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1006+18.000	for segment #1 (1000+00.000 to 1006+18.000), The ramp type for Ramp Alignment RGPSBN2900 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1006+18.000	1006+87.000	for segment #2 (1006+18.000 to 1006+87.000), The ramp type for Ramp Alignment RGPSBN2900 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1006+87.000	1007+39.000	for segment #3 (1006+87.000 to 1007+39.000), The ramp type for Ramp Alignment RGPSBN2900 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1007+39.000	1007+93.000	for segment #4 (1007+39.000 to 1007+93.000), The ramp type for Ramp Alignment RGPSBN2900 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1007+93.000	1009+80.000	for segment #5 (1007+93.000 to 1009+80.000), The ramp type for Ramp Alignment RGPSBN2900 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1009+80.000	1010+05.000	for segment #6 (1009+80.000 to 1010+05.000), The ramp type for Ramp Alignment RGPSBN2900 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1010+05.000	1011+00.000	for segment #7 (1010+05.000 to 1011+00.000), The ramp type for Ramp Alignment RGPSBN2900 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1011+00.000	1012+17.000	for segment #8 (1011+00.000 to 1012+17.000), The ramp type for Ramp Alignment RGPSBN2900 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1012+17.000	1014+29.000	for segment #9 (1012+17.000 to 1014+29.000), The ramp type for Ramp Alignment RGPSBN2900 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1014+29.000	1015+34.407	for segment #10 (1014+29.000 to 1015+34.407), The ramp type for Ramp Alignment RGPSBN2900 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1006+18.000	for segment #1 (1000+00.000 to 1006+18.000), traffic volume (18,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1006+18.000	1006+87.000	for segment #2 (1006+18.000 to 1006+87.000), traffic volume (18,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1006+87.000	1007+39.000	for segment #3 (1006+87.000 to 1007+39.000), traffic volume (18,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1007+39.000	1007+93.000	for segment #4 (1007+39.000 to 1007+93.000), traffic volume (18,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1007+93.000	1009+80.000	for segment #5 (1007+93.000 to 1009+80.000), traffic volume (18,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1009+80.000	1010+05.000	for segment #6 (1009+80.000 to 1010+05.000), traffic volume (18,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1010+05.000	1011+00.000	for segment #7 (1010+05.000 to 1011+00.000), traffic volume (18,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1011+00.000	1012+17.000	for segment #8 (1011+00.000 to 1012+17.000), traffic volume (18,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1012+17.000	1014+29.000	for segment #9 (1012+17.000 to 1014+29.000), traffic volume (18,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1014+29.000	1015+34.407	for segment #10 (1014+29.000 to 1015+34.407), traffic volume (18,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:48 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:47:09 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBXAIR0
Highway Comment: Imported from RGPSBXAIR0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:46:56 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1006+35.927
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1006+35.927
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

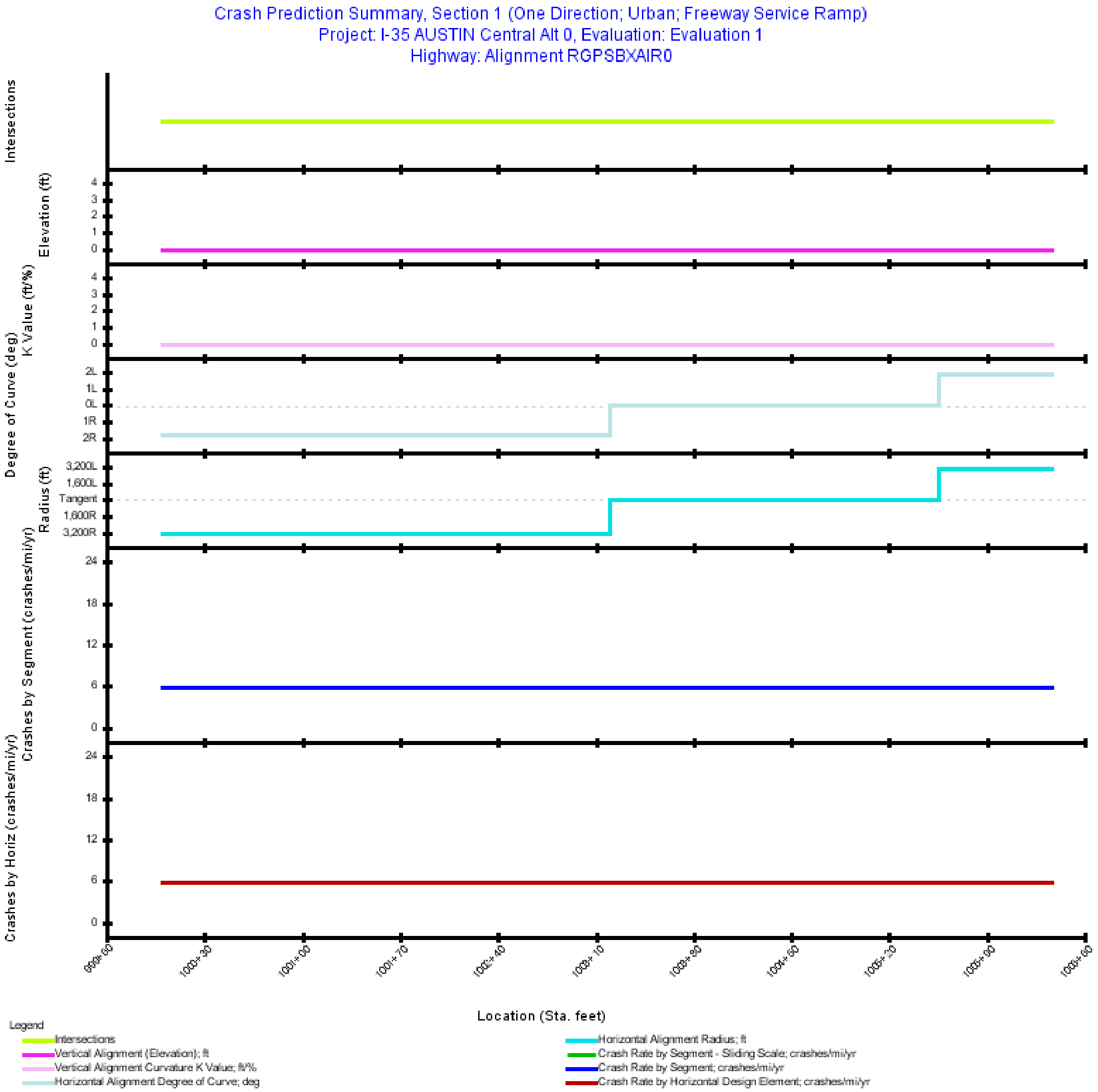

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1006+35.927	635.93	0.1204	2030: 18,750

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1204**
Average Future Road AADT (vpd)	**18,750**
Predicted Crashes	
Total Crashes	**0.69**
Fatal and Injury Crashes	**0.34**
Property-Damage-Only Crashes	**0.36**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.7660**
FI Crash Rate (crashes/mi/yr)	**2.7850**
PDO Crash Rate (crashes/mi/yr)	**2.9810**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.82**
Travel Crash Rate (crashes/million veh-mi)	**0.84**
Travel FI Crash Rate (crashes/million veh-mi)	**0.41**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.44**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1006+35.927	0.1204	0.695	0.6945	0.3354	0.3590	5.7660	0.84
Total			0.1204	0.695	0.6945	0.3354	0.3590	5.7660	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1003+19.962	0.0606	0.349	0.3494	0.1688	0.1806	5.7660	0.84
Tangent	1003+19.962	1005+55.523	0.0446	0.257	0.2572	0.1243	0.1330	5.7660	0.84
Simple Curve 2	1005+55.523	1006+35.927	0.0152	0.088	0.0878	0.0424	0.0454	5.7660	0.84

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.69	0.34	48.301	0.36	51.699
Total	0.69	0.34	48.301	0.36	51.699
Average	0.69	0.34	48.301	0.36	51.699

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0089	0.0270	0.1158	0.1838	0.3590

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.1
Highway Segment	Collision with Fixed Object	0.23	32.5	0.22	31.3	0.44	63.8
Highway Segment	Collision with Other Object	0.02	2.3	0.04	6.1	0.06	8.4
Highway Segment	Other Single-vehicle Collision	0.07	9.4	0.03	4.7	0.10	14.0
Highway Segment	Collision with Parked Vehicle	0.01	0.7	0.01	0.7	0.01	1.4
Highway Segment	Total Single Vehicle Crashes	0.31	45.0	0.30	43.8	0.62	88.7
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.2	0.00	0.3
Highway Segment	Rear-end Collision	0.02	2.5	0.04	5.5	0.06	8.0
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.6	0.01	2.1	0.02	2.7
Highway Segment	Total Multiple Vehicle Crashes	0.02	3.3	0.06	7.9	0.08	11.3
Highway Segment	Total Highway Segment Crashes	0.34	48.3	0.36	51.7	0.69	100.0
	Total Crashes	0.34	48.3	0.36	51.7	0.69	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1006+35.927	for segment #1 (1000+00.000 to 1006+35.927), The ramp type for Ramp Alignment RGPSBXAIR0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1006+35.927	for segment #1 (1000+00.000 to 1006+35.927), traffic volume (18,750 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:34 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:34:11 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBN510
Highway Comment: Imported from RGPSBN510.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:34:00 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1007+69.379
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1007+69.379
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

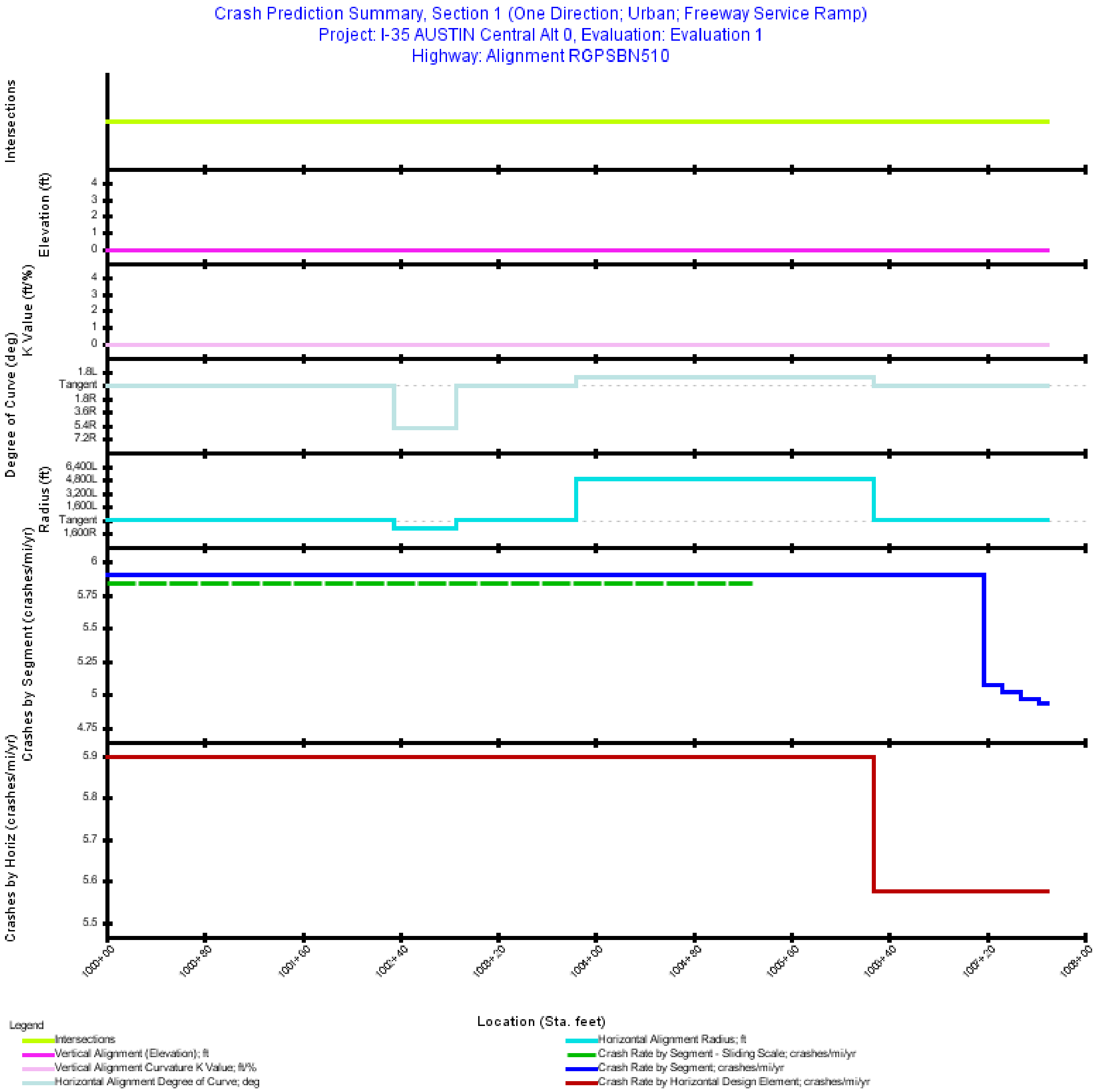

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1007+18.000	718.00	0.1360	2030: 16,100
2	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1007+18.000	1007+33.000	15.00	0.0028	2030: 16,100
3	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1007+33.000	1007+48.000	15.00	0.0028	2030: 16,100
4	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1007+48.000	1007+62.000	14.00	0.0027	2030: 16,100
5	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1007+62.000	1007+69.379	7.38	0.0014	2030: 16,100

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1457**
Average Future Road AADT (vpd)	**16,100**
Predicted Crashes	
Total Crashes	**0.85**
Fatal and Injury Crashes	**0.39**
Property-Damage-Only Crashes	**0.46**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**46**
Percent Property-Damage-Only Crashes (%)	**54**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.8388**
FI Crash Rate (crashes/mi/yr)	**2.6736**
PDO Crash Rate (crashes/mi/yr)	**3.1651**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.86**
Travel Crash Rate (crashes/million veh-mi)	**0.99**
Travel FI Crash Rate (crashes/million veh-mi)	**0.46**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.54**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1007+18.000	0.1360	0.802	0.8021	0.3679	0.4341	5.8982	1.00
2	1007+18.000	1007+33.000	0.0028	0.014	0.0144	0.0065	0.0079	5.0709	0.86
3	1007+33.000	1007+48.000	0.0028	0.014	0.0143	0.0063	0.0079	5.0186	0.85
4	1007+48.000	1007+62.000	0.0027	0.013	0.0132	0.0058	0.0074	4.9692	0.85
5	1007+62.000	1007+69.379	0.0014	0.007	0.0069	0.0030	0.0039	4.9335	0.84
Total			0.1457	0.851	0.8508	0.3896	0.4612	5.8388	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1002+35.141	0.0445	0.263	0.2627	0.1205	0.1422	5.8982	1.00
Simple Curve 1	1002+35.141	1002+85.305	0.0095	0.056	0.0560	0.0257	0.0303	5.8982	1.00
Tangent	1002+85.305	1003+83.798	0.0187	0.110	0.1100	0.0505	0.0596	5.8982	1.00
Simple Curve 2	1003+83.798	1006+27.683	0.0462	0.272	0.2724	0.1250	0.1475	5.8982	1.00
Tangent	1006+27.683	1007+69.379	0.0268	0.150	0.1496	0.0679	0.0817	5.5755	0.95

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.85	0.39	45.791	0.46	54.209
Total	0.85	0.39	45.791	0.46	54.209
Average	0.85	0.39	45.791	0.46	54.209

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0065	0.0197	0.1296	0.2121	0.4341
2	0.0001	0.0004	0.0024	0.0036	0.0079
3	0.0001	0.0004	0.0023	0.0035	0.0079
4	0.0001	0.0003	0.0021	0.0032	0.0074
5	0.0001	0.0002	0.0011	0.0017	0.0039
Total	0.0069	0.0209	0.1376	0.2242	0.4612

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.8	0.01	0.9
Highway Segment	Collision with Fixed Object	0.20	24.0	0.21	24.7	0.41	48.7
Highway Segment	Collision with Other Object	0.01	1.7	0.04	4.8	0.06	6.5
Highway Segment	Other Single-vehicle Collision	0.06	6.9	0.03	3.7	0.09	10.6
Highway Segment	Collision with Parked Vehicle	0.00	0.5	0.01	0.6	0.01	1.1
Highway Segment	Total Single Vehicle Crashes	0.28	33.2	0.29	34.5	0.58	67.8
Highway Segment	Right-Angle Collision	0.00	0.4	0.00	0.4	0.01	0.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.4	0.00	0.5	0.01	0.9
Highway Segment	Rear-end Collision	0.08	9.4	0.12	13.6	0.20	23.0
Highway Segment	Sideswipe, Same Direction Collision	0.02	2.3	0.04	5.2	0.06	7.5
Highway Segment	Total Multiple Vehicle Crashes	0.11	12.6	0.17	19.7	0.27	32.2
Highway Segment	Total Highway Segment Crashes	0.39	45.8	0.46	54.2	0.85	100.0
	Total Crashes	0.39	45.8	0.46	54.2	0.85	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1007+18.000	for segment #1 (1000+00.000 to 1007+18.000), The ramp type for Ramp Alignment RGPSBN510 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1007+18.000	1007+33.000	for segment #2 (1007+18.000 to 1007+33.000), The ramp type for Ramp Alignment RGPSBN510 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1007+33.000	1007+48.000	for segment #3 (1007+33.000 to 1007+48.000), The ramp type for Ramp Alignment RGPSBN510 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1007+48.000	1007+62.000	for segment #4 (1007+48.000 to 1007+62.000), The ramp type for Ramp Alignment RGPSBN510 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1007+62.000	1007+69.379	for segment #5 (1007+62.000 to 1007+69.379), The ramp type for Ramp Alignment RGPSBN510 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:50 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:50:10 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBXHALF0
Highway Comment: Imported from RGPSBXHALF0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:50:01 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+59.867
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+59.867
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

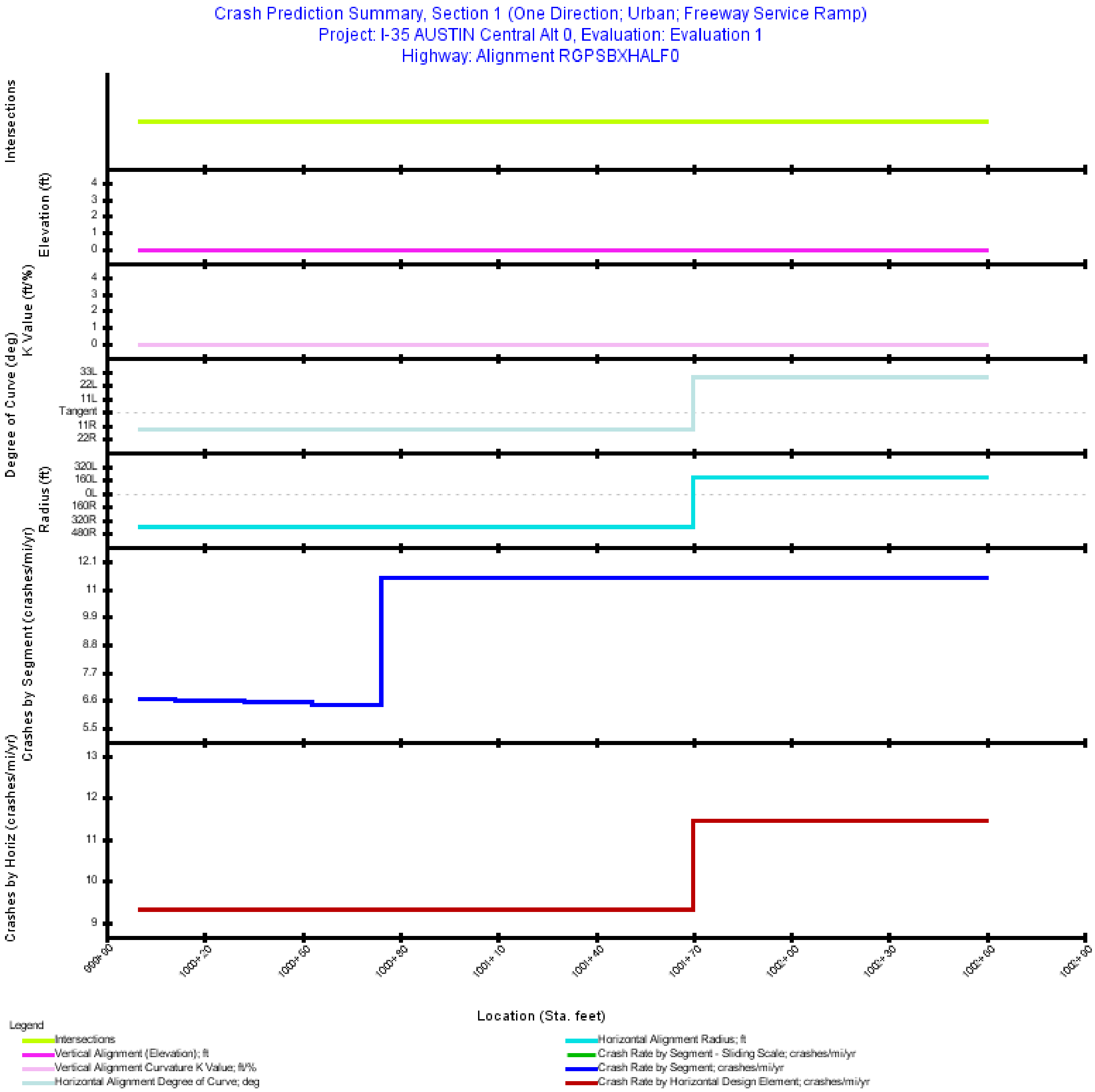

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1000+11.000	11.00	0.0021	2030: 3,000
2	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+11.000	1000+32.000	21.00	0.0040	2030: 3,000
3	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+32.000	1000+53.000	21.00	0.0040	2030: 3,000
4	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+53.000	1000+74.000	21.00	0.0040	2030: 3,000
5	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+74.000	1002+59.867	185.87	0.0352	2030: 3,000

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0492**
Average Future Road AADT (vpd)	**3,000**
Predicted Crashes	
Total Crashes	**0.49**
Fatal and Injury Crashes	**0.24**
Property-Damage-Only Crashes	**0.26**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**10.0613**
FI Crash Rate (crashes/mi/yr)	**4.8150**
PDO Crash Rate (crashes/mi/yr)	**5.2464**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.05**
Travel Crash Rate (crashes/million veh-mi)	**9.19**
Travel FI Crash Rate (crashes/million veh-mi)	**4.40**
Travel PDO Crash Rate (crashes/million veh-mi)	**4.79**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+11.000	0.0021	0.014	0.0139	0.0070	0.0068	6.6565	6.08
2	1000+11.000	1000+32.000	0.0040	0.026	0.0262	0.0132	0.0131	6.5982	6.03
3	1000+32.000	1000+53.000	0.0040	0.026	0.0259	0.0129	0.0131	6.5233	5.96
4	1000+53.000	1000+74.000	0.0040	0.026	0.0257	0.0126	0.0131	6.4500	5.89
5	1000+74.000	1002+59.867	0.0352	0.404	0.4035	0.1913	0.2122	11.4619	10.47
Total			0.0492	0.495	0.4952	0.2370	0.2582	10.0613	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+69.973	0.0322	0.300	0.3000	0.1444	0.1556	9.3206	8.51
Simple Curve 2	1001+69.973	1002+59.867	0.0170	0.195	0.1951	0.0925	0.1026	11.4619	10.47

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.49	0.24	47.856	0.26	52.144
Total	0.49	0.24	47.856	0.26	52.144
Average	0.49	0.24	47.856	0.26	52.144

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the

distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0002	0.0006	0.0025	0.0038	0.0068
2	0.0004	0.0011	0.0047	0.0071	0.0131
3	0.0004	0.0011	0.0046	0.0069	0.0131
4	0.0003	0.0010	0.0045	0.0067	0.0131
5	0.0057	0.0171	0.0720	0.0965	0.2122
Total	0.0069	0.0209	0.0882	0.1210	0.2582

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.1	0.01	1.3
Highway Segment	Collision with Fixed Object	0.17	34.0	0.18	36.7	0.35	70.7
Highway Segment	Collision with Other Object	0.01	2.4	0.04	7.1	0.05	9.5
Highway Segment	Other Single-vehicle Collision	0.05	9.8	0.03	5.5	0.08	15.3
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.8	0.01	1.5
Highway Segment	Total Single Vehicle Crashes	0.23	47.1	0.25	51.2	0.49	98.3
Highway Segment	Right-Angle Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Rear-end Collision	0.00	0.6	0.00	0.7	0.01	1.2
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.1	0.00	0.3	0.00	0.4
Highway Segment	Total Multiple Vehicle Crashes	0.00	0.7	0.01	1.0	0.01	1.7
Highway Segment	Total Highway Segment Crashes	0.24	47.9	0.26	52.1	0.49	100.0
	Total Crashes	0.24	47.9	0.26	52.1	0.49	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+11.000	for segment #1 (1000+00.000 to 1000+11.000), The ramp type for Ramp Alignment RGPSBXHALF0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1000+11.000	for segment #1 (1000+00.000 to 1000+11.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1000+11.000	for segment #1 (1000+00.000 to 1000+11.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+11.000	1000+32.000	for segment #2 (1000+11.000 to 1000+32.000), The ramp type for Ramp Alignment RGPSBXHALF0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+11.000	1000+32.000	for segment #2 (1000+11.000 to 1000+32.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+11.000	1000+32.000	for segment #2 (1000+11.000 to 1000+32.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+32.000	1000+53.000	for segment #3 (1000+32.000 to 1000+53.000), The ramp type for Ramp Alignment RGPSBXHALF0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+32.000	1000+53.000	for segment #3 (1000+32.000 to 1000+53.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+32.000	1000+53.000	for segment #3 (1000+32.000 to 1000+53.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+53.000	1000+74.000	for segment #4 (1000+53.000 to 1000+74.000), The ramp type for Ramp Alignment RGPSBXHALF0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+53.000	1000+74.000	for segment #4 (1000+53.000 to 1000+74.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+53.000	1000+74.000	for segment #4 (1000+53.000 to 1000+74.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+74.000	1002+59.867	for segment #5 (1000+74.000 to 1002+59.867), The ramp type for Ramp Alignment RGPSBXHALF0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+74.000	1002+59.867	for segment #5 (1000+74.000 to 1002+59.867), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+74.000	1002+59.867	for segment #5 (1000+74.000 to 1002+59.867), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

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Evaluation Date: Thu May 27 13:39:02 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBX320
Highway Comment: Imported from RGPSBX320.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:38:51 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1001+74.687
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1001+74.687
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

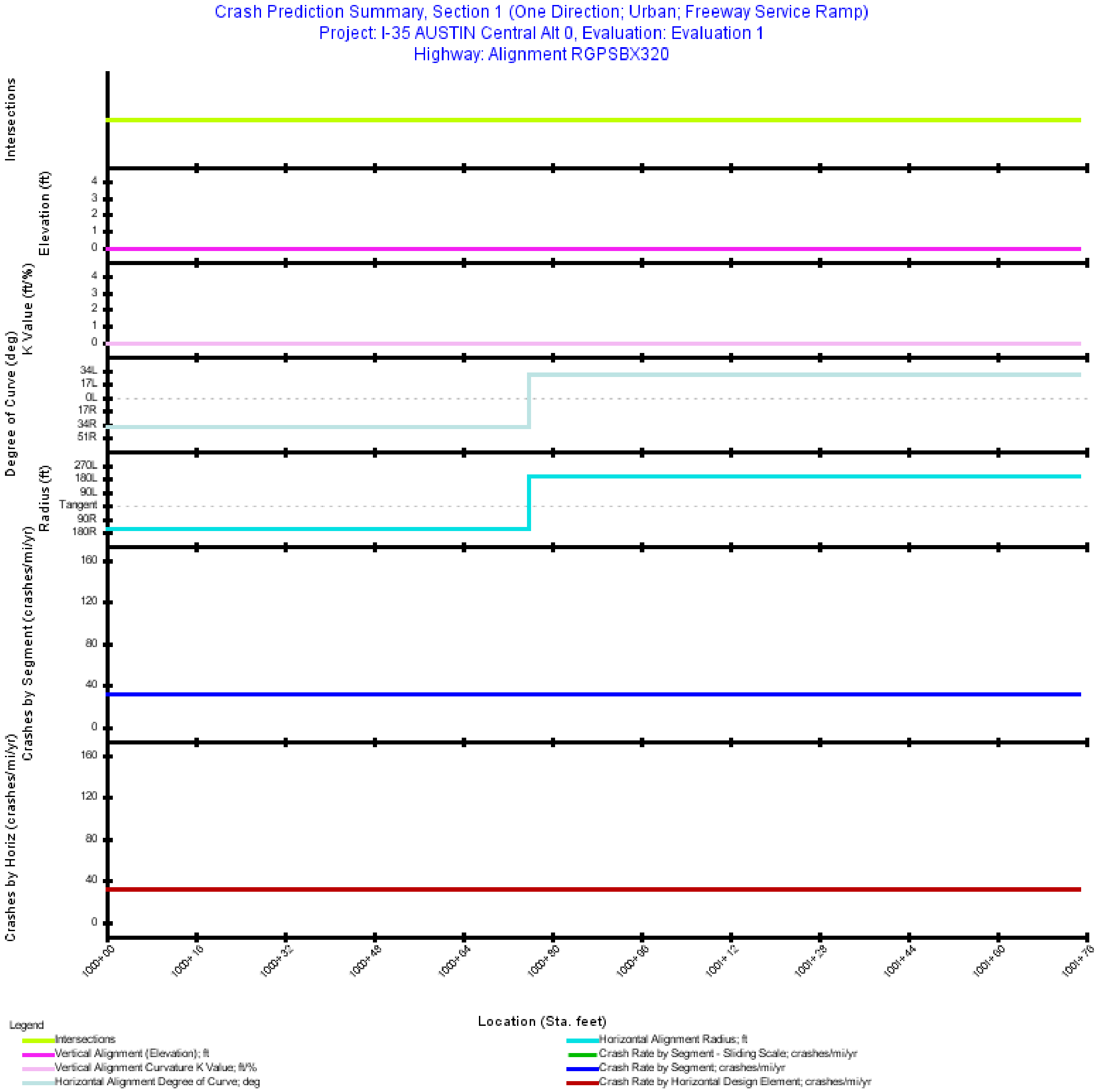

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1001+74.687	174.69	0.0331	2030: 5,150

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0331**
Average Future Road AADT (vpd)	**5,150**
Predicted Crashes	
Total Crashes	**1.05**
Fatal and Injury Crashes	**0.47**
Property-Damage-Only Crashes	**0.58**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**45**
Percent Property-Damage-Only Crashes (%)	**55**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**31.6601**
FI Crash Rate (crashes/mi/yr)	**14.2626**
PDO Crash Rate (crashes/mi/yr)	**17.3975**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.06**
Travel Crash Rate (crashes/million veh-mi)	**16.84**
Travel FI Crash Rate (crashes/million veh-mi)	**7.59**
Travel PDO Crash Rate (crashes/million veh-mi)	**9.26**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1001+74.687	0.0331	1.048	1.0475	0.4719	0.5756	31.6601	16.84
Total			0.0331	1.048	1.0475	0.4719	0.5756	31.6601	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1000+75.846	0.0144	0.455	0.4548	0.2049	0.2499	31.6601	16.84
Simple Curve 2	1000+75.846	1001+74.687	0.0187	0.593	0.5927	0.2670	0.3257	31.6601	16.84

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.05	0.47	45.049	0.58	54.951
Total	1.05	0.47	45.049	0.58	54.951
Average	1.05	0.47	45.049	0.58	54.951

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0139	0.0422	0.1775	0.2382	0.5756

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.2	0.01	1.4
Highway Segment	Collision with Fixed Object	0.34	32.1	0.40	38.6	0.74	70.7
Highway Segment	Collision with Other Object	0.02	2.3	0.08	7.5	0.10	9.8
Highway Segment	Other Single-vehicle Collision	0.10	9.2	0.06	5.8	0.16	15.0
Highway Segment	Collision with Parked Vehicle	0.01	0.7	0.01	0.9	0.02	1.5
Highway Segment	Total Single Vehicle Crashes	0.47	44.4	0.56	53.9	1.03	98.3
Highway Segment	Right-Angle Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Rear-end Collision	0.01	0.5	0.01	0.7	0.01	1.2
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.1	0.00	0.3	0.00	0.4
Highway Segment	Total Multiple Vehicle Crashes	0.01	0.6	0.01	1.1	0.02	1.7
Highway Segment	Total Highway Segment Crashes	0.47	45.0	0.58	55.0	1.05	100.0
	Total Crashes	0.47	45.0	0.58	55.0	1.05	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1001+74.687	for segment #1 (1000+00.000 to 1001+74.687), The ramp type for Ramp Alignment RGPSBX320 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1001+74.687	for segment #1 (1000+00.000 to 1001+74.687), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1001+74.687	for segment #1 (1000+00.000 to 1001+74.687), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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The use of the IHSDM software is being done strictly on a voluntary basis. In exchange for provision of IHSDM, the user agrees that the Federal Highway Administration (FHWA), U.S. Department of Transportation and any other agency of the Federal Government shall not be responsible for any errors, damage or other liability that may result from any and all use of the software, including installation and testing of the software. The user further agrees to hold the FHWA and the Federal Government harmless from any resulting liability. The user agrees that this hold harmless provision shall flow to any person to whom or any entity to which the user provides the IHSDM software. It is the user's full responsibility to inform any person to whom or any entity to which it provides the IHSDM software of this hold harmless provision.

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Report Overview

Report Generated: May 27, 2021 1:33 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:33:29 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBN320
Highway Comment: Imported from RGPSBN320.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:33:19 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1001+42.353
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1001+42.353
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

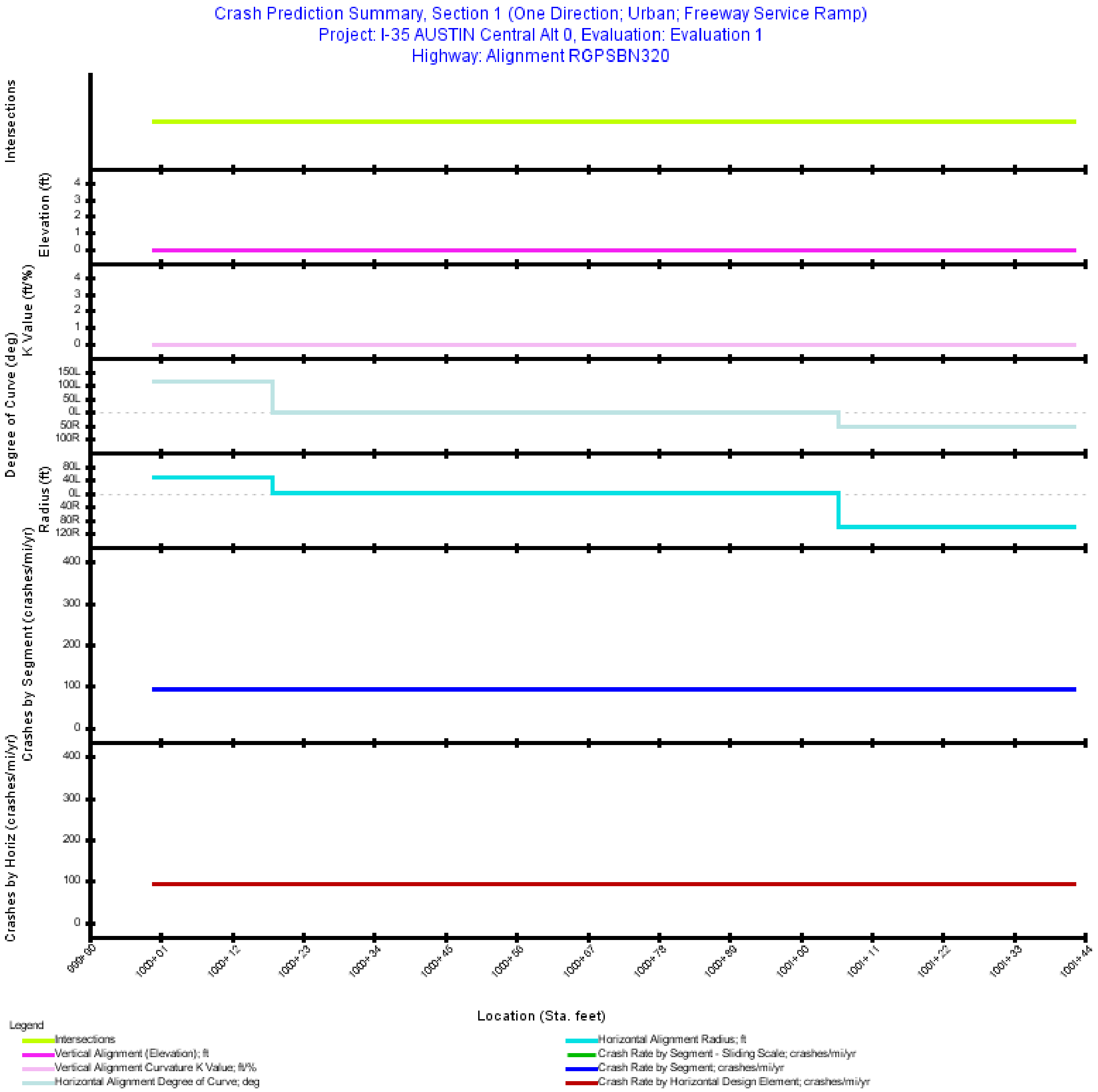

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1001+42.353	142.35	0.0270	2030: 8,750

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0270**
Average Future Road AADT (vpd)	**8,750**
Predicted Crashes	
Total Crashes	**2.54**
Fatal and Injury Crashes	**1.14**
Property-Damage-Only Crashes	**1.39**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**45**
Percent Property-Damage-Only Crashes (%)	**55**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**94.0617**
FI Crash Rate (crashes/mi/yr)	**42.3702**
PDO Crash Rate (crashes/mi/yr)	**51.6916**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.09**
Travel Crash Rate (crashes/million veh-mi)	**29.45**
Travel FI Crash Rate (crashes/million veh-mi)	**13.27**
Travel PDO Crash Rate (crashes/million veh-mi)	**16.18**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1001+42.353	0.0270	2.536	2.5360	1.1423	1.3936	94.0617	29.45
Total			0.0270	2.536	2.5360	1.1423	1.3936	94.0617	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1000+18.256	0.0035	0.325	0.3252	0.1465	0.1787	94.0617	29.45
Tangent	1000+18.256	1001+05.879	0.0166	1.561	1.5610	0.7031	0.8578	94.0617	29.45
Simple Curve 2	1001+05.879	1001+42.353	0.0069	0.650	0.6498	0.2927	0.3571	94.0617	29.45

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.54	1.14	45.045	1.39	54.955
Total	2.54	1.14	45.045	1.39	54.955
Average	2.54	1.14	45.045	1.39	54.955

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0225	0.0682	0.4407	0.6110	1.3936

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.03	1.1	0.03	1.3
Highway Segment	Collision with Fixed Object	0.76	29.8	0.92	36.4	1.68	66.3
Highway Segment	Collision with Other Object	0.05	2.1	0.18	7.1	0.23	9.2
Highway Segment	Other Single-vehicle Collision	0.22	8.6	0.14	5.4	0.36	14.0
Highway Segment	Collision with Parked Vehicle	0.02	0.6	0.02	0.8	0.04	1.4
Highway Segment	Total Single Vehicle Crashes	1.05	41.3	1.29	50.8	2.34	92.2
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.01	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.01	0.2
Highway Segment	Rear-end Collision	0.07	2.8	0.07	2.8	0.14	5.6
Highway Segment	Sideswipe, Same Direction Collision	0.02	0.7	0.03	1.1	0.04	1.8
Highway Segment	Total Multiple Vehicle Crashes	0.09	3.7	0.10	4.1	0.20	7.8
Highway Segment	Total Highway Segment Crashes	1.14	45.0	1.39	55.0	2.54	100.0
	Total Crashes	1.14	45.0	1.39	55.0	2.54	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1001+42.353	for segment #1 (1000+00.000 to 1001+42.353), The ramp type for Ramp Alignment RGPSBN320 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1001+42.353	for segment #1 (1000+00.000 to 1001+42.353), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1001+42.353	for segment #1 (1000+00.000 to 1001+42.353), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

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Evaluation Date: Thu May 27 13:51:23 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBXMAN0
Highway Comment: Imported from RGPSBXMAN0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:51:03 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1001+91.584
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

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The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1001+91.584
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

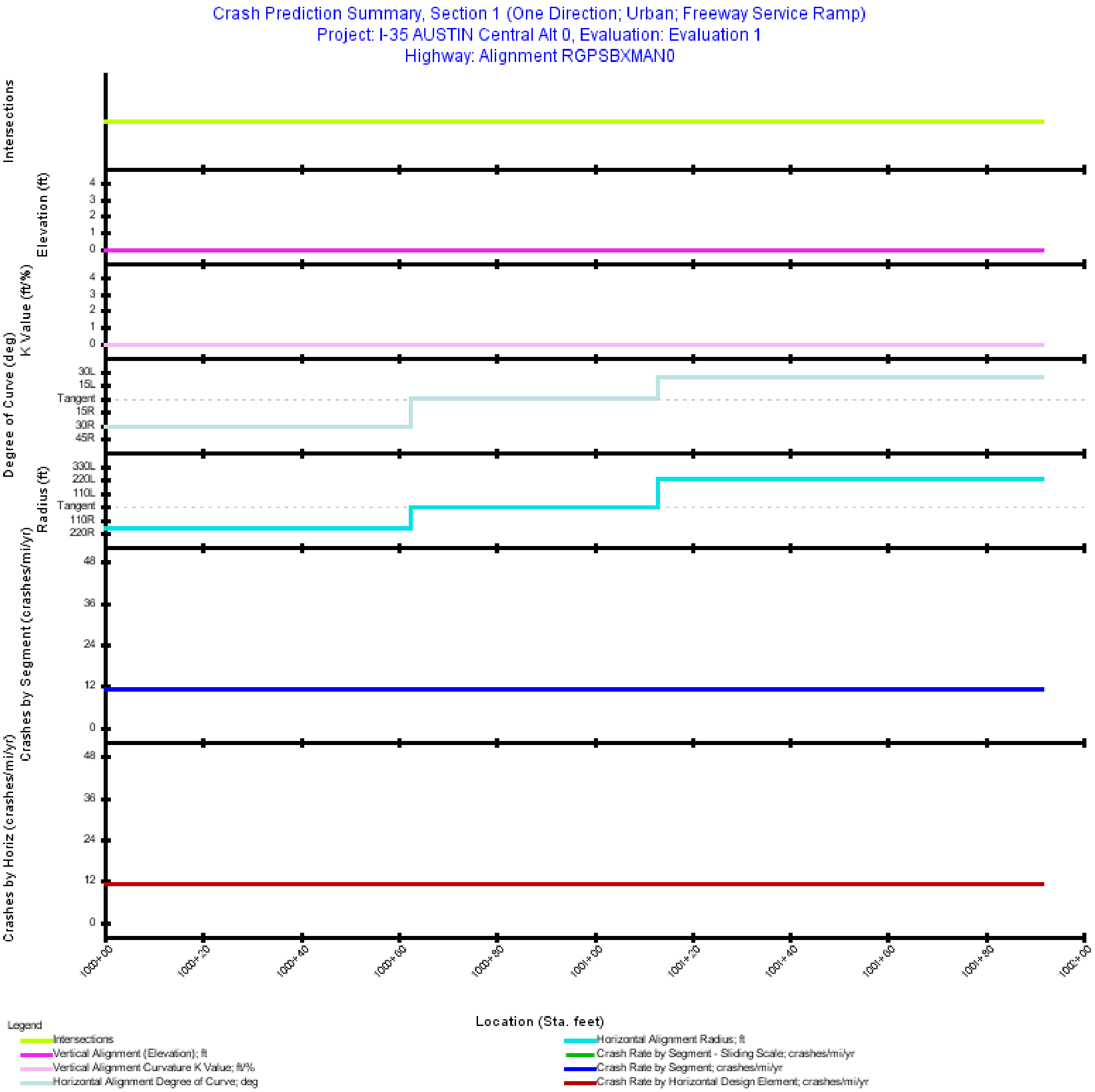

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1001+91.584	191.58	0.0363	2030: 2,450

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0363**
Average Future Road AADT (vpd)	**2,450**
Predicted Crashes	
Total Crashes	**0.41**
Fatal and Injury Crashes	**0.20**
Property-Damage-Only Crashes	**0.21**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**49**
Percent Property-Damage-Only Crashes (%)	**51**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**11.3090**
FI Crash Rate (crashes/mi/yr)	**5.5865**
PDO Crash Rate (crashes/mi/yr)	**5.7225**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.03**
Travel Crash Rate (crashes/million veh-mi)	**12.65**
Travel FI Crash Rate (crashes/million veh-mi)	**6.25**
Travel PDO Crash Rate (crashes/million veh-mi)	**6.40**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1001+91.584	0.0363	0.410	0.4103	0.2027	0.2076	11.3090	12.65
Total			0.0363	0.410	0.4103	0.2027	0.2076	11.3090	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1000+62.352	0.0118	0.134	0.1335	0.0660	0.0676	11.3090	12.65
Tangent	1000+62.352	1001+13.010	0.0096	0.108	0.1085	0.0536	0.0549	11.3090	12.65
Simple Curve 2	1001+13.010	1001+91.584	0.0149	0.168	0.1683	0.0831	0.0852	11.3090	12.65

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.41	0.20	49.399	0.21	50.601
Total	0.41	0.20	49.399	0.21	50.601
Average	0.41	0.20	49.399	0.21	50.601

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0061	0.0185	0.0776	0.1005	0.2076

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.1	0.01	1.3
Highway Segment	Collision with Fixed Object	0.14	35.2	0.15	35.7	0.29	70.9
Highway Segment	Collision with Other Object	0.01	2.5	0.03	6.9	0.04	9.4
Highway Segment	Other Single-vehicle Collision	0.04	10.1	0.02	5.3	0.06	15.5
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.8	0.01	1.5
Highway Segment	Total Single Vehicle Crashes	0.20	48.7	0.20	49.9	0.40	98.5
Highway Segment	Right-Angle Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Rear-end Collision	0.00	0.5	0.00	0.5	0.00	1.0
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.1	0.00	0.2	0.00	0.3
Highway Segment	Total Multiple Vehicle Crashes	0.00	0.7	0.00	0.7	0.01	1.5
Highway Segment	Total Highway Segment Crashes	0.20	49.4	0.21	50.6	0.41	100.0
	Total Crashes	0.20	49.4	0.21	50.6	0.41	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1001+91.584	for segment #1 (1000+00.000 to 1001+91.584), The ramp type for Ramp Alignment RGPSBXMAN0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1001+91.584	for segment #1 (1000+00.000 to 1001+91.584), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1001+91.584	for segment #1 (1000+00.000 to 1001+91.584), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:52 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:52:16 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBXMLK0
Highway Comment: Imported from RGPSBXMLK0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:52:06 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1006+57.044
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1006+57.044
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

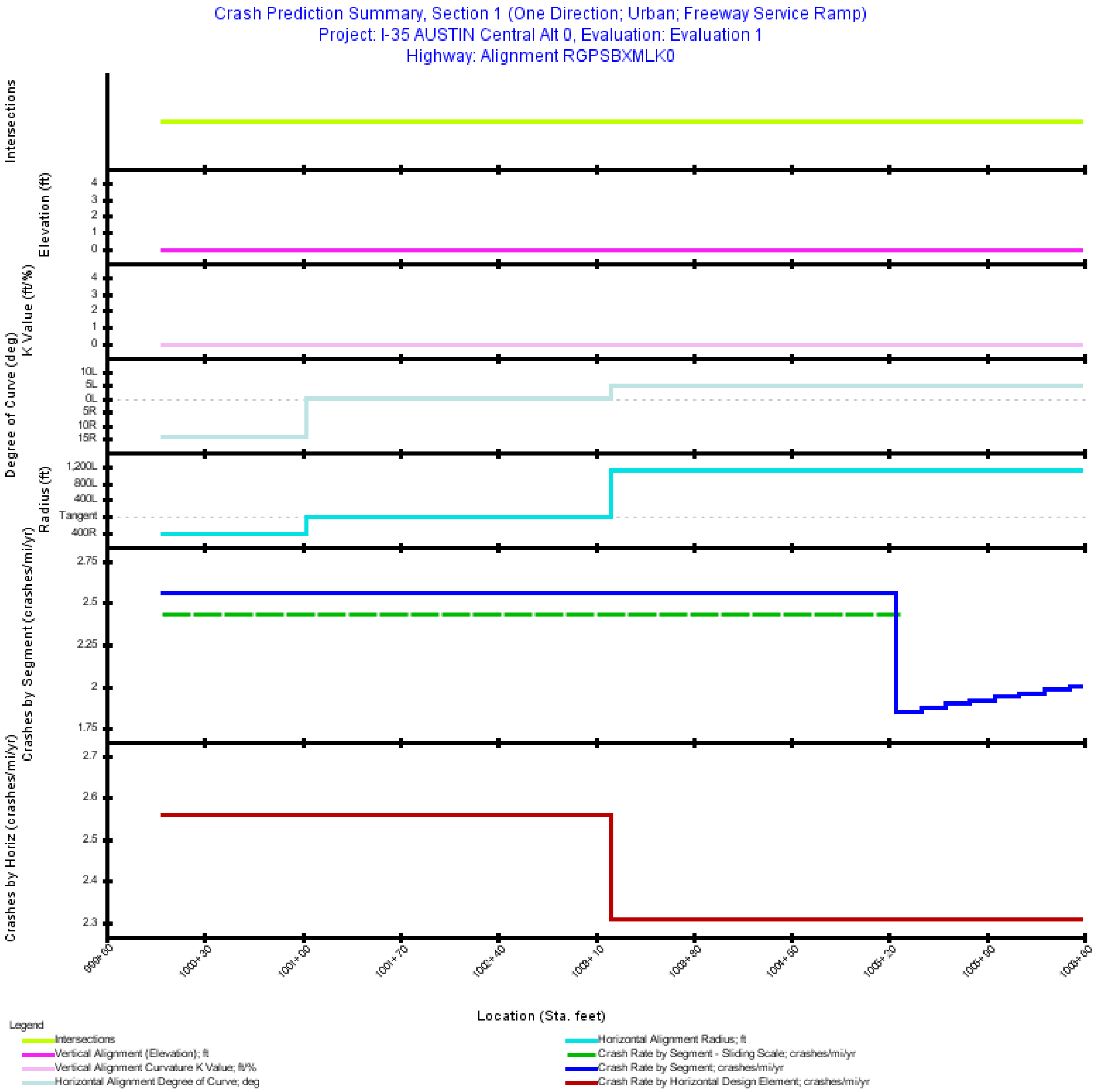

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1005+25.000	525.00	0.0994	2030: 3,350
2	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1005+25.000	1005+43.000	18.00	0.0034	2030: 3,350
3	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1005+43.000	1005+61.000	18.00	0.0034	2030: 3,350
4	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1005+61.000	1005+78.000	17.00	0.0032	2030: 3,350
5	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1005+78.000	1005+96.000	18.00	0.0034	2030: 3,350
6	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1005+96.000	1006+13.000	17.00	0.0032	2030: 3,350
7	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1006+13.000	1006+31.000	18.00	0.0034	2030: 3,350
8	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1006+31.000	1006+49.000	18.00	0.0034	2030: 3,350
9	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1006+49.000	1006+57.044	8.04	0.0015	2030: 3,350

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1244**
Average Future Road AADT (vpd)	**3,350**
Predicted Crashes	
Total Crashes	**0.30**
Fatal and Injury Crashes	**0.15**
Property-Damage-Only Crashes	**0.16**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**2.4300**
FI Crash Rate (crashes/mi/yr)	**1.1747**
PDO Crash Rate (crashes/mi/yr)	**1.2553**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.15**
Travel Crash Rate (crashes/million veh-mi)	**1.99**
Travel FI Crash Rate (crashes/million veh-mi)	**0.96**
Travel PDO Crash Rate (crashes/million veh-mi)	**1.03**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1005+25.000	0.0994	0.254	0.2543	0.1217	0.1326	2.5577	2.09
2	1005+25.000	1005+43.000	0.0034	0.006	0.0063	0.0031	0.0032	1.8515	1.51
3	1005+43.000	1005+61.000	0.0034	0.006	0.0064	0.0032	0.0032	1.8730	1.53
4	1005+61.000	1005+78.000	0.0032	0.006	0.0061	0.0031	0.0030	1.8943	1.55
5	1005+78.000	1005+96.000	0.0034	0.006	0.0065	0.0033	0.0032	1.9162	1.57
6	1005+96.000	1006+13.000	0.0032	0.006	0.0062	0.0032	0.0030	1.9385	1.58
7	1006+13.000	1006+31.000	0.0034	0.007	0.0067	0.0035	0.0032	1.9613	1.60
8	1006+31.000	1006+49.000	0.0034	0.007	0.0068	0.0035	0.0032	1.9854	1.62
9	1006+49.000	1006+57.044	0.0015	0.003	0.0031	0.0016	0.0014	2.0031	1.64
Total			0.1244	0.302	0.3024	0.1462	0.1562	2.4300	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+03.269	0.0196	0.050	0.0500	0.0239	0.0261	2.5577	2.09
Tangent	1001+03.269	1003+21.222	0.0413	0.106	0.1056	0.0505	0.0550	2.5577	2.09
Simple Curve 2	1003+21.222	1006+57.044	0.0636	0.147	0.1468	0.0717	0.0751	2.3079	1.89

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.30	0.15	48.342	0.16	51.658
Total	0.30	0.15	48.342	0.16	51.658
Average	0.30	0.15	48.342	0.16	51.658

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0036	0.0109	0.0459	0.0614	0.1326
2	0.0001	0.0003	0.0012	0.0015	0.0032
3	0.0001	0.0003	0.0012	0.0015	0.0032
4	0.0001	0.0003	0.0012	0.0015	0.0030
5	0.0001	0.0003	0.0013	0.0016	0.0032
6	0.0001	0.0003	0.0013	0.0015	0.0030
7	0.0001	0.0003	0.0014	0.0017	0.0032
8	0.0001	0.0003	0.0014	0.0017	0.0032
9	0.0001	0.0002	0.0006	0.0008	0.0014
Total	0.0044	0.0132	0.0555	0.0731	0.1562

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.00	1.1	0.00	1.3
Highway Segment	Collision with Fixed Object	0.10	34.0	0.11	35.4	0.21	69.4
Highway Segment	Collision with Other Object	0.01	2.4	0.02	6.9	0.03	9.3
Highway Segment	Other Single-vehicle Collision	0.03	9.8	0.02	5.3	0.05	15.1
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.8	0.01	1.5
Highway Segment	Total Single Vehicle Crashes	0.14	47.1	0.15	49.4	0.29	96.5
Highway Segment	Right-Angle Collision	0.00	0.0	0.00	0.0	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.0	0.00	0.1	0.00	0.1
Highway Segment	Rear-end Collision	0.00	1.0	0.01	1.5	0.01	2.5
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.2	0.00	0.6	0.00	0.8
Highway Segment	Total Multiple Vehicle Crashes	0.00	1.3	0.01	2.2	0.01	3.5
Highway Segment	Total Highway Segment Crashes	0.15	48.3	0.16	51.7	0.30	100.0
	Total Crashes	0.15	48.3	0.16	51.7	0.30	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1005+25.000	for segment #1 (1000+00.000 to 1005+25.000), The ramp type for Ramp Alignment RGPSBXMLK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1005+25.000	for segment #1 (1000+00.000 to 1005+25.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1005+25.000	for segment #1 (1000+00.000 to 1005+25.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+25.000	1005+43.000	for segment #2 (1005+25.000 to 1005+43.000), The ramp type for Ramp Alignment RGPSBXMLK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+25.000	1005+43.000	for segment #2 (1005+25.000 to 1005+43.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+25.000	1005+43.000	for segment #2 (1005+25.000 to 1005+43.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+43.000	1005+61.000	for segment #3 (1005+43.000 to 1005+61.000), The ramp type for Ramp Alignment RGPSBXMLK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+43.000	1005+61.000	for segment #3 (1005+43.000 to 1005+61.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+43.000	1005+61.000	for segment #3 (1005+43.000 to 1005+61.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+61.000	1005+78.000	for segment #4 (1005+61.000 to 1005+78.000), The ramp type for Ramp Alignment RGPSBXMLK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+61.000	1005+78.000	for segment #4 (1005+61.000 to 1005+78.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+61.000	1005+78.000	for segment #4 (1005+61.000 to 1005+78.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+78.000	1005+96.000	for segment #5 (1005+78.000 to 1005+96.000), The ramp type for Ramp Alignment RGPSBXMLK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+78.000	1005+96.000	for segment #5 (1005+78.000 to 1005+96.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+78.000	1005+96.000	for segment #5 (1005+78.000 to 1005+96.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+96.000	1006+13.000	for segment #6 (1005+96.000 to 1006+13.000), The ramp type for Ramp Alignment RGPSBXMLK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+96.000	1006+13.000	for segment #6 (1005+96.000 to 1006+13.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+96.000	1006+13.000	for segment #6 (1005+96.000 to 1006+13.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1006+13.000	1006+31.000	for segment #7 (1006+13.000 to 1006+31.000), The ramp type for Ramp Alignment RGPSBXMLK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1006+13.000	1006+31.000	for segment #7 (1006+13.000 to 1006+31.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1006+13.000	1006+31.000	for segment #7 (1006+13.000 to 1006+31.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1006+31.000	1006+49.000	for segment #8 (1006+31.000 to 1006+49.000), The ramp type for Ramp Alignment RGPSBXMLK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1006+31.000	1006+49.000	for segment #8 (1006+31.000 to 1006+49.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1006+31.000	1006+49.000	for segment #8 (1006+31.000 to 1006+49.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1006+49.000	1006+57.044	for segment #9 (1006+49.000 to 1006+57.044), The ramp type for Ramp Alignment RGPSBXMLK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1006+49.000	1006+57.044	for segment #9 (1006+49.000 to 1006+57.044), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1006+49.000	1006+57.044	for segment #9 (1006+49.000 to 1006+57.044), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:38 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:38:20 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBX120
Highway Comment: Imported from RGPSBX120.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:38:10 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1009+48.591
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1009+48.591
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

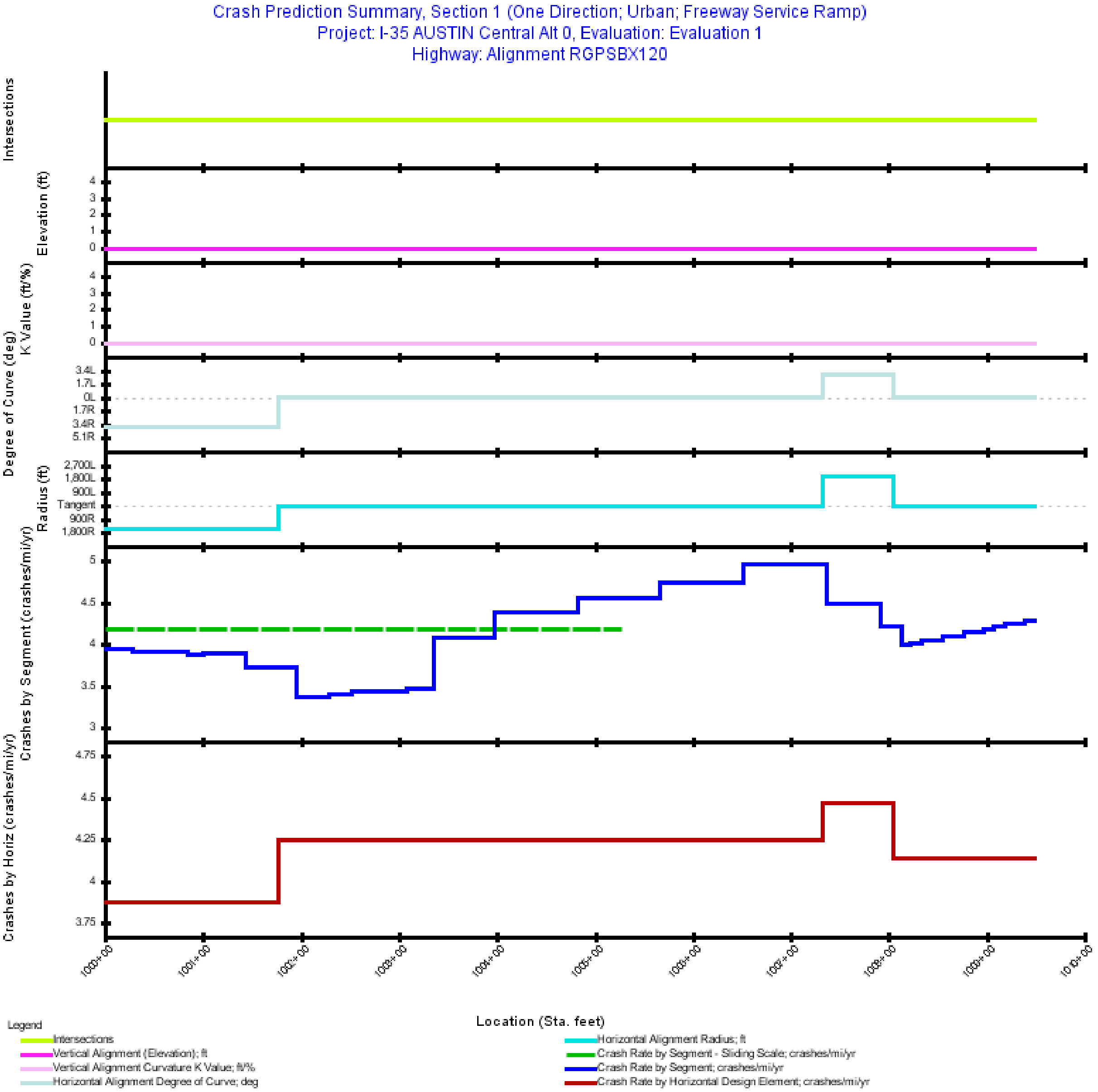

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1000+28.000	28.00	0.0053	2030: 10,650
2	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+28.000	1000+84.000	56.00	0.0106	2030: 10,650
3	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+84.000	1001+00.000	16.00	0.0030	2030: 10,650
4	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+00.000	1001+43.000	43.00	0.0081	2030: 10,650
5	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+43.000	1001+96.000	53.00	0.0100	2030: 10,650
6	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+96.000	1002+28.000	32.00	0.0061	2030: 10,650
7	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+28.000	1002+52.000	24.00	0.0045	2030: 10,650
8	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+52.000	1003+08.000	56.00	0.0106	2030: 10,650
9	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+08.000	1003+13.000	5.00	0.0009	2030: 10,650
10	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+13.000	1003+36.000	23.00	0.0044	2030: 10,650
11	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+36.000	1003+98.000	62.00	0.0117	2030: 10,650
12	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+98.000	1004+82.000	84.00	0.0159	2030: 10,650
13	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+82.000	1005+67.000	85.00	0.0161	2030: 10,650
14	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1005+67.000	1006+52.000	85.00	0.0161	2030: 10,650
15	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1006+52.000	1007+37.000	85.00	0.0161	2030: 10,650
16	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1007+37.000	1007+92.000	55.00	0.0104	2030: 10,650
17	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1007+92.000	1008+13.000	21.00	0.0040	2030: 10,650
18	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1008+13.000	1008+22.000	9.00	0.0017	2030: 10,650
19	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1008+22.000	1008+34.000	12.00	0.0023	2030: 10,650
20	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1008+34.000	1008+55.000	21.00	0.0040	2030: 10,650
21	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1008+55.000	1008+76.000	21.00	0.0040	2030: 10,650
22	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1008+76.000	1008+97.000	21.00	0.0040	2030: 10,650
23	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1008+97.000	1009+07.000	10.00	0.0019	2030: 10,650

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
24	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1009+07.000	1009+18.000	11.00	0.0021	2030: 10,650
25	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1009+18.000	1009+39.000	21.00	0.0040	2030: 10,650
26	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1009+39.000	1009+48.591	9.59	0.0018	2030: 10,650

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1797**
Average Future Road AADT (vpd)	**10,650**
Predicted Crashes	
Total Crashes	**0.75**
Fatal and Injury Crashes	**0.36**
Property-Damage-Only Crashes	**0.39**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**4.1744**
FI Crash Rate (crashes/mi/yr)	**1.9999**
PDO Crash Rate (crashes/mi/yr)	**2.1744**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.70**
Travel Crash Rate (crashes/million veh-mi)	**1.07**
Travel FI Crash Rate (crashes/million veh-mi)	**0.51**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.56**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+28.000	0.0053	0.021	0.0209	0.0103	0.0106	3.9390	1.01
2	1000+28.000	1000+84.000	0.0106	0.041	0.0414	0.0203	0.0211	3.9059	1.00
3	1000+84.000	1001+00.000	0.0030	0.012	0.0118	0.0057	0.0060	3.8779	1.00
4	1001+00.000	1001+43.000	0.0081	0.032	0.0317	0.0154	0.0163	3.8941	1.00
5	1001+43.000	1001+96.000	0.0100	0.037	0.0373	0.0181	0.0192	3.7168	0.96
6	1001+96.000	1002+28.000	0.0061	0.020	0.0204	0.0100	0.0104	3.3683	0.87
7	1002+28.000	1002+52.000	0.0045	0.015	0.0154	0.0076	0.0079	3.3935	0.87
8	1002+52.000	1003+08.000	0.0106	0.036	0.0364	0.0178	0.0186	3.4299	0.88
9	1003+08.000	1003+13.000	0.0009	0.003	0.0033	0.0016	0.0017	3.4579	0.89
10	1003+13.000	1003+36.000	0.0044	0.015	0.0151	0.0074	0.0077	3.4708	0.89
11	1003+36.000	1003+98.000	0.0117	0.048	0.0479	0.0215	0.0263	4.0760	1.05
12	1003+98.000	1004+82.000	0.0159	0.070	0.0697	0.0318	0.0379	4.3794	1.13
13	1004+82.000	1005+67.000	0.0161	0.073	0.0733	0.0340	0.0393	4.5518	1.17
14	1005+67.000	1006+52.000	0.0161	0.076	0.0762	0.0358	0.0403	4.7331	1.22
15	1006+52.000	1007+37.000	0.0161	0.080	0.0797	0.0380	0.0417	4.9519	1.27
16	1007+37.000	1007+92.000	0.0104	0.047	0.0467	0.0221	0.0245	4.4804	1.15
17	1007+92.000	1008+13.000	0.0040	0.017	0.0167	0.0081	0.0087	4.2086	1.08
18	1008+13.000	1008+22.000	0.0017	0.007	0.0068	0.0033	0.0035	3.9908	1.03
19	1008+22.000	1008+34.000	0.0023	0.009	0.0091	0.0045	0.0046	4.0134	1.03
20	1008+34.000	1008+55.000	0.0040	0.016	0.0161	0.0080	0.0081	4.0493	1.04
21	1008+55.000	1008+76.000	0.0040	0.016	0.0163	0.0082	0.0081	4.0959	1.05
22	1008+76.000	1008+97.000	0.0040	0.017	0.0165	0.0084	0.0081	4.1436	1.07
23	1008+97.000	1009+07.000	0.0019	0.008	0.0079	0.0041	0.0039	4.1796	1.07
24	1009+07.000	1009+18.000	0.0021	0.009	0.0088	0.0045	0.0043	4.2043	1.08
25	1009+18.000	1009+39.000	0.0040	0.017	0.0169	0.0088	0.0081	4.2425	1.09
26	1009+39.000	1009+48.591	0.0018	0.008	0.0078	0.0041	0.0037	4.2796	1.10
Total			0.1797	0.750	0.7500	0.3593	0.3907	4.1744	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+76.358	0.0334	0.129	0.1293	0.0631	0.0661	3.8700	1.00
Tangent	1001+76.358	1007+32.297	0.1053	0.447	0.4468	0.2102	0.2366	4.2430	1.09
Simple Curve 2	1007+32.297	1008+04.251	0.0136	0.061	0.0608	0.0289	0.0319	4.4650	1.15
Tangent	1008+04.251	1009+48.591	0.0273	0.113	0.1131	0.0571	0.0560	4.1371	1.06

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.75	0.36	47.910	0.39	52.090
Total	0.75	0.36	47.910	0.39	52.090
Average	0.75	0.36	47.910	0.39	52.090

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0003	0.0009	0.0037	0.0055	0.0106
2	0.0006	0.0017	0.0072	0.0109	0.0211
3	0.0002	0.0005	0.0020	0.0031	0.0060
4	0.0004	0.0013	0.0054	0.0082	0.0163
5	0.0005	0.0015	0.0064	0.0097	0.0192
6	0.0003	0.0008	0.0035	0.0054	0.0104
7	0.0002	0.0006	0.0027	0.0040	0.0079
8	0.0005	0.0015	0.0063	0.0095	0.0186
9	0.0000	0.0001	0.0006	0.0009	0.0017
10	0.0002	0.0006	0.0026	0.0040	0.0077
11	0.0005	0.0016	0.0069	0.0125	0.0263
12	0.0008	0.0023	0.0100	0.0188	0.0379
13	0.0008	0.0024	0.0107	0.0200	0.0393
14	0.0009	0.0026	0.0113	0.0212	0.0403
15	0.0009	0.0027	0.0120	0.0224	0.0417
16	0.0006	0.0018	0.0077	0.0120	0.0245
17	0.0002	0.0007	0.0029	0.0043	0.0087
18	0.0001	0.0003	0.0012	0.0018	0.0035
19	0.0001	0.0004	0.0016	0.0024	0.0046
20	0.0002	0.0007	0.0028	0.0043	0.0081
21	0.0002	0.0007	0.0029	0.0044	0.0081
22	0.0002	0.0007	0.0030	0.0045	0.0081
23	0.0001	0.0003	0.0014	0.0022	0.0039
24	0.0001	0.0004	0.0016	0.0024	0.0043
25	0.0002	0.0007	0.0031	0.0047	0.0081
26	0.0001	0.0003	0.0014	0.0022	0.0037
Total	0.0092	0.0280	0.1208	0.2012	0.3907

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.25	33.0	0.25	33.0	0.49	66.0
Highway Segment	Collision with Other Object	0.02	2.3	0.05	6.4	0.07	8.7
Highway Segment	Other Single-vehicle Collision	0.07	9.5	0.04	4.9	0.11	14.5
Highway Segment	Collision with Parked Vehicle	0.01	0.7	0.01	0.7	0.01	1.4
Highway Segment	Total Single Vehicle Crashes	0.34	45.8	0.35	46.1	0.69	91.8
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Rear-end Collision	0.01	1.6	0.03	4.1	0.04	5.8
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.4	0.01	1.6	0.01	2.0
Highway Segment	Total Multiple Vehicle Crashes	0.02	2.1	0.04	6.0	0.06	8.2
Highway Segment	Total Highway Segment Crashes	0.36	47.9	0.39	52.1	0.75	100.0
	Total Crashes	0.36	47.9	0.39	52.1	0.75	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+28.000	for segment #1 (1000+00.000 to 1000+28.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+28.000	1000+84.000	for segment #2 (1000+28.000 to 1000+84.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+84.000	1001+00.000	for segment #3 (1000+84.000 to 1001+00.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+00.000	1001+43.000	for segment #4 (1001+00.000 to 1001+43.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+43.000	1001+96.000	for segment #5 (1001+43.000 to 1001+96.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+96.000	1002+28.000	for segment #6 (1001+96.000 to 1002+28.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+28.000	1002+52.000	for segment #7 (1002+28.000 to 1002+52.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+52.000	1003+08.000	for segment #8 (1002+52.000 to 1003+08.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+08.000	1003+13.000	for segment #9 (1003+08.000 to 1003+13.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+13.000	1003+36.000	for segment #10 (1003+13.000 to 1003+36.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+36.000	1003+98.000	for segment #11 (1003+36.000 to 1003+98.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+36.000	1003+98.000	for segment #11 (1003+36.000 to 1003+98.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+98.000	1004+82.000	for segment #12 (1003+98.000 to 1004+82.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+98.000	1004+82.000	for segment #12 (1003+98.000 to 1004+82.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+82.000	1005+67.000	for segment #13 (1004+82.000 to 1005+67.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+82.000	1005+67.000	for segment #13 (1004+82.000 to 1005+67.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+67.000	1006+52.000	for segment #14 (1005+67.000 to 1006+52.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+67.000	1006+52.000	for segment #14 (1005+67.000 to 1006+52.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1006+52.000	1007+37.000	for segment #15 (1006+52.000 to 1007+37.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1006+52.000	1007+37.000	for segment #15 (1006+52.000 to 1007+37.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1007+37.000	1007+92.000	for segment #16 (1007+37.000 to 1007+92.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1007+37.000	1007+92.000	for segment #16 (1007+37.000 to 1007+92.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1007+92.000	1008+13.000	for segment #17 (1007+92.000 to 1008+13.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1007+92.000	1008+13.000	for segment #17 (1007+92.000 to 1008+13.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1007+92.000	1008+13.000	for segment #17 (1007+92.000 to 1008+13.000), Right shoulder width (1.72 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1008+13.000	1008+22.000	for segment #18 (1008+13.000 to 1008+22.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1008+13.000	1008+22.000	for segment #18 (1008+13.000 to 1008+22.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1008+13.000	1008+22.000	for segment #18 (1008+13.000 to 1008+22.000), Right shoulder width (1.54 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1008+22.000	1008+34.000	for segment #19 (1008+22.000 to 1008+34.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1008+22.000	1008+34.000	for segment #19 (1008+22.000 to 1008+34.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1008+22.000	1008+34.000	for segment #19 (1008+22.000 to 1008+34.000), Right shoulder width (1.42 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1008+34.000	1008+55.000	for segment #20 (1008+34.000 to 1008+55.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1008+34.000	1008+55.000	for segment #20 (1008+34.000 to 1008+55.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1008+34.000	1008+55.000	for segment #20 (1008+34.000 to 1008+55.000), Right shoulder width (1.23 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1008+55.000	1008+76.000	for segment #21 (1008+55.000 to 1008+76.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1008+55.000	1008+76.000	for segment #21 (1008+55.000 to 1008+76.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1008+55.000	1008+76.000	for segment #21 (1008+55.000 to 1008+76.000), Right shoulder width (0.98 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1008+76.000	1008+97.000	for segment #22 (1008+76.000 to 1008+97.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1008+76.000	1008+97.000	for segment #22 (1008+76.000 to 1008+97.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1008+76.000	1008+97.000	for segment #22 (1008+76.000 to 1008+97.000), Right shoulder width (0.73 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1008+97.000	1009+07.000	for segment #23 (1008+97.000 to 1009+07.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1008+97.000	1009+07.000	for segment #23 (1008+97.000 to 1009+07.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1008+97.000	1009+07.000	for segment #23 (1008+97.000 to 1009+07.000), Right shoulder width (0.55 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1009+07.000	1009+18.000	for segment #24 (1009+07.000 to 1009+18.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1009+07.000	1009+18.000	for segment #24 (1009+07.000 to 1009+18.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1009+07.000	1009+18.000	for segment #24 (1009+07.000 to 1009+18.000), Right shoulder width (0.43 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1009+18.000	1009+39.000	for segment #25 (1009+18.000 to 1009+39.000), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1009+18.000	1009+39.000	for segment #25 (1009+18.000 to 1009+39.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1009+18.000	1009+39.000	for segment #25 (1009+18.000 to 1009+39.000), Right shoulder width (0.24 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1009+39.000	1009+48.591	for segment #26 (1009+39.000 to 1009+48.591), The ramp type for Ramp Alignment RGPSBX120 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1009+39.000	1009+48.591	for segment #26 (1009+39.000 to 1009+48.591), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1009+39.000	1009+48.591	for segment #26 (1009+39.000 to 1009+48.591), Right shoulder width (0.06 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:57 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:56:49 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBN150
Highway Comment: Imported from RGPNBN150.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:56:36 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1006+70.314
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1006+70.314
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

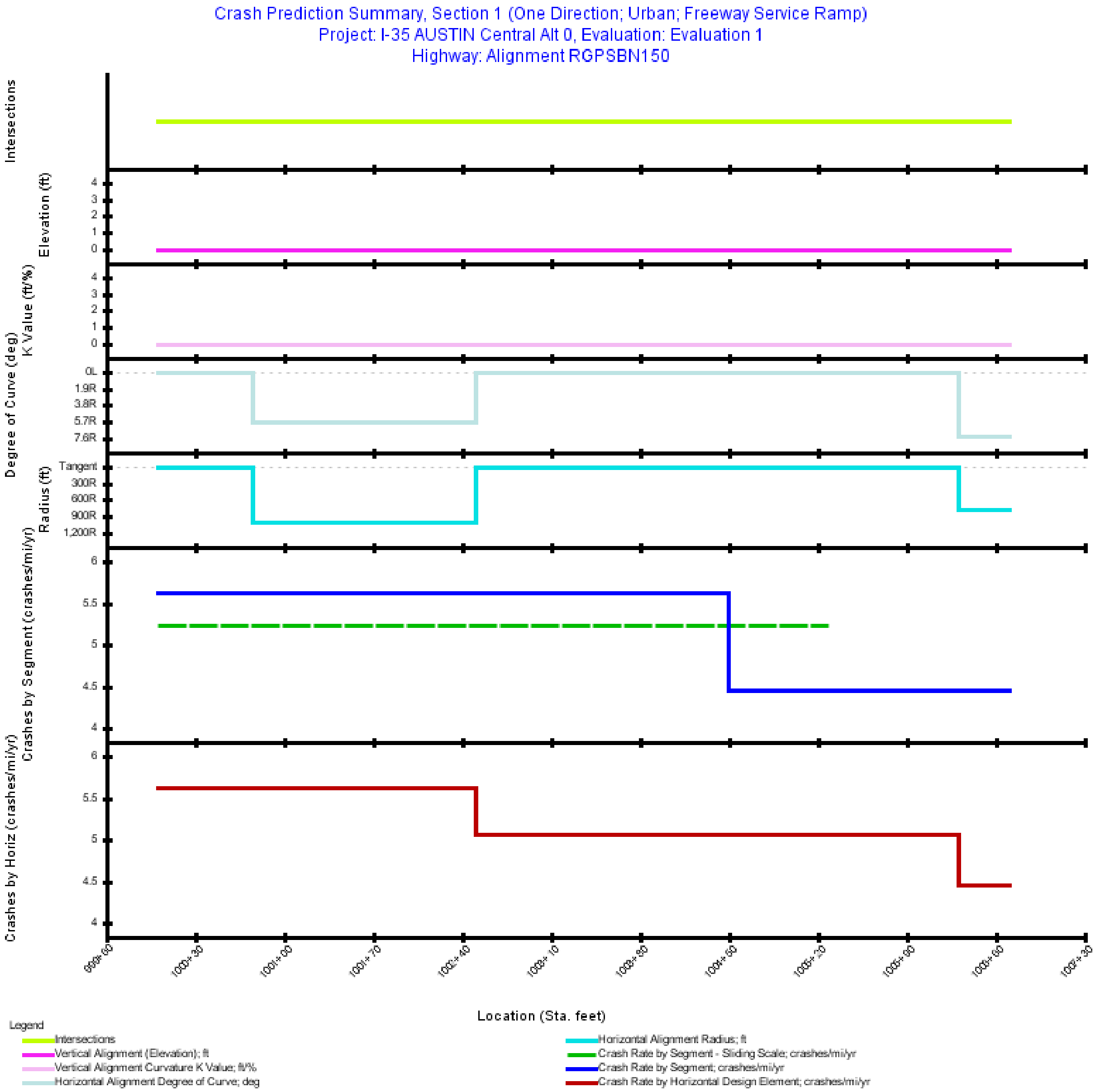

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1004+49.000	449.00	0.0850	2030: 14,550
2	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1004+49.000	1006+70.314	221.31	0.0419	2030: 14,550

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1270**
Average Future Road AADT (vpd)	**14,550**
Predicted Crashes	
Total Crashes	**0.67**
Fatal and Injury Crashes	**0.30**
Property-Damage-Only Crashes	**0.37**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**45**
Percent Property-Damage-Only Crashes (%)	**55**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.2368**
FI Crash Rate (crashes/mi/yr)	**2.3475**
PDO Crash Rate (crashes/mi/yr)	**2.8893**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.67**
Travel Crash Rate (crashes/million veh-mi)	**0.99**
Travel FI Crash Rate (crashes/million veh-mi)	**0.44**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.54**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1004+49.000	0.0850	0.478	0.4782	0.2077	0.2705	5.6238	1.06
2	1004+49.000	1006+70.314	0.0419	0.187	0.1866	0.0903	0.0963	4.4516	0.84
Total			0.1270	0.665	0.6648	0.2980	0.3668	5.2368	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1000+75.175	0.0142	0.080	0.0801	0.0348	0.0453	5.6238	1.06
Simple Curve 1	1000+75.175	1002+50.684	0.0332	0.187	0.1869	0.0812	0.1057	5.6238	1.06
Tangent	1002+50.684	1006+30.505	0.0719	0.364	0.3643	0.1658	0.1985	5.0637	0.95
Simple Curve 2	1006+30.505	1006+70.314	0.0075	0.034	0.0336	0.0162	0.0173	4.4516	0.84

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.67	0.30	44.827	0.37	55.173
Total	0.67	0.30	44.827	0.37	55.173
Average	0.67	0.30	44.827	0.37	55.173

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0037	0.0113	0.0743	0.1183	0.2705
2	0.0019	0.0058	0.0372	0.0454	0.0963
Total	0.0057	0.0172	0.1115	0.1637	0.3668

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.8	0.01	1.0
Highway Segment	Collision with Fixed Object	0.16	24.5	0.18	26.6	0.34	51.1
Highway Segment	Collision with Other Object	0.01	1.7	0.03	5.2	0.05	6.9
Highway Segment	Other Single-vehicle Collision	0.05	7.0	0.03	4.0	0.07	11.0
Highway Segment	Collision with Parked Vehicle	0.00	0.5	0.00	0.6	0.01	1.1
Highway Segment	Total Single Vehicle Crashes	0.23	33.9	0.25	37.2	0.47	71.1
Highway Segment	Right-Angle Collision	0.00	0.3	0.00	0.3	0.00	0.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.3	0.00	0.4	0.01	0.8
Highway Segment	Rear-end Collision	0.06	8.2	0.08	12.4	0.14	20.6
Highway Segment	Sideswipe, Same Direction Collision	0.01	2.0	0.03	4.8	0.04	6.7
Highway Segment	Total Multiple Vehicle Crashes	0.07	10.9	0.12	18.0	0.19	28.9
Highway Segment	Total Highway Segment Crashes	0.30	44.8	0.37	55.2	0.67	100.0
	Total Crashes	0.30	44.8	0.37	55.2	0.67	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1004+49.000	for segment #1 (1000+00.000 to 1004+49.000), The ramp type for Ramp Alignment RGPSBN150 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1004+49.000	for segment #1 (1000+00.000 to 1004+49.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1004+49.000	for segment #1 (1000+00.000 to 1004+49.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+49.000	1006+70.314	for segment #2 (1004+49.000 to 1006+70.314), The ramp type for Ramp Alignment RGPSBN150 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1004+49.000	1006+70.314	for segment #2 (1004+49.000 to 1006+70.314), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

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Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:39:43 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBX70
Highway Comment: Imported from RGPSBX70.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:39:33 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1005+11.673
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1005+11.673
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

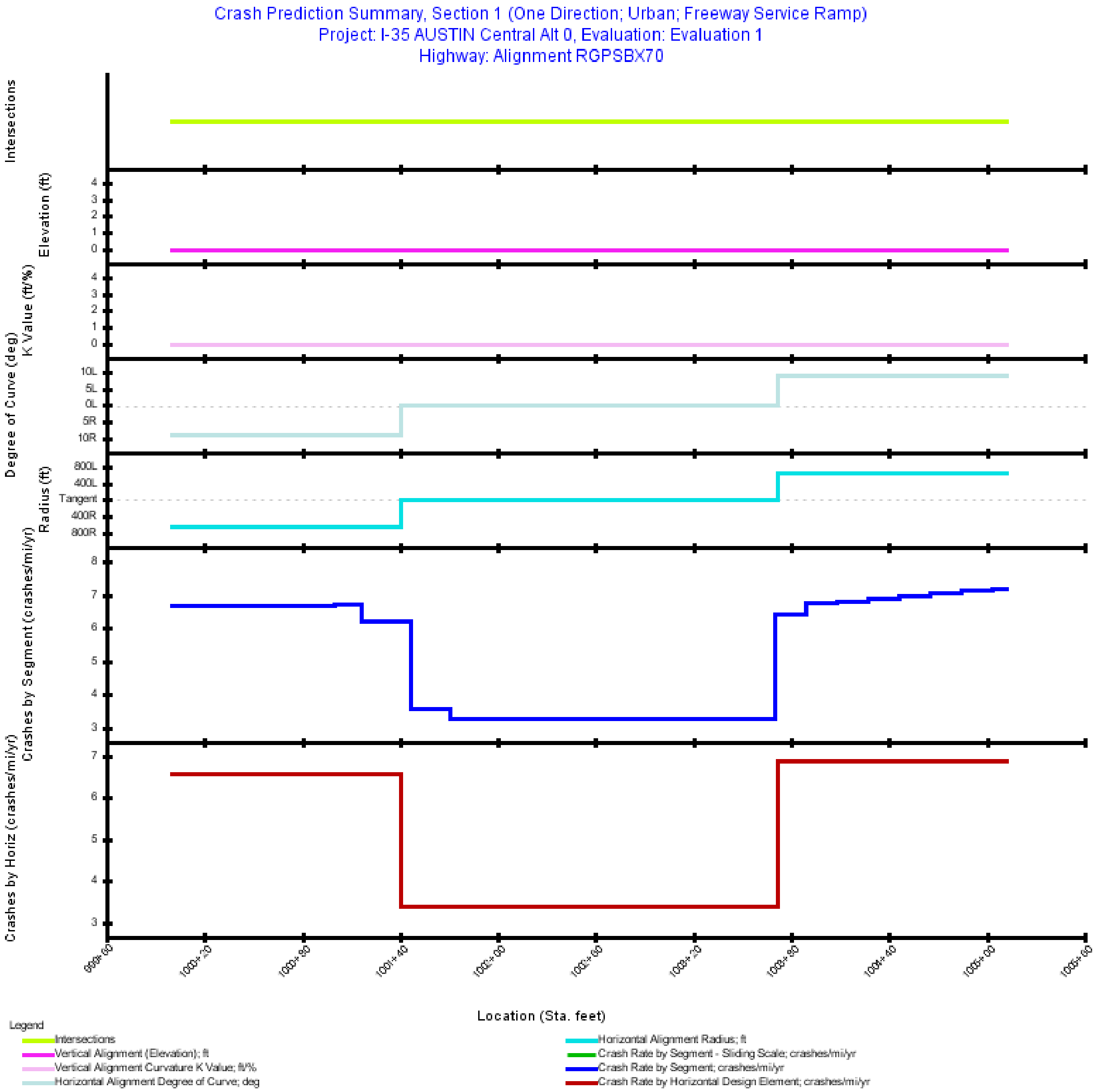

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1001+00.000	100.00	0.0189	2030: 11,250
2	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+00.000	1001+16.000	16.00	0.0030	2030: 11,250
3	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+16.000	1001+47.000	31.00	0.0059	2030: 11,250
4	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+47.000	1001+71.000	24.00	0.0045	2030: 11,250
5	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+71.000	1001+79.000	8.00	0.0015	2030: 11,250
6	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+79.000	1002+10.000	31.00	0.0059	2030: 11,250
7	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+10.000	1002+25.000	15.00	0.0028	2030: 11,250
8	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+25.000	1003+70.000	145.00	0.0275	2030: 11,250
9	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+70.000	1003+89.000	19.00	0.0036	2030: 11,250
10	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+89.000	1004+08.000	19.00	0.0036	2030: 11,250
11	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+08.000	1004+27.000	19.00	0.0036	2030: 11,250
12	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+27.000	1004+46.000	19.00	0.0036	2030: 11,250
13	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+46.000	1004+65.000	19.00	0.0036	2030: 11,250
14	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+65.000	1004+84.000	19.00	0.0036	2030: 11,250
15	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+84.000	1005+03.000	19.00	0.0036	2030: 11,250
16	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1005+03.000	1005+11.673	8.67	0.0016	2030: 11,250

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0969**
Average Future Road AADT (vpd)	**11,250**
Predicted Crashes	
Total Crashes	**0.51**
Fatal and Injury Crashes	**0.25**
Property-Damage-Only Crashes	**0.25**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**50**
Percent Property-Damage-Only Crashes (%)	**50**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.2223**
FI Crash Rate (crashes/mi/yr)	**2.6171**
PDO Crash Rate (crashes/mi/yr)	**2.6052**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.40**
Travel Crash Rate (crashes/million veh-mi)	**1.27**
Travel FI Crash Rate (crashes/million veh-mi)	**0.64**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.63**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1001+00.000	0.0189	0.126	0.1260	0.0634	0.0625	6.6504	1.62
2	1001+00.000	1001+16.000	0.0030	0.020	0.0204	0.0103	0.0101	6.7189	1.64
3	1001+16.000	1001+47.000	0.0059	0.036	0.0363	0.0186	0.0177	6.1803	1.50
4	1001+47.000	1001+71.000	0.0045	0.016	0.0162	0.0087	0.0075	3.5553	0.87
5	1001+71.000	1001+79.000	0.0015	0.005	0.0049	0.0025	0.0025	3.2613	0.79
6	1001+79.000	1002+10.000	0.0059	0.019	0.0191	0.0095	0.0097	3.2613	0.79
7	1002+10.000	1002+25.000	0.0028	0.009	0.0093	0.0046	0.0047	3.2613	0.79
8	1002+25.000	1003+70.000	0.0275	0.090	0.0896	0.0444	0.0452	3.2620	0.79
9	1003+70.000	1003+89.000	0.0036	0.023	0.0231	0.0110	0.0120	6.4073	1.56
10	1003+89.000	1004+08.000	0.0036	0.024	0.0242	0.0117	0.0125	6.7305	1.64
11	1004+08.000	1004+27.000	0.0036	0.025	0.0245	0.0120	0.0125	6.8060	1.66
12	1004+27.000	1004+46.000	0.0036	0.025	0.0248	0.0123	0.0125	6.8833	1.68
13	1004+46.000	1004+65.000	0.0036	0.025	0.0251	0.0125	0.0125	6.9624	1.70
14	1004+65.000	1004+84.000	0.0036	0.025	0.0253	0.0128	0.0125	7.0433	1.72
15	1004+84.000	1005+03.000	0.0036	0.026	0.0256	0.0131	0.0125	7.1261	1.74
16	1005+03.000	1005+11.673	0.0016	0.012	0.0118	0.0061	0.0057	7.1876	1.75
Total			0.0969	0.506	0.5061	0.2536	0.2525	5.2223	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+40.371	0.0266	0.175	0.1748	0.0884	0.0865	6.5766	1.60
Tangent	1001+40.371	1003+71.411	0.0438	0.149	0.1486	0.0745	0.0741	3.3952	0.83
Simple Curve 2	1003+71.411	1005+11.673	0.0266	0.183	0.1827	0.0908	0.0919	6.8765	1.68

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.51	0.25	50.114	0.25	49.886
Total	0.51	0.25	50.114	0.25	49.886
Average	0.51	0.25	50.114	0.25	49.886

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0020	0.0060	0.0250	0.0305	0.0625
2	0.0003	0.0010	0.0041	0.0049	0.0101
3	0.0006	0.0018	0.0073	0.0090	0.0177
4	0.0003	0.0008	0.0034	0.0042	0.0075
5	0.0001	0.0002	0.0010	0.0012	0.0025
6	0.0003	0.0009	0.0037	0.0046	0.0097
7	0.0001	0.0004	0.0018	0.0022	0.0047
8	0.0014	0.0042	0.0175	0.0213	0.0452
9	0.0003	0.0010	0.0043	0.0053	0.0120
10	0.0004	0.0011	0.0046	0.0056	0.0125
11	0.0004	0.0011	0.0047	0.0058	0.0125
12	0.0004	0.0012	0.0048	0.0059	0.0125
13	0.0004	0.0012	0.0049	0.0060	0.0125
14	0.0004	0.0012	0.0051	0.0062	0.0125
15	0.0004	0.0012	0.0052	0.0063	0.0125
16	0.0002	0.0006	0.0024	0.0029	0.0057
Total	0.0079	0.0240	0.0998	0.1218	0.2525

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.18	34.9	0.17	32.7	0.34	67.5
Highway Segment	Collision with Other Object	0.01	2.5	0.03	6.3	0.04	8.8
Highway Segment	Other Single-vehicle Collision	0.05	10.0	0.03	4.9	0.08	14.9
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.7	0.01	1.5
Highway Segment	Total Single Vehicle Crashes	0.24	48.3	0.23	45.6	0.47	93.9
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Rear-end Collision	0.01	1.4	0.01	2.9	0.02	4.3
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.3	0.01	1.1	0.01	1.5
Highway Segment	Total Multiple Vehicle Crashes	0.01	1.8	0.02	4.2	0.03	6.1
Highway Segment	Total Highway Segment Crashes	0.25	50.1	0.25	49.9	0.51	100.0
	Total Crashes	0.25	50.1	0.25	49.9	0.51	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1001+00.000	for segment #1 (1000+00.000 to 1001+00.000), The ramp type for Ramp Alignment RGPSBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+00.000	1001+16.000	for segment #2 (1001+00.000 to 1001+16.000), The ramp type for Ramp Alignment RGPSBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+16.000	1001+47.000	for segment #3 (1001+16.000 to 1001+47.000), The ramp type for Ramp Alignment RGPSBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+47.000	1001+71.000	for segment #4 (1001+47.000 to 1001+71.000), The ramp type for Ramp Alignment RGPSBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+71.000	1001+79.000	for segment #5 (1001+71.000 to 1001+79.000), The ramp type for Ramp Alignment RGPSBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+71.000	1001+79.000	for segment #5 (1001+71.000 to 1001+79.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+71.000	1001+79.000	for segment #5 (1001+71.000 to 1001+79.000), Right shoulder width (1.60 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+79.000	1002+10.000	for segment #6 (1001+79.000 to 1002+10.000), The ramp type for Ramp Alignment RGPSBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+79.000	1002+10.000	for segment #6 (1001+79.000 to 1002+10.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+79.000	1002+10.000	for segment #6 (1001+79.000 to 1002+10.000), Right shoulder width (0.98 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+10.000	1002+25.000	for segment #7 (1002+10.000 to 1002+25.000), The ramp type for Ramp Alignment RGPSBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+10.000	1002+25.000	for segment #7 (1002+10.000 to 1002+25.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+10.000	1002+25.000	for segment #7 (1002+10.000 to 1002+25.000), Right shoulder width (0.24 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+25.000	1003+70.000	for segment #8 (1002+25.000 to 1003+70.000), The ramp type for Ramp Alignment RGPSBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+25.000	1003+70.000	for segment #8 (1002+25.000 to 1003+70.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+25.000	1003+70.000	for segment #8 (1002+25.000 to 1003+70.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+70.000	1003+89.000	for segment #9 (1003+70.000 to 1003+89.000), The ramp type for Ramp Alignment RGPSBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+70.000	1003+89.000	for segment #9 (1003+70.000 to 1003+89.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+70.000	1003+89.000	for segment #9 (1003+70.000 to 1003+89.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+89.000	1004+08.000	for segment #10 (1003+89.000 to 1004+08.000), The ramp type for Ramp Alignment RGPSBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+89.000	1004+08.000	for segment #10 (1003+89.000 to 1004+08.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+89.000	1004+08.000	for segment #10 (1003+89.000 to 1004+08.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+08.000	1004+27.000	for segment #11 (1004+08.000 to 1004+27.000), The ramp type for Ramp Alignment RGPSBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+08.000	1004+27.000	for segment #11 (1004+08.000 to 1004+27.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+08.000	1004+27.000	for segment #11 (1004+08.000 to 1004+27.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+27.000	1004+46.000	for segment #12 (1004+27.000 to 1004+46.000), The ramp type for Ramp Alignment RGPSBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+27.000	1004+46.000	for segment #12 (1004+27.000 to 1004+46.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+27.000	1004+46.000	for segment #12 (1004+27.000 to 1004+46.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1004+46.000	1004+65.000	for segment #13 (1004+46.000 to 1004+65.000), The ramp type for Ramp Alignment RGPSBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+46.000	1004+65.000	for segment #13 (1004+46.000 to 1004+65.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+46.000	1004+65.000	for segment #13 (1004+46.000 to 1004+65.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+65.000	1004+84.000	for segment #14 (1004+65.000 to 1004+84.000), The ramp type for Ramp Alignment RGPSBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+65.000	1004+84.000	for segment #14 (1004+65.000 to 1004+84.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+65.000	1004+84.000	for segment #14 (1004+65.000 to 1004+84.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+84.000	1005+03.000	for segment #15 (1004+84.000 to 1005+03.000), The ramp type for Ramp Alignment RGPSBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+84.000	1005+03.000	for segment #15 (1004+84.000 to 1005+03.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+84.000	1005+03.000	for segment #15 (1004+84.000 to 1005+03.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+03.000	1005+11.673	for segment #16 (1005+03.000 to 1005+11.673), The ramp type for Ramp Alignment RGPSBX70 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+03.000	1005+11.673	for segment #16 (1005+03.000 to 1005+11.673), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+03.000	1005+11.673	for segment #16 (1005+03.000 to 1005+11.673), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:35 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:34:52 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBN70
Highway Comment: Imported from RGPSBN70.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:34:41 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1005+49.425
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1005+49.425
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

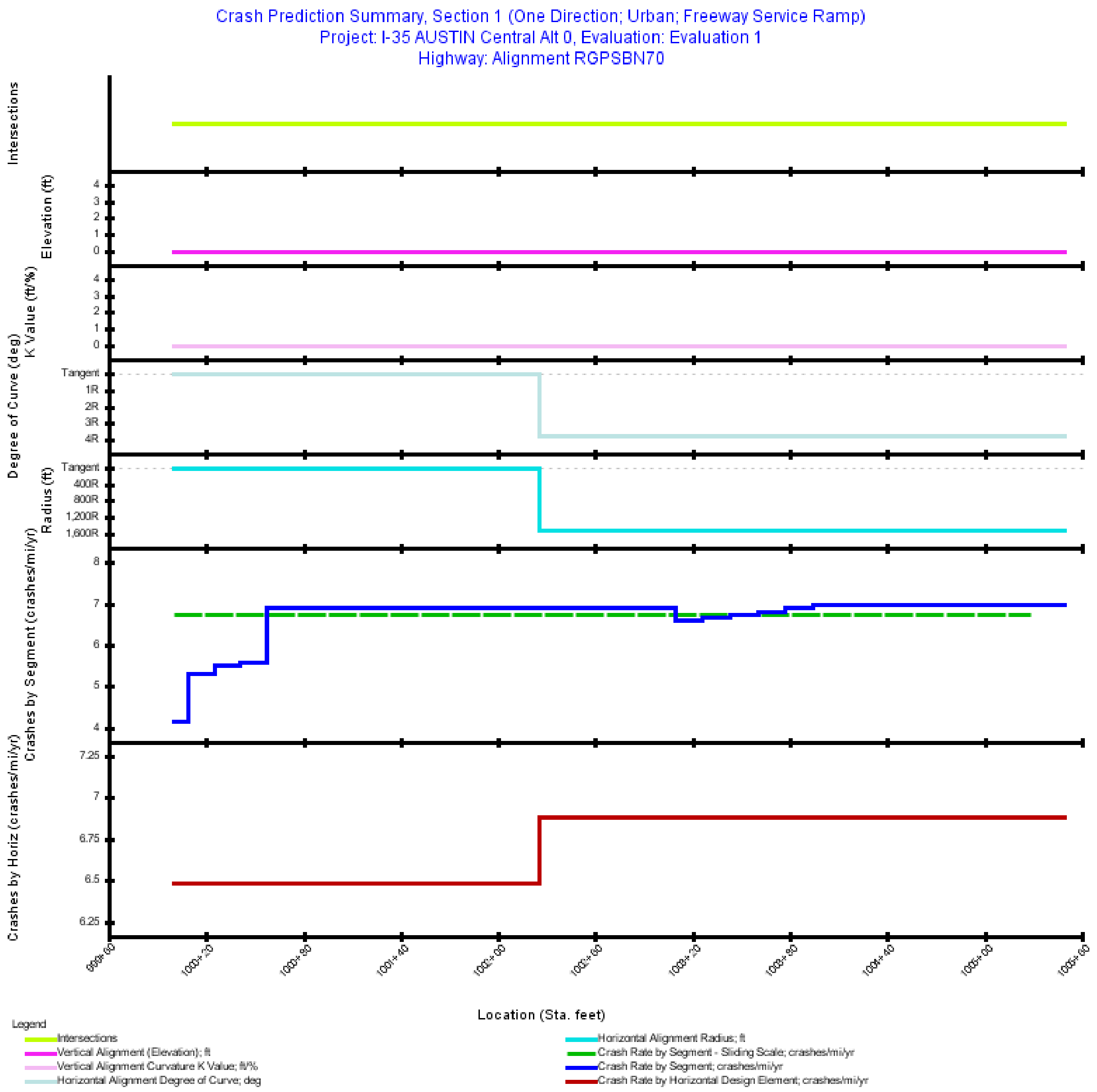

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1000+09.000	9.00	0.0017	2030: 15,050
2	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+09.000	1000+25.000	16.00	0.0030	2030: 15,050
3	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+25.000	1000+41.000	16.00	0.0030	2030: 15,050
4	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+41.000	1000+57.000	16.00	0.0030	2030: 15,050
5	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+57.000	1003+09.000	252.00	0.0477	2030: 15,050
6	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+09.000	1003+26.000	17.00	0.0032	2030: 15,050
7	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+26.000	1003+43.000	17.00	0.0032	2030: 15,050
8	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+43.000	1003+60.000	17.00	0.0032	2030: 15,050
9	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+60.000	1003+77.000	17.00	0.0032	2030: 15,050
10	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+77.000	1003+94.000	17.00	0.0032	2030: 15,050
11	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+94.000	1005+49.425	155.43	0.0294	2030: 15,050

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1041**
Average Future Road AADT (vpd)	**15,050**
Predicted Crashes	
Total Crashes	**0.70**
Fatal and Injury Crashes	**0.35**
Property-Damage-Only Crashes	**0.35**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**49**
Percent Property-Damage-Only Crashes (%)	**51**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**6.7186**
FI Crash Rate (crashes/mi/yr)	**3.3238**
PDO Crash Rate (crashes/mi/yr)	**3.3948**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.57**
Travel Crash Rate (crashes/million veh-mi)	**1.22**
Travel FI Crash Rate (crashes/million veh-mi)	**0.60**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.62**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+09.000	0.0017	0.007	0.0071	0.0032	0.0038	4.1372	0.75
2	1000+09.000	1000+25.000	0.0030	0.016	0.0160	0.0075	0.0086	5.2918	0.96
3	1000+25.000	1000+41.000	0.0030	0.017	0.0167	0.0079	0.0088	5.5099	1.00
4	1000+41.000	1000+57.000	0.0030	0.017	0.0169	0.0081	0.0088	5.5693	1.01
5	1000+57.000	1003+09.000	0.0477	0.329	0.3292	0.1599	0.1693	6.8976	1.26
6	1003+09.000	1003+26.000	0.0032	0.021	0.0212	0.0103	0.0109	6.5774	1.20
7	1003+26.000	1003+43.000	0.0032	0.021	0.0214	0.0105	0.0109	6.6515	1.21
8	1003+43.000	1003+60.000	0.0032	0.022	0.0217	0.0108	0.0109	6.7272	1.23
9	1003+60.000	1003+77.000	0.0032	0.022	0.0219	0.0110	0.0109	6.8047	1.24
10	1003+77.000	1003+94.000	0.0032	0.022	0.0222	0.0113	0.0109	6.8840	1.25
11	1003+94.000	1005+49.425	0.0294	0.205	0.2049	0.1054	0.0995	6.9618	1.27
Total			0.1041	0.699	0.6991	0.3459	0.3533	6.7186	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1002+25.521	0.0427	0.277	0.2768	0.1336	0.1432	6.4808	1.18
Simple Curve 1	1002+25.521	1005+49.425	0.0613	0.422	0.4223	0.2123	0.2100	6.8841	1.25

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.70	0.35	49.471	0.35	50.529
Total	0.70	0.35	49.471	0.35	50.529
Average	0.70	0.35	49.471	0.35	50.529

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0001	0.0002	0.0013	0.0016	0.0038
2	0.0001	0.0004	0.0028	0.0041	0.0086
3	0.0001	0.0004	0.0029	0.0044	0.0088
4	0.0001	0.0005	0.0030	0.0045	0.0088
5	0.0027	0.0083	0.0551	0.0937	0.1693
6	0.0002	0.0006	0.0038	0.0057	0.0109
7	0.0002	0.0006	0.0039	0.0059	0.0109
8	0.0002	0.0006	0.0040	0.0060	0.0109
9	0.0002	0.0006	0.0041	0.0061	0.0109
10	0.0002	0.0006	0.0042	0.0063	0.0109
11	0.0020	0.0059	0.0388	0.0587	0.0995
Total	0.0062	0.0189	0.1238	0.1970	0.3533

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.7	0.01	0.9
Highway Segment	Collision with Fixed Object	0.19	26.7	0.17	23.9	0.35	50.6
Highway Segment	Collision with Other Object	0.01	1.9	0.03	4.6	0.05	6.5
Highway Segment	Other Single-vehicle Collision	0.05	7.7	0.03	3.6	0.08	11.3
Highway Segment	Collision with Parked Vehicle	0.00	0.6	0.00	0.5	0.01	1.1
Highway Segment	Total Single Vehicle Crashes	0.26	36.9	0.23	33.4	0.49	70.3
Highway Segment	Right-Angle Collision	0.00	0.4	0.00	0.3	0.01	0.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.4	0.00	0.4	0.01	0.8
Highway Segment	Rear-end Collision	0.07	9.4	0.08	11.8	0.15	21.2
Highway Segment	Sideswipe, Same Direction Collision	0.02	2.3	0.03	4.6	0.05	6.8
Highway Segment	Total Multiple Vehicle Crashes	0.09	12.5	0.12	17.1	0.21	29.7
Highway Segment	Total Highway Segment Crashes	0.35	49.5	0.35	50.5	0.70	100.0
	Total Crashes	0.35	49.5	0.35	50.5	0.70	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+09.000	for segment #1 (1000+00.000 to 1000+09.000), The ramp type for Ramp Alignment RGPSBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+09.000	1000+25.000	for segment #2 (1000+09.000 to 1000+25.000), The ramp type for Ramp Alignment RGPSBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+25.000	1000+41.000	for segment #3 (1000+25.000 to 1000+41.000), The ramp type for Ramp Alignment RGPSBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+41.000	1000+57.000	for segment #4 (1000+41.000 to 1000+57.000), The ramp type for Ramp Alignment RGPSBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+57.000	1003+09.000	for segment #5 (1000+57.000 to 1003+09.000), The ramp type for Ramp Alignment RGPSBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+09.000	1003+26.000	for segment #6 (1003+09.000 to 1003+26.000), The ramp type for Ramp Alignment RGPSBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+26.000	1003+43.000	for segment #7 (1003+26.000 to 1003+43.000), The ramp type for Ramp Alignment RGPSBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+43.000	1003+60.000	for segment #8 (1003+43.000 to 1003+60.000), The ramp type for Ramp Alignment RGPSBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+60.000	1003+77.000	for segment #9 (1003+60.000 to 1003+77.000), The ramp type for Ramp Alignment RGPSBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+77.000	1003+94.000	for segment #10 (1003+77.000 to 1003+94.000), The ramp type for Ramp Alignment RGPSBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+94.000	1005+49.425	for segment #11 (1003+94.000 to 1005+49.425), The ramp type for Ramp Alignment RGPSBN70 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:49 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:48:56 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBXCHZ0
Highway Comment: Imported from RGPSBXCHZ0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:48:46 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+04.366
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+04.366
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

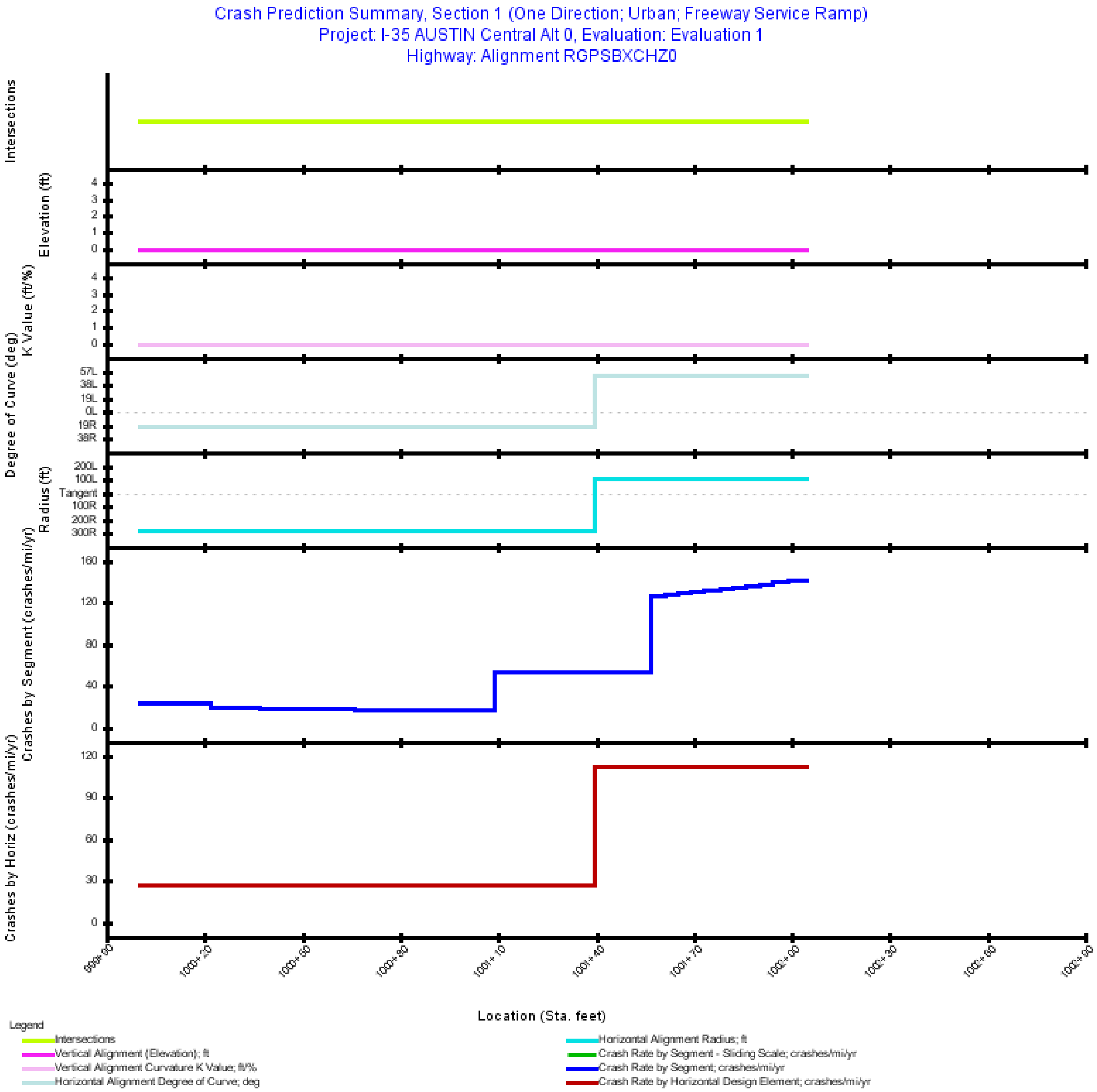

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1000+08.000	8.00	0.0015	2030: 8,250
2	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+08.000	1000+22.000	14.00	0.0027	2030: 8,250
3	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+22.000	1000+37.000	15.00	0.0028	2030: 8,250
4	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+37.000	1000+51.000	14.00	0.0027	2030: 8,250
5	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+51.000	1000+66.000	15.00	0.0028	2030: 8,250
6	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+66.000	1000+80.000	14.00	0.0027	2030: 8,250
7	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+80.000	1000+95.000	15.00	0.0028	2030: 8,250
8	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+95.000	1001+09.000	14.00	0.0027	2030: 8,250
9	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+09.000	1001+57.000	48.00	0.0091	2030: 8,250
10	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+57.000	1001+61.000	4.00	0.0008	2030: 8,250
11	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+61.000	1001+65.000	4.00	0.0008	2030: 8,250
12	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+65.000	1001+69.000	4.00	0.0008	2030: 8,250
13	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+69.000	1001+73.000	4.00	0.0008	2030: 8,250
14	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+73.000	1001+78.000	5.00	0.0009	2030: 8,250
15	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+78.000	1001+82.000	4.00	0.0008	2030: 8,250
16	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+82.000	1001+86.000	4.00	0.0008	2030: 8,250
17	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+86.000	1001+90.000	4.00	0.0008	2030: 8,250
18	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+90.000	1001+94.000	4.00	0.0008	2030: 8,250
19	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+94.000	1001+99.000	5.00	0.0009	2030: 8,250
20	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+99.000	1002+04.366	5.37	0.0010	2030: 8,250

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0387**
Average Future Road AADT (vpd)	**8,250**
Predicted Crashes	
Total Crashes	**2.08**
Fatal and Injury Crashes	**1.00**
Property-Damage-Only Crashes	**1.08**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**53.7152**
FI Crash Rate (crashes/mi/yr)	**25.7891**
PDO Crash Rate (crashes/mi/yr)	**27.9261**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.12**
Travel Crash Rate (crashes/million veh-mi)	**17.84**
Travel FI Crash Rate (crashes/million veh-mi)	**8.56**
Travel PDO Crash Rate (crashes/million veh-mi)	**9.27**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+08.000	0.0015	0.036	0.0365	0.0184	0.0181	24.1094	8.01
2	1000+08.000	1000+22.000	0.0027	0.063	0.0634	0.0317	0.0317	23.9001	7.94
3	1000+22.000	1000+37.000	0.0028	0.057	0.0566	0.0278	0.0288	19.9207	6.61
4	1000+37.000	1000+51.000	0.0027	0.047	0.0474	0.0229	0.0245	17.8665	5.93
5	1000+51.000	1000+66.000	0.0028	0.050	0.0502	0.0239	0.0263	17.6714	5.87
6	1000+66.000	1000+80.000	0.0027	0.046	0.0464	0.0218	0.0245	17.4806	5.80
7	1000+80.000	1000+95.000	0.0028	0.049	0.0491	0.0229	0.0263	17.2942	5.74
8	1000+95.000	1001+09.000	0.0027	0.045	0.0454	0.0209	0.0245	17.1120	5.68
9	1001+09.000	1001+57.000	0.0091	0.482	0.4824	0.2187	0.2638	53.0677	17.62
10	1001+57.000	1001+61.000	0.0008	0.096	0.0958	0.0441	0.0517	126.4690	42.00
11	1001+61.000	1001+65.000	0.0008	0.097	0.0968	0.0451	0.0517	127.7532	42.42
12	1001+65.000	1001+69.000	0.0008	0.098	0.0978	0.0461	0.0517	129.0658	42.86
13	1001+69.000	1001+73.000	0.0008	0.099	0.0988	0.0471	0.0517	130.4074	43.31
14	1001+73.000	1001+78.000	0.0009	0.125	0.1250	0.0603	0.0646	131.9521	43.82
15	1001+78.000	1001+82.000	0.0008	0.101	0.1012	0.0494	0.0517	133.5352	44.34
16	1001+82.000	1001+86.000	0.0008	0.102	0.1023	0.0505	0.0517	134.9753	44.82
17	1001+86.000	1001+90.000	0.0008	0.103	0.1034	0.0517	0.0517	136.4473	45.31
18	1001+90.000	1001+94.000	0.0008	0.104	0.1045	0.0528	0.0517	137.9517	45.81
19	1001+94.000	1001+99.000	0.0009	0.132	0.1323	0.0676	0.0646	139.6839	46.39
20	1001+99.000	1002+04.366	0.0010	0.144	0.1440	0.0747	0.0694	141.7324	47.07
Total			0.0387	2.079	2.0791	0.9982	1.0809	53.7152	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+39.733	0.0265	0.704	0.7038	0.3302	0.3736	26.5944	8.83
Simple Curve 2	1001+39.733	1002+04.366	0.0122	1.375	1.3753	0.6680	0.7073	112.3486	37.31

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.08	1.00	48.011	1.08	51.989
Total	2.08	1.00	48.011	1.08	51.989
Average	2.08	1.00	48.011	1.08	51.989

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0005	0.0015	0.0065	0.0099	0.0181
2	0.0009	0.0026	0.0112	0.0170	0.0317
3	0.0008	0.0025	0.0106	0.0138	0.0288
4	0.0007	0.0022	0.0090	0.0110	0.0245
5	0.0007	0.0023	0.0094	0.0115	0.0263
6	0.0007	0.0021	0.0086	0.0105	0.0245
7	0.0007	0.0022	0.0090	0.0110	0.0263
8	0.0007	0.0020	0.0082	0.0100	0.0245
9	0.0064	0.0193	0.0812	0.1118	0.2638
10	0.0012	0.0037	0.0156	0.0236	0.0517
11	0.0012	0.0037	0.0160	0.0241	0.0517
12	0.0013	0.0038	0.0163	0.0247	0.0517
13	0.0013	0.0039	0.0167	0.0252	0.0517
14	0.0017	0.0050	0.0213	0.0323	0.0646
15	0.0014	0.0041	0.0175	0.0265	0.0517
16	0.0014	0.0042	0.0179	0.0271	0.0517
17	0.0014	0.0043	0.0183	0.0277	0.0517
18	0.0014	0.0044	0.0187	0.0283	0.0517
19	0.0019	0.0056	0.0239	0.0362	0.0646
20	0.0020	0.0062	0.0264	0.0400	0.0694
Total	0.0282	0.0855	0.3623	0.5222	1.0809

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.02	1.1	0.03	1.3
Highway Segment	Collision with Fixed Object	0.71	34.1	0.76	36.3	1.47	70.4
Highway Segment	Collision with Other Object	0.05	2.4	0.15	7.0	0.20	9.5
Highway Segment	Other Single-vehicle Collision	0.20	9.8	0.11	5.4	0.32	15.3
Highway Segment	Collision with Parked Vehicle	0.01	0.7	0.02	0.8	0.03	1.5
Highway Segment	Total Single Vehicle Crashes	0.98	47.3	1.05	50.7	2.04	98.0
Highway Segment	Right-Angle Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.0	0.00	0.0	0.00	0.1
Highway Segment	Rear-end Collision	0.01	0.6	0.02	0.9	0.03	1.4
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.1	0.01	0.3	0.01	0.5
Highway Segment	Total Multiple Vehicle Crashes	0.01	0.7	0.03	1.3	0.04	2.0
Highway Segment	Total Highway Segment Crashes	1.00	48.0	1.08	52.0	2.08	100.0
	Total Crashes	1.00	48.0	1.08	52.0	2.08	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+08.000	for segment #1 (1000+00.000 to 1000+08.000), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1000+08.000	for segment #1 (1000+00.000 to 1000+08.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1000+08.000	for segment #1 (1000+00.000 to 1000+08.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+08.000	1000+22.000	for segment #2 (1000+08.000 to 1000+22.000), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+08.000	1000+22.000	for segment #2 (1000+08.000 to 1000+22.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+08.000	1000+22.000	for segment #2 (1000+08.000 to 1000+22.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+22.000	1000+37.000	for segment #3 (1000+22.000 to 1000+37.000), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+22.000	1000+37.000	for segment #3 (1000+22.000 to 1000+37.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+22.000	1000+37.000	for segment #3 (1000+22.000 to 1000+37.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+37.000	1000+51.000	for segment #4 (1000+37.000 to 1000+51.000), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+37.000	1000+51.000	for segment #4 (1000+37.000 to 1000+51.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+37.000	1000+51.000	for segment #4 (1000+37.000 to 1000+51.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+51.000	1000+66.000	for segment #5 (1000+51.000 to 1000+66.000), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+51.000	1000+66.000	for segment #5 (1000+51.000 to 1000+66.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+51.000	1000+66.000	for segment #5 (1000+51.000 to 1000+66.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+66.000	1000+80.000	for segment #6 (1000+66.000 to 1000+80.000), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+66.000	1000+80.000	for segment #6 (1000+66.000 to 1000+80.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+66.000	1000+80.000	for segment #6 (1000+66.000 to 1000+80.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+80.000	1000+95.000	for segment #7 (1000+80.000 to 1000+95.000), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+80.000	1000+95.000	for segment #7 (1000+80.000 to 1000+95.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+80.000	1000+95.000	for segment #7 (1000+80.000 to 1000+95.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+95.000	1001+09.000	for segment #8 (1000+95.000 to 1001+09.000), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+95.000	1001+09.000	for segment #8 (1000+95.000 to 1001+09.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+95.000	1001+09.000	for segment #8 (1000+95.000 to 1001+09.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+09.000	1001+57.000	for segment #9 (1001+09.000 to 1001+57.000), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+09.000	1001+57.000	for segment #9 (1001+09.000 to 1001+57.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+09.000	1001+57.000	for segment #9 (1001+09.000 to 1001+57.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+57.000	1001+61.000	for segment #10 (1001+57.000 to 1001+61.000), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+57.000	1001+61.000	for segment #10 (1001+57.000 to 1001+61.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+57.000	1001+61.000	for segment #10 (1001+57.000 to 1001+61.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+61.000	1001+65.000	for segment #11 (1001+61.000 to 1001+65.000), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+61.000	1001+65.000	for segment #11 (1001+61.000 to 1001+65.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+61.000	1001+65.000	for segment #11 (1001+61.000 to 1001+65.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+65.000	1001+69.000	for segment #12 (1001+65.000 to 1001+69.000), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+65.000	1001+69.000	for segment #12 (1001+65.000 to 1001+69.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+65.000	1001+69.000	for segment #12 (1001+65.000 to 1001+69.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+69.000	1001+73.000	for segment #13 (1001+69.000 to 1001+73.000), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+69.000	1001+73.000	for segment #13 (1001+69.000 to 1001+73.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+69.000	1001+73.000	for segment #13 (1001+69.000 to 1001+73.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+73.000	1001+78.000	for segment #14 (1001+73.000 to 1001+78.000), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+73.000	1001+78.000	for segment #14 (1001+73.000 to 1001+78.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+73.000	1001+78.000	for segment #14 (1001+73.000 to 1001+78.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+78.000	1001+82.000	for segment #15 (1001+78.000 to 1001+82.000), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+78.000	1001+82.000	for segment #15 (1001+78.000 to 1001+82.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+78.000	1001+82.000	for segment #15 (1001+78.000 to 1001+82.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+82.000	1001+86.000	for segment #16 (1001+82.000 to 1001+86.000), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+82.000	1001+86.000	for segment #16 (1001+82.000 to 1001+86.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+82.000	1001+86.000	for segment #16 (1001+82.000 to 1001+86.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+86.000	1001+90.000	for segment #17 (1001+86.000 to 1001+90.000), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+86.000	1001+90.000	for segment #17 (1001+86.000 to 1001+90.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+86.000	1001+90.000	for segment #17 (1001+86.000 to 1001+90.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+90.000	1001+94.000	for segment #18 (1001+90.000 to 1001+94.000), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+90.000	1001+94.000	for segment #18 (1001+90.000 to 1001+94.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+90.000	1001+94.000	for segment #18 (1001+90.000 to 1001+94.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+94.000	1001+99.000	for segment #19 (1001+94.000 to 1001+99.000), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+94.000	1001+99.000	for segment #19 (1001+94.000 to 1001+99.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+94.000	1001+99.000	for segment #19 (1001+94.000 to 1001+99.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+99.000	1002+04.366	for segment #20 (1001+99.000 to 1002+04.366), The ramp type for Ramp Alignment RGPSBXCHZ0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+99.000	1002+04.366	for segment #20 (1001+99.000 to 1002+04.366), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+99.000	1002+04.366	for segment #20 (1001+99.000 to 1002+04.366), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:35 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:35:33 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBNCHZ0
Highway Comment: Imported from RGPSBNCHZ0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:35:23 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1006+33.651
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1006+33.651
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

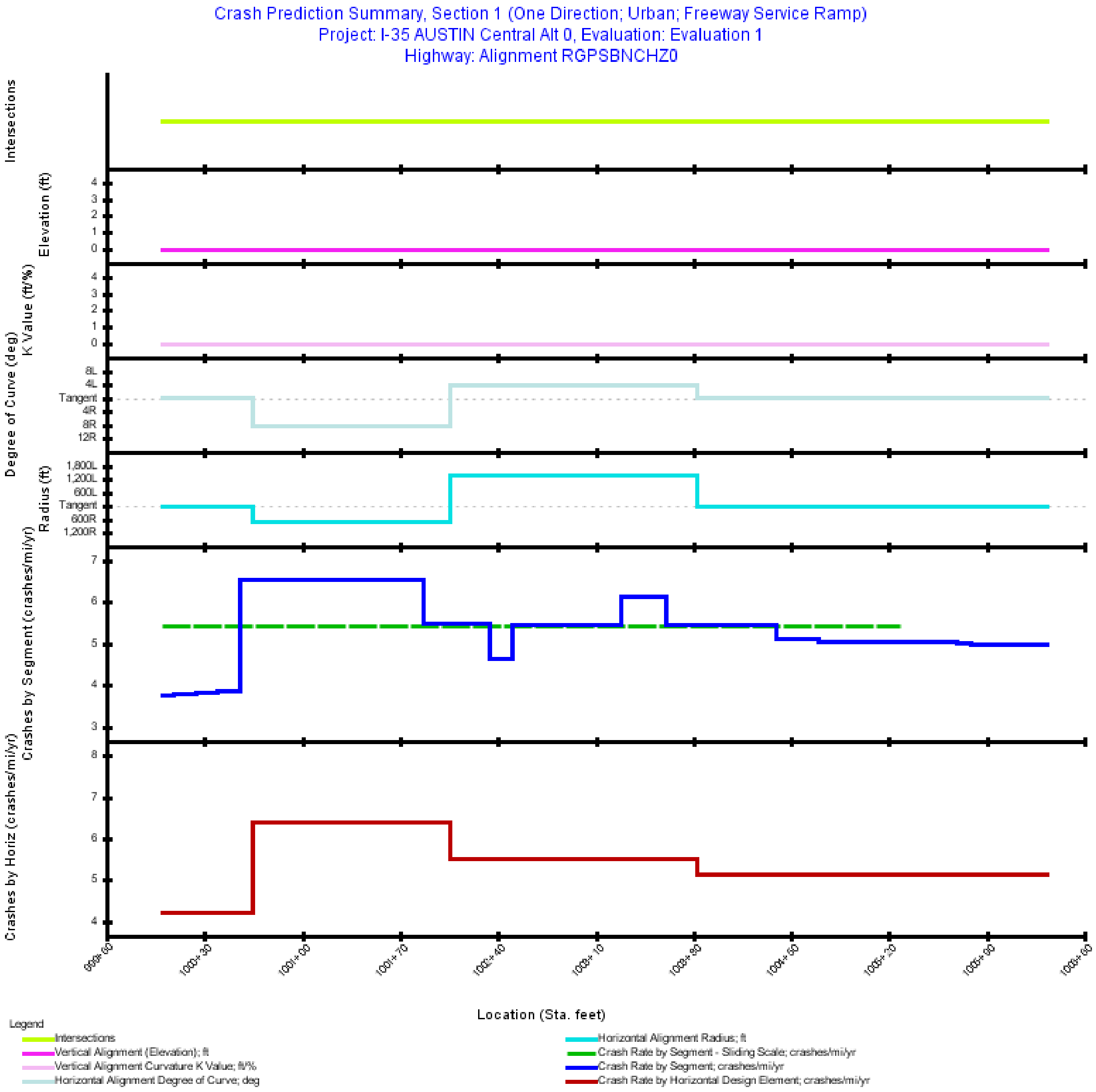

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1000+08.000	8.00	0.0015	2030: 13,550
2	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+08.000	1000+24.000	16.00	0.0030	2030: 13,550
3	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+24.000	1000+39.000	15.00	0.0028	2030: 13,550
4	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+39.000	1000+55.000	16.00	0.0030	2030: 13,550
5	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+55.000	1001+87.000	132.00	0.0250	2030: 13,550
6	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1001+87.000	1002+34.000	47.00	0.0089	2030: 13,550
7	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+34.000	1002+50.000	16.00	0.0030	2030: 13,550
8	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+50.000	1003+28.000	78.00	0.0148	2030: 13,550
9	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+28.000	1003+60.000	32.00	0.0061	2030: 13,550
10	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+60.000	1004+39.000	79.00	0.0150	2030: 13,550
11	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1004+39.000	1004+70.000	31.00	0.0059	2030: 13,550
12	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1004+70.000	1005+69.000	99.00	0.0187	2030: 13,550
13	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1005+69.000	1005+79.000	10.00	0.0019	2030: 13,550
14	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1005+79.000	1006+33.651	54.65	0.0104	2030: 13,550

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1200**
Average Future Road AADT (vpd)	**13,550**
Predicted Crashes	
Total Crashes	**0.65**
Fatal and Injury Crashes	**0.31**
Property-Damage-Only Crashes	**0.34**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.4303**
FI Crash Rate (crashes/mi/yr)	**2.6060**
PDO Crash Rate (crashes/mi/yr)	**2.8242**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.59**
Travel Crash Rate (crashes/million veh-mi)	**1.10**
Travel FI Crash Rate (crashes/million veh-mi)	**0.53**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.57**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+08.000	0.0015	0.006	0.0057	0.0026	0.0031	3.7609	0.76
2	1000+08.000	1000+24.000	0.0030	0.011	0.0115	0.0053	0.0062	3.7915	0.77
3	1000+24.000	1000+39.000	0.0028	0.011	0.0109	0.0051	0.0058	3.8319	0.78
4	1000+39.000	1000+55.000	0.0030	0.012	0.0117	0.0055	0.0062	3.8733	0.78
5	1000+55.000	1001+87.000	0.0250	0.164	0.1637	0.0763	0.0874	6.5465	1.32
6	1001+87.000	1002+34.000	0.0089	0.049	0.0488	0.0229	0.0259	5.4818	1.11
7	1002+34.000	1002+50.000	0.0030	0.014	0.0141	0.0067	0.0074	4.6434	0.94
8	1002+50.000	1003+28.000	0.0148	0.081	0.0806	0.0388	0.0418	5.4563	1.10
9	1003+28.000	1003+60.000	0.0061	0.037	0.0372	0.0181	0.0191	6.1344	1.24
10	1003+60.000	1004+39.000	0.0150	0.082	0.0816	0.0401	0.0416	5.4547	1.10
11	1004+39.000	1004+70.000	0.0059	0.030	0.0301	0.0148	0.0153	5.1280	1.04
12	1004+70.000	1005+69.000	0.0187	0.095	0.0949	0.0467	0.0482	5.0608	1.02
13	1005+69.000	1005+79.000	0.0019	0.009	0.0095	0.0047	0.0048	5.0052	1.01
14	1005+79.000	1006+33.651	0.0104	0.051	0.0515	0.0253	0.0262	4.9725	1.00
Total			0.1200	0.652	0.6517	0.3127	0.3389	5.4303	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1000+64.199	0.0122	0.051	0.0512	0.0238	0.0274	4.2123	0.85
Simple Curve 1	1000+64.199	1002+05.849	0.0268	0.172	0.1718	0.0801	0.0917	6.4048	1.29
Simple Curve 2	1002+05.849	1003+82.340	0.0334	0.184	0.1842	0.0886	0.0955	5.5094	1.11
Tangent	1003+82.340	1006+33.651	0.0476	0.244	0.2445	0.1202	0.1243	5.1365	1.04

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.65	0.31	47.991	0.34	52.009
Total	0.65	0.31	47.991	0.34	52.009
Average	0.65	0.31	47.991	0.34	52.009

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0001	0.0002	0.0011	0.0013	0.0031
2	0.0001	0.0003	0.0022	0.0027	0.0062
3	0.0001	0.0003	0.0021	0.0025	0.0058
4	0.0001	0.0004	0.0023	0.0028	0.0062
5	0.0016	0.0049	0.0314	0.0383	0.0874
6	0.0005	0.0015	0.0094	0.0115	0.0259
7	0.0001	0.0004	0.0028	0.0034	0.0074
8	0.0008	0.0023	0.0150	0.0207	0.0418
9	0.0003	0.0010	0.0067	0.0101	0.0191
10	0.0007	0.0023	0.0147	0.0223	0.0416
11	0.0003	0.0008	0.0055	0.0083	0.0153
12	0.0009	0.0026	0.0172	0.0260	0.0482
13	0.0001	0.0003	0.0017	0.0026	0.0048
14	0.0005	0.0014	0.0093	0.0141	0.0262
Total	0.0062	0.0188	0.1213	0.1665	0.3389

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.8	0.01	0.9
Highway Segment	Collision with Fixed Object	0.17	26.8	0.17	25.9	0.34	52.7
Highway Segment	Collision with Other Object	0.01	1.9	0.03	5.0	0.04	6.9
Highway Segment	Other Single-vehicle Collision	0.05	7.7	0.03	3.9	0.08	11.6
Highway Segment	Collision with Parked Vehicle	0.00	0.6	0.00	0.6	0.01	1.1
Highway Segment	Total Single Vehicle Crashes	0.24	37.1	0.24	36.2	0.48	73.3
Highway Segment	Right-Angle Collision	0.00	0.3	0.00	0.3	0.00	0.6
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.3	0.00	0.4	0.01	0.7
Highway Segment	Rear-end Collision	0.05	8.2	0.07	10.9	0.12	19.1
Highway Segment	Sideswipe, Same Direction Collision	0.01	2.0	0.03	4.2	0.04	6.2
Highway Segment	Total Multiple Vehicle Crashes	0.07	10.9	0.10	15.8	0.17	26.7
Highway Segment	Total Highway Segment Crashes	0.31	48.0	0.34	52.0	0.65	100.0
	Total Crashes	0.31	48.0	0.34	52.0	0.65	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+08.000	for segment #1 (1000+00.000 to 1000+08.000), The ramp type for Ramp Alignment RGPSBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1000+08.000	for segment #1 (1000+00.000 to 1000+08.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1000+08.000	for segment #1 (1000+00.000 to 1000+08.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+08.000	1000+24.000	for segment #2 (1000+08.000 to 1000+24.000), The ramp type for Ramp Alignment RGPSBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+08.000	1000+24.000	for segment #2 (1000+08.000 to 1000+24.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+08.000	1000+24.000	for segment #2 (1000+08.000 to 1000+24.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+24.000	1000+39.000	for segment #3 (1000+24.000 to 1000+39.000), The ramp type for Ramp Alignment RGPSBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+24.000	1000+39.000	for segment #3 (1000+24.000 to 1000+39.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+24.000	1000+39.000	for segment #3 (1000+24.000 to 1000+39.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+39.000	1000+55.000	for segment #4 (1000+39.000 to 1000+55.000), The ramp type for Ramp Alignment RGPSBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+39.000	1000+55.000	for segment #4 (1000+39.000 to 1000+55.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+39.000	1000+55.000	for segment #4 (1000+39.000 to 1000+55.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+55.000	1001+87.000	for segment #5 (1000+55.000 to 1001+87.000), The ramp type for Ramp Alignment RGPSBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+55.000	1001+87.000	for segment #5 (1000+55.000 to 1001+87.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+55.000	1001+87.000	for segment #5 (1000+55.000 to 1001+87.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+87.000	1002+34.000	for segment #6 (1001+87.000 to 1002+34.000), The ramp type for Ramp Alignment RGPSBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1001+87.000	1002+34.000	for segment #6 (1001+87.000 to 1002+34.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+87.000	1002+34.000	for segment #6 (1001+87.000 to 1002+34.000), Right shoulder width (0.25 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+34.000	1002+50.000	for segment #7 (1002+34.000 to 1002+50.000), The ramp type for Ramp Alignment RGPSBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+34.000	1002+50.000	for segment #7 (1002+34.000 to 1002+50.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+34.000	1002+50.000	for segment #7 (1002+34.000 to 1002+50.000), Right shoulder width (0.59 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+50.000	1003+28.000	for segment #8 (1002+50.000 to 1003+28.000), The ramp type for Ramp Alignment RGPSBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+50.000	1003+28.000	for segment #8 (1002+50.000 to 1003+28.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+50.000	1003+28.000	for segment #8 (1002+50.000 to 1003+28.000), Right shoulder width (1.09 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+28.000	1003+60.000	for segment #9 (1003+28.000 to 1003+60.000), The ramp type for Ramp Alignment RGPSBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+28.000	1003+60.000	for segment #9 (1003+28.000 to 1003+60.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+28.000	1003+60.000	for segment #9 (1003+28.000 to 1003+60.000), Right shoulder width (1.68 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+60.000	1004+39.000	for segment #10 (1003+60.000 to 1004+39.000), The ramp type for Ramp Alignment RGPSBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+60.000	1004+39.000	for segment #10 (1003+60.000 to 1004+39.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1004+39.000	1004+70.000	for segment #11 (1004+39.000 to 1004+70.000), The ramp type for Ramp Alignment RGPSBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1004+39.000	1004+70.000	for segment #11 (1004+39.000 to 1004+70.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+70.000	1005+69.000	for segment #12 (1004+70.000 to 1005+69.000), The ramp type for Ramp Alignment RGPSBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1004+70.000	1005+69.000	for segment #12 (1004+70.000 to 1005+69.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+69.000	1005+79.000	for segment #13 (1005+69.000 to 1005+79.000), The ramp type for Ramp Alignment RGPSBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1005+69.000	1005+79.000	for segment #13 (1005+69.000 to 1005+79.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1005+79.000	1006+33.651	for segment #14 (1005+79.000 to 1006+33.651), The ramp type for Ramp Alignment RGPSBNCHZ0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1005+79.000	1006+33.651	for segment #14 (1005+79.000 to 1006+33.651), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:53 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:53:04 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBXRVS0
Highway Comment: Imported from RGPSBXRVS0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:52:52 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1003+94.537
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1003+94.537
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

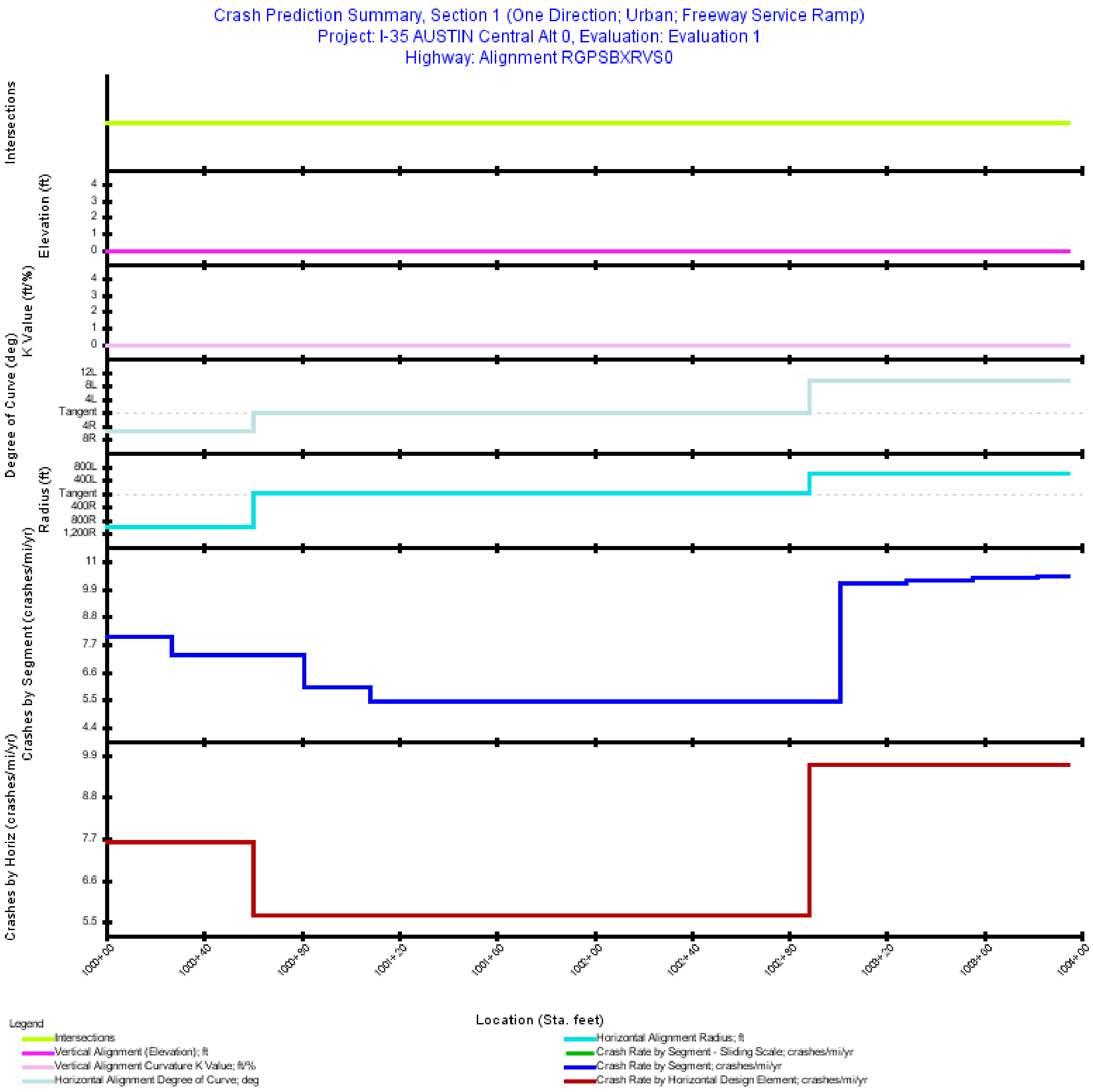

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1000+27.000	27.00	0.0051	2030: 16,650
2	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+27.000	1000+81.000	54.00	0.0102	2030: 16,650
3	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+81.000	1001+08.000	27.00	0.0051	2030: 16,650
4	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+08.000	1003+01.000	193.00	0.0366	2030: 16,650
5	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+01.000	1003+28.000	27.00	0.0051	2030: 16,650
6	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+28.000	1003+55.000	27.00	0.0051	2030: 16,650
7	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+55.000	1003+82.000	27.00	0.0051	2030: 16,650
8	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+82.000	1003+94.537	12.54	0.0024	2030: 16,650

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0747**
Average Future Road AADT (vpd)	**16,650**
Predicted Crashes	
Total Crashes	**0.53**
Fatal and Injury Crashes	**0.27**
Property-Damage-Only Crashes	**0.26**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**51**
Percent Property-Damage-Only Crashes (%)	**49**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**7.0434**
FI Crash Rate (crashes/mi/yr)	**3.6007**
PDO Crash Rate (crashes/mi/yr)	**3.4427**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.45**
Travel Crash Rate (crashes/million veh-mi)	**1.16**
Travel FI Crash Rate (crashes/million veh-mi)	**0.59**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.57**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+27.000	0.0051	0.041	0.0408	0.0204	0.0205	7.9853	1.31
2	1000+27.000	1000+81.000	0.0102	0.075	0.0746	0.0379	0.0367	7.2895	1.20
3	1000+81.000	1001+08.000	0.0051	0.030	0.0305	0.0159	0.0146	5.9688	0.98
4	1001+08.000	1003+01.000	0.0366	0.199	0.1987	0.1028	0.0959	5.4359	0.89
5	1003+01.000	1003+28.000	0.0051	0.052	0.0517	0.0259	0.0258	10.1096	1.66
6	1003+28.000	1003+55.000	0.0051	0.052	0.0523	0.0265	0.0258	10.2273	1.68
7	1003+55.000	1003+82.000	0.0051	0.053	0.0529	0.0271	0.0258	10.3476	1.70
8	1003+82.000	1003+94.537	0.0024	0.025	0.0248	0.0128	0.0120	10.4375	1.72
Total			0.0747	0.526	0.5263	0.2691	0.2572	7.0434	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1000+60.206	0.0114	0.087	0.0867	0.0436	0.0430	7.6015	1.25
Tangent	1000+60.206	1002+88.131	0.0432	0.245	0.2447	0.1264	0.1183	5.6681	0.93
Simple Curve 2	1002+88.131	1003+94.537	0.0202	0.195	0.1949	0.0990	0.0959	9.6732	1.59

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.53	0.27	51.122	0.26	48.878
Total	0.53	0.27	51.122	0.26	48.878
Average	0.53	0.27	51.122	0.26	48.878

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0006	0.0017	0.0072	0.0109	0.0205
2	0.0010	0.0031	0.0134	0.0203	0.0367
3	0.0004	0.0013	0.0056	0.0085	0.0146
4	0.0031	0.0094	0.0392	0.0511	0.0959
5	0.0008	0.0024	0.0102	0.0124	0.0258
6	0.0008	0.0025	0.0104	0.0127	0.0258
7	0.0008	0.0026	0.0107	0.0130	0.0258
8	0.0004	0.0012	0.0050	0.0061	0.0120
Total	0.0080	0.0242	0.1017	0.1351	0.2572

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.1
Highway Segment	Collision with Fixed Object	0.18	35.0	0.16	31.0	0.35	66.0
Highway Segment	Collision with Other Object	0.01	2.5	0.03	6.0	0.04	8.5
Highway Segment	Other Single-vehicle Collision	0.05	10.1	0.02	4.6	0.08	14.7
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.7	0.01	1.4
Highway Segment	Total Single Vehicle Crashes	0.26	48.5	0.23	43.3	0.48	91.7
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Rear-end Collision	0.01	2.0	0.02	3.9	0.03	5.9
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.5	0.01	1.5	0.01	2.0
Highway Segment	Total Multiple Vehicle Crashes	0.01	2.7	0.03	5.6	0.04	8.3
Highway Segment	Total Highway Segment Crashes	0.27	51.1	0.26	48.9	0.53	100.0
	Total Crashes	0.27	51.1	0.26	48.9	0.53	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+27.000	for segment #1 (1000+00.000 to 1000+27.000), The ramp type for Ramp Alignment RGPSBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1000+27.000	for segment #1 (1000+00.000 to 1000+27.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+27.000	1000+81.000	for segment #2 (1000+27.000 to 1000+81.000), The ramp type for Ramp Alignment RGPSBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+27.000	1000+81.000	for segment #2 (1000+27.000 to 1000+81.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+81.000	1001+08.000	for segment #3 (1000+81.000 to 1001+08.000), The ramp type for Ramp Alignment RGPSBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+81.000	1001+08.000	for segment #3 (1000+81.000 to 1001+08.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+08.000	1003+01.000	for segment #4 (1001+08.000 to 1003+01.000), The ramp type for Ramp Alignment RGPSBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+08.000	1003+01.000	for segment #4 (1001+08.000 to 1003+01.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+01.000	1003+28.000	for segment #5 (1003+01.000 to 1003+28.000), The ramp type for Ramp Alignment RGPSBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+01.000	1003+28.000	for segment #5 (1003+01.000 to 1003+28.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+28.000	1003+55.000	for segment #6 (1003+28.000 to 1003+55.000), The ramp type for Ramp Alignment RGPSBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+28.000	1003+55.000	for segment #6 (1003+28.000 to 1003+55.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+55.000	1003+82.000	for segment #7 (1003+55.000 to 1003+82.000), The ramp type for Ramp Alignment RGPSBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+55.000	1003+82.000	for segment #7 (1003+55.000 to 1003+82.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+82.000	1003+94.537	for segment #8 (1003+82.000 to 1003+94.537), The ramp type for Ramp Alignment RGPSBXRVS0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+82.000	1003+94.537	for segment #8 (1003+82.000 to 1003+94.537), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:54 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:54:37 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBXWODL0
Highway Comment: Imported from RGPSBXWODL0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:54:24 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1003+25.793
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1003+25.793
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

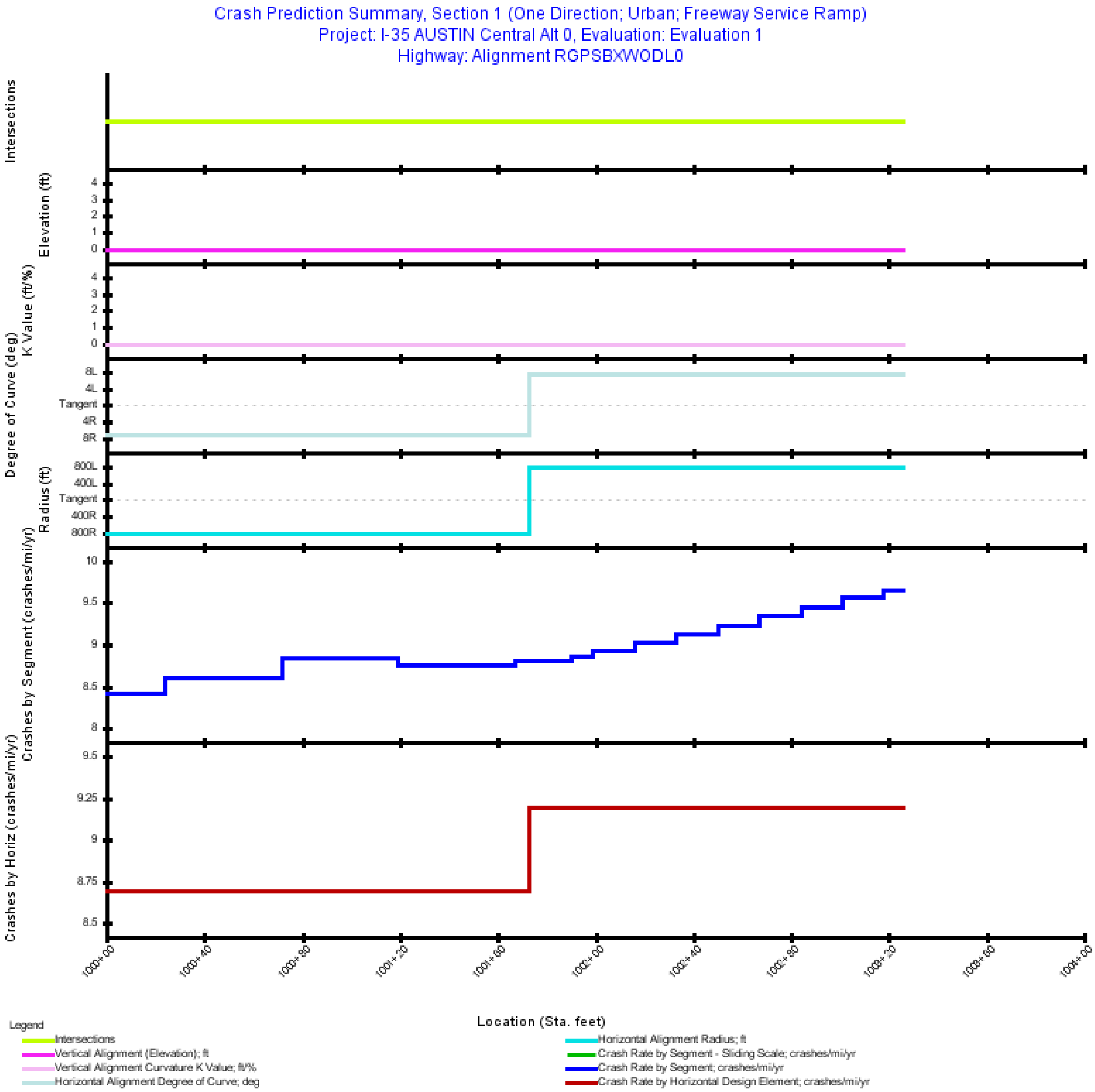

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1000+24.000	24.00	0.0045	2030: 20,800
2	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+24.000	1000+72.000	48.00	0.0091	2030: 20,800
3	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+72.000	1001+19.000	47.00	0.0089	2030: 20,800
4	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+19.000	1001+67.000	48.00	0.0091	2030: 20,800
5	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+67.000	1001+90.000	23.00	0.0044	2030: 20,800
6	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+90.000	1001+99.000	9.00	0.0017	2030: 20,800
7	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+99.000	1002+16.000	17.00	0.0032	2030: 20,800
8	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+16.000	1002+33.000	17.00	0.0032	2030: 20,800
9	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+33.000	1002+50.000	17.00	0.0032	2030: 20,800
10	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+50.000	1002+67.000	17.00	0.0032	2030: 20,800
11	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+67.000	1002+84.000	17.00	0.0032	2030: 20,800
12	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+84.000	1003+01.000	17.00	0.0032	2030: 20,800
13	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+01.000	1003+18.000	17.00	0.0032	2030: 20,800
14	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+18.000	1003+25.793	7.79	0.0015	2030: 20,800

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0617**
Average Future Road AADT (vpd)	**20,800**
Predicted Crashes	
Total Crashes	**0.55**
Fatal and Injury Crashes	**0.27**
Property-Damage-Only Crashes	**0.28**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**49**
Percent Property-Damage-Only Crashes (%)	**51**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**8.9245**
FI Crash Rate (crashes/mi/yr)	**4.4057**
PDO Crash Rate (crashes/mi/yr)	**4.5188**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.47**
Travel Crash Rate (crashes/million veh-mi)	**1.18**
Travel FI Crash Rate (crashes/million veh-mi)	**0.58**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.59**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+24.000	0.0045	0.038	0.0383	0.0187	0.0196	8.4169	1.11
2	1000+24.000	1000+72.000	0.0091	0.078	0.0782	0.0383	0.0399	8.6000	1.13
3	1000+72.000	1001+19.000	0.0089	0.079	0.0787	0.0386	0.0401	8.8441	1.17
4	1001+19.000	1001+67.000	0.0091	0.080	0.0795	0.0386	0.0410	8.7459	1.15
5	1001+67.000	1001+90.000	0.0044	0.038	0.0384	0.0184	0.0199	8.8066	1.16
6	1001+90.000	1001+99.000	0.0017	0.015	0.0151	0.0072	0.0078	8.8538	1.17
7	1001+99.000	1002+16.000	0.0032	0.029	0.0287	0.0139	0.0148	8.9290	1.18
8	1002+16.000	1002+33.000	0.0032	0.029	0.0291	0.0143	0.0148	9.0294	1.19
9	1002+33.000	1002+50.000	0.0032	0.029	0.0294	0.0146	0.0148	9.1321	1.20
10	1002+50.000	1002+67.000	0.0032	0.030	0.0297	0.0149	0.0148	9.2372	1.22
11	1002+67.000	1002+84.000	0.0032	0.030	0.0301	0.0153	0.0148	9.3447	1.23
12	1002+84.000	1003+01.000	0.0032	0.030	0.0304	0.0156	0.0148	9.4548	1.25
13	1003+01.000	1003+18.000	0.0032	0.031	0.0308	0.0160	0.0148	9.5674	1.26
14	1003+18.000	1003+25.793	0.0015	0.014	0.0142	0.0075	0.0068	9.6511	1.27
Total			0.0617	0.551	0.5507	0.2718	0.2788	8.9245	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+72.813	0.0327	0.284	0.2844	0.1388	0.1456	8.6884	1.14
Simple Curve 2	1001+72.813	1003+25.793	0.0290	0.266	0.2663	0.1331	0.1332	9.1912	1.21

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.55	0.27	49.366	0.28	50.634
Total	0.55	0.27	49.366	0.28	50.634
Average	0.55	0.27	49.366	0.28	50.634

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0006	0.0018	0.0074	0.0090	0.0196
2	0.0012	0.0036	0.0151	0.0184	0.0399
3	0.0012	0.0037	0.0152	0.0186	0.0401
4	0.0012	0.0037	0.0152	0.0185	0.0410
5	0.0006	0.0017	0.0073	0.0089	0.0199
6	0.0002	0.0007	0.0029	0.0035	0.0078
7	0.0004	0.0013	0.0055	0.0067	0.0148
8	0.0004	0.0013	0.0056	0.0068	0.0148
9	0.0005	0.0014	0.0057	0.0070	0.0148
10	0.0005	0.0014	0.0059	0.0072	0.0148
11	0.0005	0.0014	0.0060	0.0073	0.0148
12	0.0005	0.0015	0.0062	0.0075	0.0148
13	0.0005	0.0015	0.0063	0.0077	0.0148
14	0.0002	0.0007	0.0029	0.0036	0.0068
Total	0.0085	0.0257	0.1070	0.1306	0.2788

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.18	33.5	0.18	32.3	0.36	65.8
Highway Segment	Collision with Other Object	0.01	2.4	0.04	6.3	0.05	8.6
Highway Segment	Other Single-vehicle Collision	0.05	9.7	0.03	4.8	0.08	14.5
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.7	0.01	1.4
Highway Segment	Total Single Vehicle Crashes	0.26	46.5	0.25	45.1	0.50	91.5
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Rear-end Collision	0.01	2.2	0.02	3.8	0.03	6.0
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.5	0.01	1.5	0.01	2.0
Highway Segment	Total Multiple Vehicle Crashes	0.02	2.9	0.03	5.5	0.05	8.5
Highway Segment	Total Highway Segment Crashes	0.27	49.4	0.28	50.6	0.55	100.0
	Total Crashes	0.27	49.4	0.28	50.6	0.55	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+24.000	for segment #1 (1000+00.000 to 1000+24.000), The ramp type for Ramp Alignment RGPSBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1000+24.000	for segment #1 (1000+00.000 to 1000+24.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+24.000	1000+72.000	for segment #2 (1000+24.000 to 1000+72.000), The ramp type for Ramp Alignment RGPSBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+24.000	1000+72.000	for segment #2 (1000+24.000 to 1000+72.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+72.000	1001+19.000	for segment #3 (1000+72.000 to 1001+19.000), The ramp type for Ramp Alignment RGPSBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+72.000	1001+19.000	for segment #3 (1000+72.000 to 1001+19.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+72.000	1001+19.000	for segment #3 (1000+72.000 to 1001+19.000), Right shoulder width (1.99 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+19.000	1001+67.000	for segment #4 (1001+19.000 to 1001+67.000), The ramp type for Ramp Alignment RGPSBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+19.000	1001+67.000	for segment #4 (1001+19.000 to 1001+67.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+19.000	1001+67.000	for segment #4 (1001+19.000 to 1001+67.000), Right shoulder width (0.99 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+67.000	1001+90.000	for segment #5 (1001+67.000 to 1001+90.000), The ramp type for Ramp Alignment RGPSBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+67.000	1001+90.000	for segment #5 (1001+67.000 to 1001+90.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+67.000	1001+90.000	for segment #5 (1001+67.000 to 1001+90.000), Right shoulder width (0.24 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+90.000	1001+99.000	for segment #6 (1001+90.000 to 1001+99.000), The ramp type for Ramp Alignment RGPSBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+90.000	1001+99.000	for segment #6 (1001+90.000 to 1001+99.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+90.000	1001+99.000	for segment #6 (1001+90.000 to 1001+99.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+99.000	1002+16.000	for segment #7 (1001+99.000 to 1002+16.000), The ramp type for Ramp Alignment RGPSBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+99.000	1002+16.000	for segment #7 (1001+99.000 to 1002+16.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+99.000	1002+16.000	for segment #7 (1001+99.000 to 1002+16.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+16.000	1002+33.000	for segment #8 (1002+16.000 to 1002+33.000), The ramp type for Ramp Alignment RGPSBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+16.000	1002+33.000	for segment #8 (1002+16.000 to 1002+33.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+16.000	1002+33.000	for segment #8 (1002+16.000 to 1002+33.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+33.000	1002+50.000	for segment #9 (1002+33.000 to 1002+50.000), The ramp type for Ramp Alignment RGPSBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+33.000	1002+50.000	for segment #9 (1002+33.000 to 1002+50.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+33.000	1002+50.000	for segment #9 (1002+33.000 to 1002+50.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+50.000	1002+67.000	for segment #10 (1002+50.000 to 1002+67.000), The ramp type for Ramp Alignment RGPSBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+50.000	1002+67.000	for segment #10 (1002+50.000 to 1002+67.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+50.000	1002+67.000	for segment #10 (1002+50.000 to 1002+67.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1002+67.000	1002+84.000	for segment #11 (1002+67.000 to 1002+84.000), The ramp type for Ramp Alignment RGPSBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+67.000	1002+84.000	for segment #11 (1002+67.000 to 1002+84.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+67.000	1002+84.000	for segment #11 (1002+67.000 to 1002+84.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+84.000	1003+01.000	for segment #12 (1002+84.000 to 1003+01.000), The ramp type for Ramp Alignment RGPSBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+84.000	1003+01.000	for segment #12 (1002+84.000 to 1003+01.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+84.000	1003+01.000	for segment #12 (1002+84.000 to 1003+01.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+01.000	1003+18.000	for segment #13 (1003+01.000 to 1003+18.000), The ramp type for Ramp Alignment RGPSBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+01.000	1003+18.000	for segment #13 (1003+01.000 to 1003+18.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+01.000	1003+18.000	for segment #13 (1003+01.000 to 1003+18.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+18.000	1003+25.793	for segment #14 (1003+18.000 to 1003+25.793), The ramp type for Ramp Alignment RGPSBXWODL0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+18.000	1003+25.793	for segment #14 (1003+18.000 to 1003+25.793), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+18.000	1003+25.793	for segment #14 (1003+18.000 to 1003+25.793), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1000+24.000	for segment #1 (1000+00.000 to 1000+24.000), traffic volume (20,800 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX
1000+24.000	1000+72.000	for segment #2 (1000+24.000 to 1000+72.000), traffic volume (20,800 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX
1000+72.000	1001+19.000	for segment #3 (1000+72.000 to 1001+19.000), traffic volume (20,800 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX
1001+19.000	1001+67.000	for segment #4 (1001+19.000 to 1001+67.000), traffic volume (20,800 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX
1001+67.000	1001+90.000	for segment #5 (1001+67.000 to 1001+90.000), traffic volume (20,800 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX
1001+90.000	1001+99.000	for segment #6 (1001+90.000 to 1001+99.000), traffic volume (20,800 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX
1001+99.000	1002+16.000	for segment #7 (1001+99.000 to 1002+16.000), traffic volume (20,800 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX
1002+16.000	1002+33.000	for segment #8 (1002+16.000 to 1002+33.000), traffic volume (20,800 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX
1002+33.000	1002+50.000	for segment #9 (1002+33.000 to 1002+50.000), traffic volume (20,800 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX
1002+50.000	1002+67.000	for segment #10 (1002+50.000 to 1002+67.000), traffic volume (20,800 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX
1002+67.000	1002+84.000	for segment #11 (1002+67.000 to 1002+84.000), traffic volume (20,800 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX
1002+84.000	1003+01.000	for segment #12 (1002+84.000 to 1003+01.000), traffic volume (20,800 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX
1003+01.000	1003+18.000	for segment #13 (1003+01.000 to 1003+18.000), traffic volume (20,800 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX
1003+18.000	1003+25.793	for segment #14 (1003+18.000 to 1003+25.793), traffic volume (20,800 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:37 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:36:57 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBNRVS0
Highway Comment: Imported from RGPSBNRVS0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:36:46 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1003+39.304
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1003+39.304
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

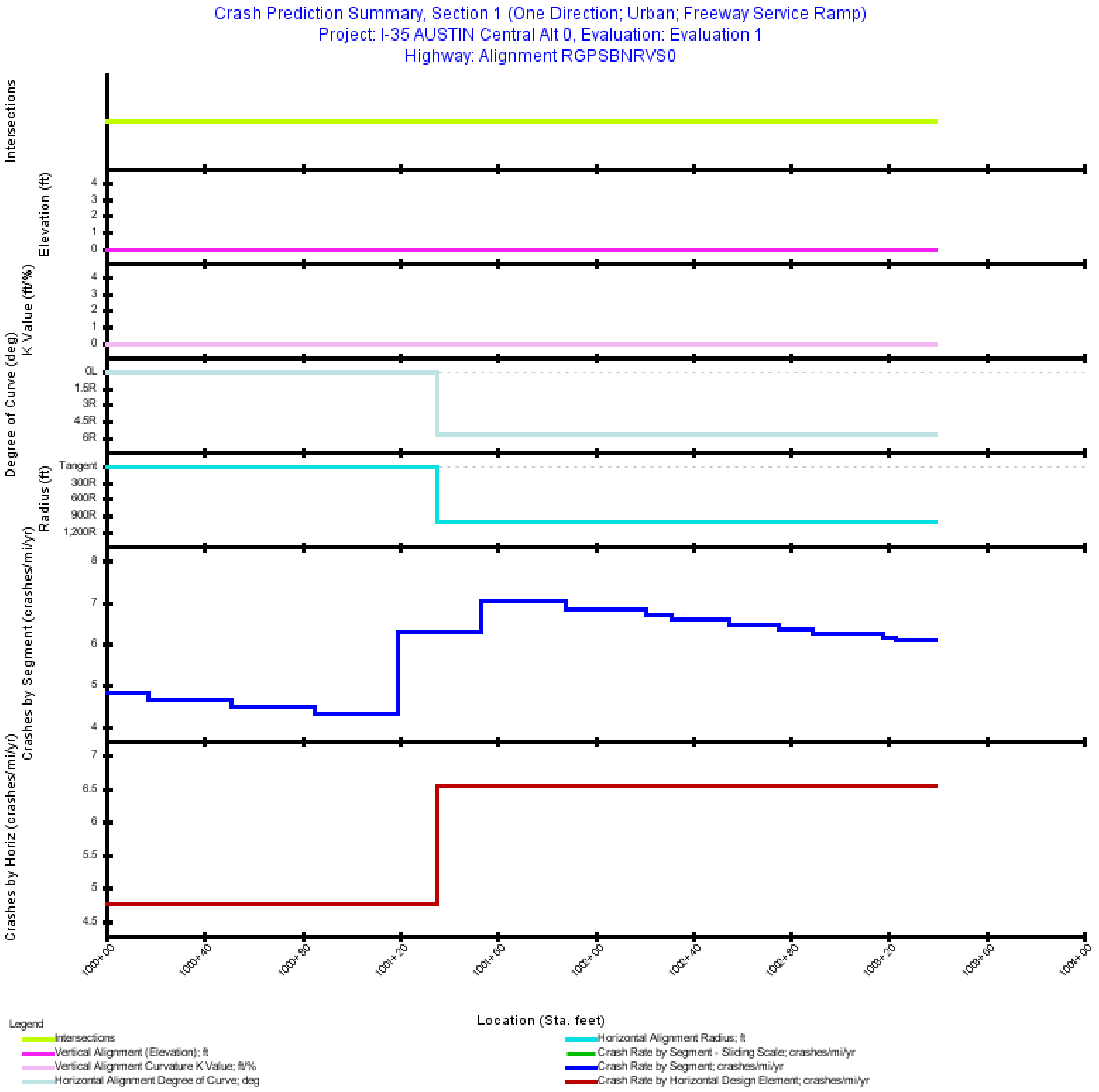

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1000+17.000	17.00	0.0032	2030: 17,150
2	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+17.000	1000+51.000	34.00	0.0064	2030: 17,150
3	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+51.000	1000+85.000	34.00	0.0064	2030: 17,150
4	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+85.000	1001+19.000	34.00	0.0064	2030: 17,150
5	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1001+19.000	1001+53.000	34.00	0.0064	2030: 17,150
6	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1001+53.000	1001+88.000	35.00	0.0066	2030: 17,150
7	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1001+88.000	1002+21.000	33.00	0.0063	2030: 17,150
8	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+21.000	1002+31.000	10.00	0.0019	2030: 17,150
9	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+31.000	1002+55.000	24.00	0.0045	2030: 17,150
10	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+55.000	1002+75.000	20.00	0.0038	2030: 17,150
11	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+75.000	1002+89.000	14.00	0.0027	2030: 17,150
12	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+89.000	1003+18.000	29.00	0.0055	2030: 17,150
13	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+18.000	1003+23.000	5.00	0.0009	2030: 17,150
14	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+23.000	1003+39.304	16.30	0.0031	2030: 17,150

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0643**
Average Future Road AADT (vpd)	**17,150**
Predicted Crashes	
Total Crashes	**0.38**
Fatal and Injury Crashes	**0.17**
Property-Damage-Only Crashes	**0.21**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**45**
Percent Property-Damage-Only Crashes (%)	**55**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.8364**
FI Crash Rate (crashes/mi/yr)	**2.6212**
PDO Crash Rate (crashes/mi/yr)	**3.2153**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.40**
Travel Crash Rate (crashes/million veh-mi)	**0.93**
Travel FI Crash Rate (crashes/million veh-mi)	**0.42**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.51**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+17.000	0.0032	0.015	0.0155	0.0074	0.0081	4.8179	0.77
2	1000+17.000	1000+51.000	0.0064	0.030	0.0301	0.0143	0.0159	4.6779	0.75
3	1000+51.000	1000+85.000	0.0064	0.029	0.0290	0.0135	0.0155	4.4984	0.72
4	1000+85.000	1001+19.000	0.0064	0.028	0.0279	0.0128	0.0151	4.3265	0.69
5	1001+19.000	1001+53.000	0.0064	0.040	0.0404	0.0184	0.0221	6.2800	1.00
6	1001+53.000	1001+88.000	0.0066	0.047	0.0466	0.0208	0.0259	7.0353	1.12
7	1001+88.000	1002+21.000	0.0063	0.043	0.0426	0.0189	0.0238	6.8206	1.09
8	1002+21.000	1002+31.000	0.0019	0.013	0.0127	0.0056	0.0071	6.6907	1.07
9	1002+31.000	1002+55.000	0.0045	0.030	0.0300	0.0132	0.0168	6.5897	1.05
10	1002+55.000	1002+75.000	0.0038	0.025	0.0245	0.0107	0.0138	6.4615	1.03
11	1002+75.000	1002+89.000	0.0027	0.017	0.0169	0.0074	0.0095	6.3641	1.02
12	1002+89.000	1003+18.000	0.0055	0.034	0.0343	0.0149	0.0194	6.2431	1.00
13	1003+18.000	1003+23.000	0.0009	0.006	0.0058	0.0025	0.0033	6.1491	0.98
14	1003+23.000	1003+39.304	0.0031	0.019	0.0188	0.0081	0.0107	6.0910	0.97
Total			0.0643	0.375	0.3751	0.1684	0.2066	5.8364	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1001+35.248	0.0256	0.122	0.1218	0.0568	0.0650	4.7545	0.76
Simple Curve 1	1001+35.248	1003+39.304	0.0386	0.253	0.2533	0.1117	0.1416	6.5535	1.05

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.38	0.17	44.911	0.21	55.089
Total	0.38	0.17	44.911	0.21	55.089
Average	0.38	0.17	44.911	0.21	55.089

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0002	0.0005	0.0031	0.0037	0.0081
2	0.0003	0.0009	0.0059	0.0072	0.0159
3	0.0003	0.0009	0.0056	0.0068	0.0155
4	0.0003	0.0008	0.0053	0.0064	0.0151
5	0.0003	0.0010	0.0068	0.0101	0.0221
6	0.0004	0.0012	0.0076	0.0116	0.0259
7	0.0004	0.0011	0.0069	0.0105	0.0238
8	0.0001	0.0003	0.0021	0.0031	0.0071
9	0.0002	0.0007	0.0048	0.0073	0.0168
10	0.0002	0.0006	0.0039	0.0060	0.0138
11	0.0001	0.0004	0.0027	0.0041	0.0095
12	0.0003	0.0008	0.0055	0.0083	0.0194
13	0.0000	0.0001	0.0009	0.0014	0.0033
14	0.0002	0.0005	0.0030	0.0045	0.0107
Total	0.0033	0.0099	0.0642	0.0911	0.2066

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.00	0.8	0.00	0.9
Highway Segment	Collision with Fixed Object	0.09	23.9	0.10	26.5	0.19	50.5
Highway Segment	Collision with Other Object	0.01	1.7	0.02	5.2	0.03	6.8
Highway Segment	Other Single-vehicle Collision	0.03	6.9	0.01	4.0	0.04	10.9
Highway Segment	Collision with Parked Vehicle	0.00	0.5	0.00	0.6	0.00	1.1
Highway Segment	Total Single Vehicle Crashes	0.12	33.1	0.14	37.1	0.26	70.2
Highway Segment	Right-Angle Collision	0.00	0.4	0.00	0.3	0.00	0.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.4	0.00	0.4	0.00	0.8
Highway Segment	Rear-end Collision	0.03	8.8	0.05	12.4	0.08	21.3
Highway Segment	Sideswipe, Same Direction Collision	0.01	2.1	0.02	4.8	0.03	6.9
Highway Segment	Total Multiple Vehicle Crashes	0.04	11.8	0.07	18.0	0.11	29.8
Highway Segment	Total Highway Segment Crashes	0.17	44.9	0.21	55.1	0.38	100.0
	Total Crashes	0.17	44.9	0.21	55.1	0.38	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+17.000	for segment #1 (1000+00.000 to 1000+17.000), The ramp type for Ramp Alignment RGPSBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1000+17.000	for segment #1 (1000+00.000 to 1000+17.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+17.000	1000+51.000	for segment #2 (1000+17.000 to 1000+51.000), The ramp type for Ramp Alignment RGPSBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+17.000	1000+51.000	for segment #2 (1000+17.000 to 1000+51.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+51.000	1000+85.000	for segment #3 (1000+51.000 to 1000+85.000), The ramp type for Ramp Alignment RGPSBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+51.000	1000+85.000	for segment #3 (1000+51.000 to 1000+85.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+85.000	1001+19.000	for segment #4 (1000+85.000 to 1001+19.000), The ramp type for Ramp Alignment RGPSBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+85.000	1001+19.000	for segment #4 (1000+85.000 to 1001+19.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+19.000	1001+53.000	for segment #5 (1001+19.000 to 1001+53.000), The ramp type for Ramp Alignment RGPSBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1001+19.000	1001+53.000	for segment #5 (1001+19.000 to 1001+53.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+53.000	1001+88.000	for segment #6 (1001+53.000 to 1001+88.000), The ramp type for Ramp Alignment RGPSBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1001+53.000	1001+88.000	for segment #6 (1001+53.000 to 1001+88.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+88.000	1002+21.000	for segment #7 (1001+88.000 to 1002+21.000), The ramp type for Ramp Alignment RGPSBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1001+88.000	1002+21.000	for segment #7 (1001+88.000 to 1002+21.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+21.000	1002+31.000	for segment #8 (1002+21.000 to 1002+31.000), The ramp type for Ramp Alignment RGPSBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+21.000	1002+31.000	for segment #8 (1002+21.000 to 1002+31.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+31.000	1002+55.000	for segment #9 (1002+31.000 to 1002+55.000), The ramp type for Ramp Alignment RGPSBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+31.000	1002+55.000	for segment #9 (1002+31.000 to 1002+55.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+55.000	1002+75.000	for segment #10 (1002+55.000 to 1002+75.000), The ramp type for Ramp Alignment RGPSBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+55.000	1002+75.000	for segment #10 (1002+55.000 to 1002+75.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+75.000	1002+89.000	for segment #11 (1002+75.000 to 1002+89.000), The ramp type for Ramp Alignment RGPSBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+75.000	1002+89.000	for segment #11 (1002+75.000 to 1002+89.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+89.000	1003+18.000	for segment #12 (1002+89.000 to 1003+18.000), The ramp type for Ramp Alignment RGPSBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+89.000	1003+18.000	for segment #12 (1002+89.000 to 1003+18.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+18.000	1003+23.000	for segment #13 (1003+18.000 to 1003+23.000), The ramp type for Ramp Alignment RGPSBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+18.000	1003+23.000	for segment #13 (1003+18.000 to 1003+23.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+23.000	1003+39.304	for segment #14 (1003+23.000 to 1003+39.304), The ramp type for Ramp Alignment RGPSBNRVS0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1003+23.000	1003+39.304	for segment #14 (1003+23.000 to 1003+39.304), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:37 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:37:39 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBNWODL0
Highway Comment: Imported from RGPSBNWODL0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:37:28 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1012+67.282
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1012+67.282
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

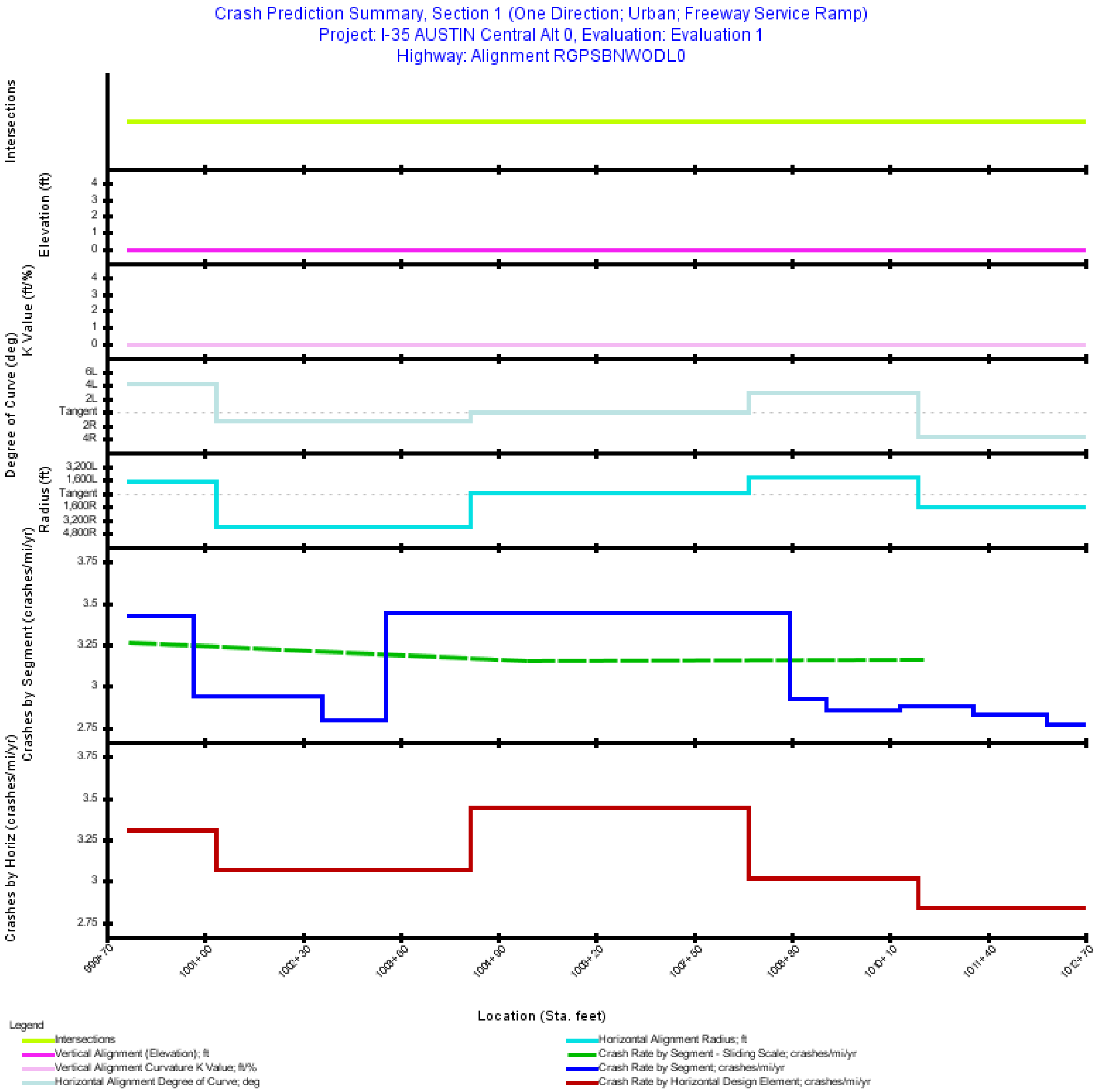

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1000+86.000	86.00	0.0163	2030: 8,400
2	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+86.000	1002+56.000	170.00	0.0322	2030: 8,400
3	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+56.000	1003+41.000	85.00	0.0161	2030: 8,400
4	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+41.000	1008+77.000	536.00	0.1015	2030: 8,400
5	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1008+77.000	1009+26.000	49.00	0.0093	2030: 8,400
6	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1009+26.000	1010+24.000	98.00	0.0186	2030: 8,400
7	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1010+24.000	1011+21.000	97.00	0.0184	2030: 8,400
8	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1011+21.000	1012+19.000	98.00	0.0186	2030: 8,400
9	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1012+19.000	1012+67.282	48.28	0.0091	2030: 8,400

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2400**
Average Future Road AADT (vpd)	**8,400**
Predicted Crashes	
Total Crashes	**0.76**
Fatal and Injury Crashes	**0.34**
Property-Damage-Only Crashes	**0.42**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**45**
Percent Property-Damage-Only Crashes (%)	**55**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**3.1496**
FI Crash Rate (crashes/mi/yr)	**1.4031**
PDO Crash Rate (crashes/mi/yr)	**1.7465**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.74**
Travel Crash Rate (crashes/million veh-mi)	**1.03**
Travel FI Crash Rate (crashes/million veh-mi)	**0.46**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.57**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+86.000	0.0163	0.056	0.0558	0.0251	0.0307	3.4268	1.12
2	1000+86.000	1002+56.000	0.0322	0.095	0.0947	0.0426	0.0522	2.9427	0.96
3	1002+56.000	1003+41.000	0.0161	0.045	0.0451	0.0201	0.0250	2.7991	0.91
4	1003+41.000	1008+77.000	0.1015	0.349	0.3492	0.1566	0.1926	3.4401	1.12
5	1008+77.000	1009+26.000	0.0093	0.027	0.0271	0.0119	0.0152	2.9212	0.95
6	1009+26.000	1010+24.000	0.0186	0.053	0.0531	0.0233	0.0297	2.8599	0.93
7	1010+24.000	1011+21.000	0.0184	0.053	0.0529	0.0232	0.0298	2.8816	0.94
8	1011+21.000	1012+19.000	0.0186	0.053	0.0526	0.0229	0.0297	2.8341	0.92
9	1012+19.000	1012+67.282	0.0091	0.025	0.0254	0.0110	0.0143	2.7750	0.91
Total			0.2400	0.756	0.7560	0.3368	0.4192	3.1496	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+15.952	0.0220	0.072	0.0725	0.0326	0.0399	3.3017	1.08
Simple Curve 2	1001+15.952	1004+52.880	0.0638	0.196	0.1960	0.0878	0.1082	3.0717	1.00
Tangent	1004+52.880	1008+22.389	0.0700	0.241	0.2408	0.1080	0.1328	3.4401	1.12
Simple Curve 3	1008+22.389	1010+48.030	0.0427	0.129	0.1289	0.0570	0.0719	3.0160	0.98
Simple Curve 4	1010+48.030	1012+67.282	0.0415	0.118	0.1178	0.0514	0.0664	2.8369	0.93

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.76	0.34	44.549	0.42	55.451
Total	0.76	0.34	44.549	0.42	55.451
Average	0.76	0.34	44.549	0.42	55.451

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0005	0.0014	0.0093	0.0140	0.0307
2	0.0008	0.0024	0.0157	0.0237	0.0522
3	0.0004	0.0011	0.0074	0.0112	0.0250
4	0.0026	0.0078	0.0519	0.0944	0.1926
5	0.0002	0.0007	0.0044	0.0067	0.0152
6	0.0004	0.0013	0.0086	0.0130	0.0297
7	0.0004	0.0013	0.0085	0.0129	0.0298
8	0.0004	0.0013	0.0084	0.0128	0.0297
9	0.0002	0.0006	0.0041	0.0061	0.0143
Total	0.0059	0.0179	0.1182	0.1947	0.4192

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.9	0.01	1.0
Highway Segment	Collision with Fixed Object	0.20	25.8	0.22	28.7	0.41	54.6
Highway Segment	Collision with Other Object	0.01	1.8	0.04	5.6	0.06	7.4
Highway Segment	Other Single-vehicle Collision	0.06	7.4	0.03	4.3	0.09	11.7
Highway Segment	Collision with Parked Vehicle	0.00	0.5	0.01	0.6	0.01	1.2
Highway Segment	Total Single Vehicle Crashes	0.27	35.8	0.30	40.1	0.57	75.9
Highway Segment	Right-Angle Collision	0.00	0.3	0.00	0.3	0.00	0.5
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.3	0.00	0.4	0.01	0.6
Highway Segment	Rear-end Collision	0.05	6.6	0.08	10.6	0.13	17.1
Highway Segment	Sideswipe, Same Direction Collision	0.01	1.6	0.03	4.1	0.04	5.7
Highway Segment	Total Multiple Vehicle Crashes	0.07	8.8	0.12	15.3	0.18	24.1
Highway Segment	Total Highway Segment Crashes	0.34	44.5	0.42	55.5	0.76	100.0
	Total Crashes	0.34	44.5	0.42	55.5	0.76	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+86.000	for segment #1 (1000+00.000 to 1000+86.000), The ramp type for Ramp Alignment RGPSBNWODL0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+86.000	1002+56.000	for segment #2 (1000+86.000 to 1002+56.000), The ramp type for Ramp Alignment RGPSBNWODL0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+56.000	1003+41.000	for segment #3 (1002+56.000 to 1003+41.000), The ramp type for Ramp Alignment RGPSBNWODL0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+41.000	1008+77.000	for segment #4 (1003+41.000 to 1008+77.000), The ramp type for Ramp Alignment RGPSBNWODL0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1008+77.000	1009+26.000	for segment #5 (1008+77.000 to 1009+26.000), The ramp type for Ramp Alignment RGPSBNWODL0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1009+26.000	1010+24.000	for segment #6 (1009+26.000 to 1010+24.000), The ramp type for Ramp Alignment RGPSBNWODL0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1010+24.000	1011+21.000	for segment #7 (1010+24.000 to 1011+21.000), The ramp type for Ramp Alignment RGPSBNWODL0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1011+21.000	1012+19.000	for segment #8 (1011+21.000 to 1012+19.000), The ramp type for Ramp Alignment RGPSBNWODL0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1012+19.000	1012+67.282	for segment #9 (1012+19.000 to 1012+67.282), The ramp type for Ramp Alignment RGPSBNWODL0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:55:28 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBXWODW0
Highway Comment: Imported from RGPSBXWODW0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:55:19 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1012+86.962
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1012+86.962
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

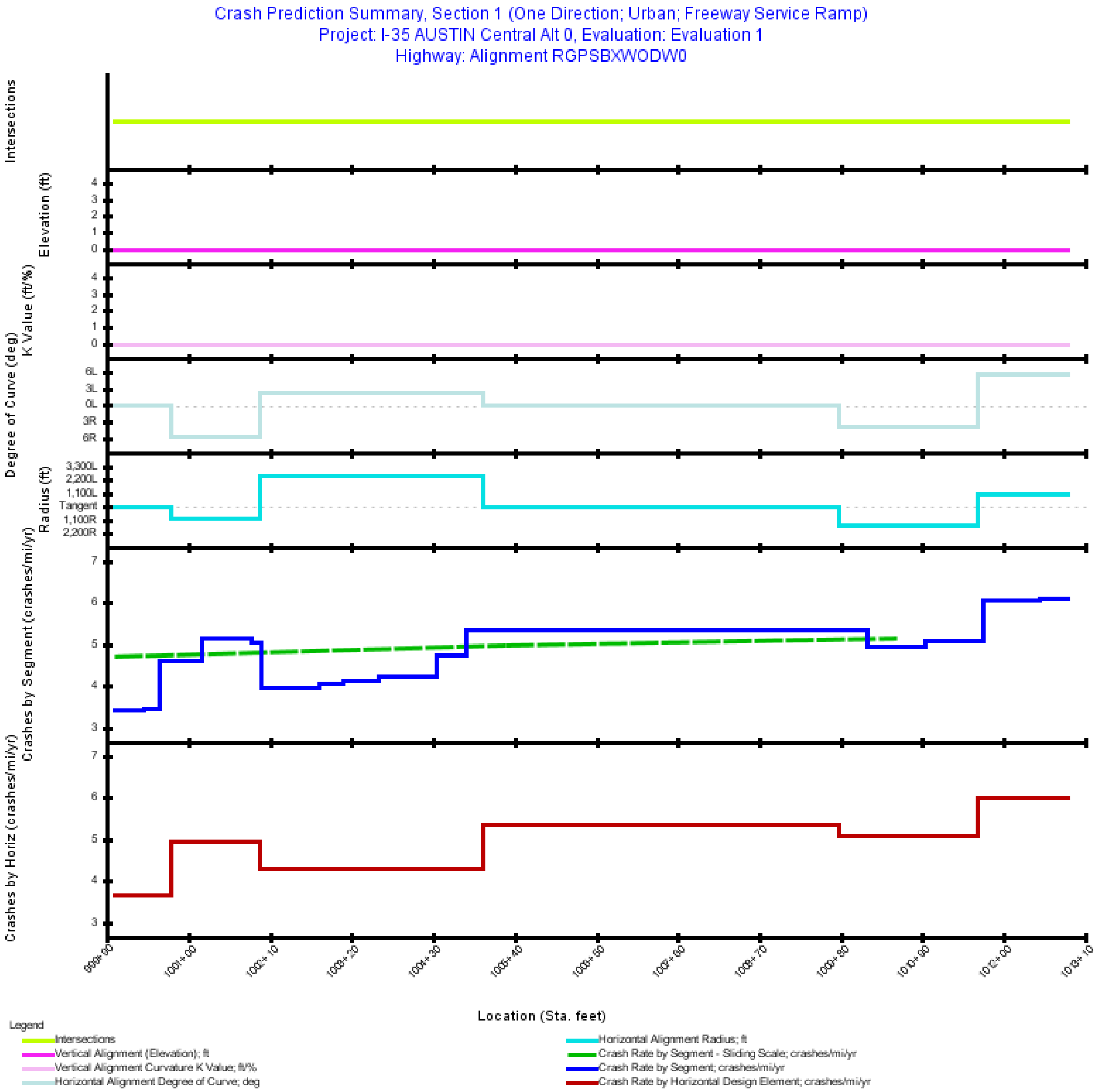

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1000+40.000	40.00	0.0076	2030: 12,400
2	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+40.000	1000+62.000	22.00	0.0042	2030: 12,400
3	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+62.000	1001+19.000	57.00	0.0108	2030: 12,400
4	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+19.000	1001+86.000	67.00	0.0127	2030: 12,400
5	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+86.000	1001+98.000	12.00	0.0023	2030: 12,400
6	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1001+98.000	1002+77.000	79.00	0.0150	2030: 12,400
7	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+77.000	1003+09.000	32.00	0.0061	2030: 12,400
8	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+09.000	1003+56.000	47.00	0.0089	2030: 12,400
9	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+56.000	1004+35.000	79.00	0.0150	2030: 12,400
10	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+35.000	1004+74.000	39.00	0.0074	2030: 12,400
11	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+74.000	1010+16.000	542.00	0.1027	2030: 12,400
12	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1010+16.000	1010+94.000	78.00	0.0148	2030: 12,400
13	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1010+94.000	1011+71.000	77.00	0.0146	2030: 12,400
14	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1011+71.000	1012+49.000	78.00	0.0148	2030: 12,400
15	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1012+49.000	1012+86.962	37.96	0.0072	2030: 12,400

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2437**
Average Future Road AADT (vpd)	**12,400**
Predicted Crashes	
Total Crashes	**1.22**
Fatal and Injury Crashes	**0.60**
Property-Damage-Only Crashes	**0.61**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**49**
Percent Property-Damage-Only Crashes (%)	**51**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**4.9894**
FI Crash Rate (crashes/mi/yr)	**2.4657**
PDO Crash Rate (crashes/mi/yr)	**2.5237**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.10**
Travel Crash Rate (crashes/million veh-mi)	**1.10**
Travel FI Crash Rate (crashes/million veh-mi)	**0.55**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.56**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+40.000	0.0076	0.026	0.0258	0.0123	0.0135	3.4076	0.75
2	1000+40.000	1000+62.000	0.0042	0.014	0.0144	0.0069	0.0075	3.4510	0.76
3	1000+62.000	1001+19.000	0.0108	0.050	0.0498	0.0234	0.0264	4.6134	1.02
4	1001+19.000	1001+86.000	0.0127	0.065	0.0653	0.0306	0.0346	5.1427	1.14
5	1001+86.000	1001+98.000	0.0023	0.011	0.0115	0.0054	0.0060	5.0427	1.11
6	1001+98.000	1002+77.000	0.0150	0.060	0.0596	0.0288	0.0307	3.9807	0.88
7	1002+77.000	1003+09.000	0.0061	0.025	0.0247	0.0120	0.0127	4.0723	0.90
8	1003+09.000	1003+56.000	0.0089	0.037	0.0368	0.0180	0.0189	4.1389	0.91
9	1003+56.000	1004+35.000	0.0150	0.064	0.0635	0.0312	0.0324	4.2473	0.94
10	1004+35.000	1004+74.000	0.0074	0.035	0.0349	0.0173	0.0176	4.7297	1.04
11	1004+74.000	1010+16.000	0.1027	0.549	0.5495	0.2752	0.2743	5.3533	1.18
12	1010+16.000	1010+94.000	0.0148	0.073	0.0729	0.0360	0.0368	4.9337	1.09
13	1010+94.000	1011+71.000	0.0146	0.074	0.0741	0.0370	0.0371	5.0789	1.12
14	1011+71.000	1012+49.000	0.0148	0.089	0.0894	0.0447	0.0448	6.0548	1.34
15	1012+49.000	1012+86.962	0.0072	0.044	0.0439	0.0221	0.0218	6.1071	1.35
Total			0.2437	1.216	1.2161	0.6010	0.6151	4.9894	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1000+77.170	0.0146	0.053	0.0534	0.0255	0.0280	3.6570	0.81
Simple Curve 1	1000+77.170	1001+96.331	0.0226	0.112	0.1117	0.0525	0.0592	4.9482	1.09
Simple Curve 2	1001+96.331	1004+96.923	0.0569	0.244	0.2444	0.1197	0.1247	4.2930	0.95
Tangent	1004+96.923	1009+78.388	0.0912	0.488	0.4882	0.2445	0.2437	5.3533	1.18
Simple Curve 3	1009+78.388	1011+64.142	0.0352	0.178	0.1785	0.0888	0.0897	5.0735	1.12
Simple Curve 4	1011+64.142	1012+86.962	0.0233	0.140	0.1400	0.0701	0.0699	6.0165	1.33

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.22	0.60	49.419	0.61	50.581
Total	1.22	0.60	49.419	0.61	50.581
Average	1.22	0.60	49.419	0.61	50.581

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0003	0.0010	0.0044	0.0066	0.0135
2	0.0002	0.0006	0.0024	0.0037	0.0075
3	0.0006	0.0019	0.0083	0.0125	0.0264
4	0.0008	0.0025	0.0108	0.0164	0.0346
5	0.0001	0.0004	0.0019	0.0029	0.0060
6	0.0008	0.0024	0.0102	0.0154	0.0307
7	0.0003	0.0010	0.0042	0.0064	0.0127
8	0.0005	0.0015	0.0064	0.0096	0.0189
9	0.0009	0.0026	0.0110	0.0167	0.0324
10	0.0005	0.0014	0.0059	0.0095	0.0176
11	0.0066	0.0200	0.0873	0.1613	0.2743
12	0.0010	0.0030	0.0128	0.0193	0.0368
13	0.0010	0.0031	0.0131	0.0198	0.0371
14	0.0012	0.0037	0.0158	0.0239	0.0448
15	0.0006	0.0018	0.0078	0.0118	0.0218
Total	0.0155	0.0470	0.2024	0.3361	0.6151

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.41	34.0	0.39	32.0	0.80	66.0
Highway Segment	Collision with Other Object	0.03	2.4	0.07	6.2	0.10	8.6
Highway Segment	Other Single-vehicle Collision	0.12	9.8	0.06	4.8	0.18	14.6
Highway Segment	Collision with Parked Vehicle	0.01	0.7	0.01	0.7	0.02	1.4
Highway Segment	Total Single Vehicle Crashes	0.57	47.1	0.54	44.7	1.12	91.8
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Rear-end Collision	0.02	1.7	0.05	4.1	0.07	5.8
Highway Segment	Sideswipe, Same Direction Collision	0.01	0.4	0.02	1.6	0.02	2.0
Highway Segment	Total Multiple Vehicle Crashes	0.03	2.3	0.07	5.9	0.10	8.2
Highway Segment	Total Highway Segment Crashes	0.60	49.4	0.61	50.6	1.22	100.0
	Total Crashes	0.60	49.4	0.61	50.6	1.22	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+40.000	for segment #1 (1000+00.000 to 1000+40.000), The ramp type for Ramp Alignment RGPSBXWODW0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+40.000	1000+62.000	for segment #2 (1000+40.000 to 1000+62.000), The ramp type for Ramp Alignment RGPSBXWODW0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+62.000	1001+19.000	for segment #3 (1000+62.000 to 1001+19.000), The ramp type for Ramp Alignment RGPSBXWODW0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+19.000	1001+86.000	for segment #4 (1001+19.000 to 1001+86.000), The ramp type for Ramp Alignment RGPSBXWODW0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+86.000	1001+98.000	for segment #5 (1001+86.000 to 1001+98.000), The ramp type for Ramp Alignment RGPSBXWODW0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+98.000	1002+77.000	for segment #6 (1001+98.000 to 1002+77.000), The ramp type for Ramp Alignment RGPSBXWODW0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+77.000	1003+09.000	for segment #7 (1002+77.000 to 1003+09.000), The ramp type for Ramp Alignment RGPSBXWODW0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+09.000	1003+56.000	for segment #8 (1003+09.000 to 1003+56.000), The ramp type for Ramp Alignment RGPSBXWODW0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+56.000	1004+35.000	for segment #9 (1003+56.000 to 1004+35.000), The ramp type for Ramp Alignment RGPSBXWODW0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+35.000	1004+74.000	for segment #10 (1004+35.000 to 1004+74.000), The ramp type for Ramp Alignment RGPSBXWODW0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+74.000	1010+16.000	for segment #11 (1004+74.000 to 1010+16.000), The ramp type for Ramp Alignment RGPSBXWODW0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1010+16.000	1010+94.000	for segment #12 (1010+16.000 to 1010+94.000), The ramp type for Ramp Alignment RGPSBXWODW0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1010+94.000	1011+71.000	for segment #13 (1010+94.000 to 1011+71.000), The ramp type for Ramp Alignment RGPSBXWODW0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1011+71.000	1012+49.000	for segment #14 (1011+71.000 to 1012+49.000), The ramp type for Ramp Alignment RGPSBXWODW0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1012+49.000	1012+86.962	for segment #15 (1012+49.000 to 1012+86.962), The ramp type for Ramp Alignment RGPSBXWODW0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

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Evaluation Date: Thu May 27 13:36:15 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBNOLF0
Highway Comment: Imported from RGPSBNOLF0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:36:04 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1012+02.965
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
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Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1012+02.965
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

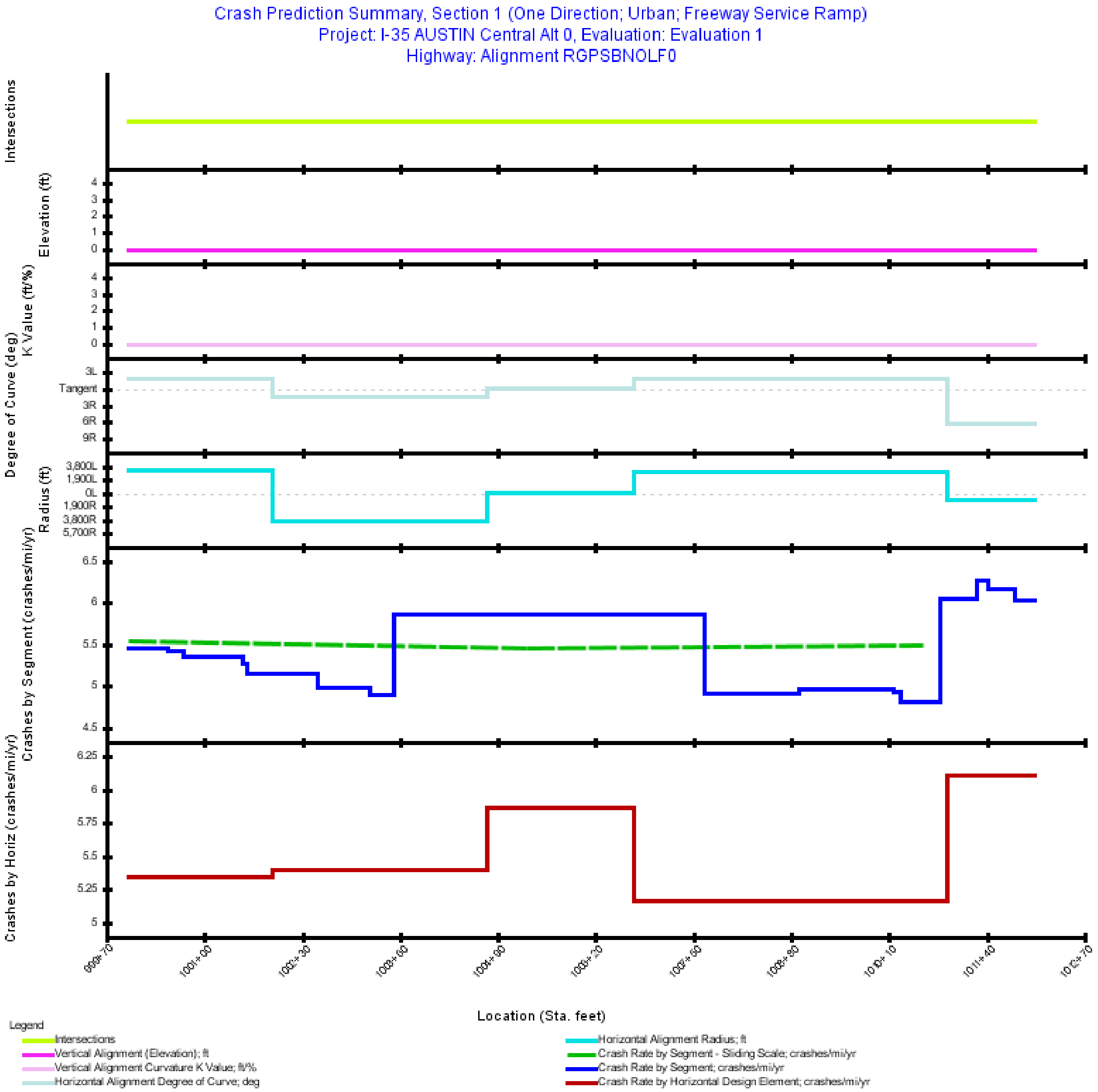

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1000+51.000	51.00	0.0097	2030: 15,900
2	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+51.000	1000+73.000	22.00	0.0042	2030: 15,900
3	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+73.000	1001+51.000	78.00	0.0148	2030: 15,900
4	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1001+51.000	1001+56.000	5.00	0.0009	2030: 15,900
5	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1001+56.000	1002+51.000	95.00	0.0180	2030: 15,900
6	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+51.000	1003+20.000	69.00	0.0131	2030: 15,900
7	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+20.000	1003+51.000	31.00	0.0059	2030: 15,900
8	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+51.000	1007+64.000	413.00	0.0782	2030: 15,900
9	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1007+64.000	1008+90.000	126.00	0.0239	2030: 15,900
10	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1008+90.000	1010+00.000	110.00	0.0208	2030: 15,900
11	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1010+00.000	1010+15.000	15.00	0.0028	2030: 15,900
12	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1010+15.000	1010+26.000	11.00	0.0021	2030: 15,900
13	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1010+26.000	1010+77.000	51.00	0.0097	2030: 15,900
14	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1010+77.000	1011+27.000	50.00	0.0095	2030: 15,900
15	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1011+27.000	1011+41.000	14.00	0.0027	2030: 15,900
16	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1011+41.000	1011+78.000	37.00	0.0070	2030: 15,900
17	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1011+78.000	1012+02.965	24.96	0.0047	2030: 15,900

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2278**
Average Future Road AADT (vpd)	**15,900**
Predicted Crashes	
Total Crashes	**1.24**
Fatal and Injury Crashes	**0.56**
Property-Damage-Only Crashes	**0.68**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**45**
Percent Property-Damage-Only Crashes (%)	**55**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.4518**
FI Crash Rate (crashes/mi/yr)	**2.4630**
PDO Crash Rate (crashes/mi/yr)	**2.9888**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.32**
Travel Crash Rate (crashes/million veh-mi)	**0.94**
Travel FI Crash Rate (crashes/million veh-mi)	**0.42**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.52**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+51.000	0.0097	0.053	0.0527	0.0251	0.0275	5.4523	0.94
2	1000+51.000	1000+73.000	0.0042	0.023	0.0226	0.0107	0.0119	5.4307	0.94
3	1000+73.000	1001+51.000	0.0148	0.079	0.0791	0.0372	0.0419	5.3516	0.92
4	1001+51.000	1001+56.000	0.0009	0.005	0.0050	0.0023	0.0027	5.2757	0.91
5	1001+56.000	1002+51.000	0.0180	0.093	0.0926	0.0428	0.0499	5.1477	0.89
6	1002+51.000	1003+20.000	0.0131	0.065	0.0651	0.0295	0.0356	4.9841	0.86
7	1003+20.000	1003+51.000	0.0059	0.029	0.0288	0.0129	0.0159	4.9008	0.84
8	1003+51.000	1007+64.000	0.0782	0.459	0.4586	0.2055	0.2531	5.8632	1.01
9	1007+64.000	1008+90.000	0.0239	0.117	0.1175	0.0526	0.0649	4.9226	0.85
10	1008+90.000	1010+00.000	0.0208	0.104	0.1036	0.0469	0.0567	4.9705	0.86
11	1010+00.000	1010+15.000	0.0028	0.014	0.0141	0.0064	0.0077	4.9679	0.86
12	1010+15.000	1010+26.000	0.0021	0.010	0.0103	0.0047	0.0056	4.9243	0.85
13	1010+26.000	1010+77.000	0.0097	0.047	0.0466	0.0210	0.0256	4.8220	0.83
14	1010+77.000	1011+27.000	0.0095	0.057	0.0572	0.0252	0.0320	6.0428	1.04
15	1011+27.000	1011+41.000	0.0027	0.017	0.0166	0.0073	0.0094	6.2748	1.08
16	1011+41.000	1011+78.000	0.0070	0.043	0.0432	0.0188	0.0245	6.1683	1.06
17	1011+78.000	1012+02.965	0.0047	0.029	0.0286	0.0123	0.0163	6.0416	1.04
Total			0.2278	1.242	1.2421	0.5612	0.6810	5.4518	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+91.300	0.0362	0.194	0.1938	0.0913	0.1025	5.3479	0.92
Simple Curve 2	1001+91.300	1004+76.198	0.0540	0.291	0.2911	0.1316	0.1595	5.3957	0.93
Tangent	1004+76.198	1006+71.117	0.0369	0.216	0.2165	0.0970	0.1194	5.8632	1.01
Simple Curve 3	1006+71.117	1010+87.519	0.0789	0.407	0.4072	0.1830	0.2241	5.1627	0.89
Simple Curve 4	1010+87.519	1012+02.965	0.0219	0.134	0.1336	0.0582	0.0754	6.1109	1.05

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.24	0.56	45.178	0.68	54.822
Total	1.24	0.56	45.178	0.68	54.822
Average	1.24	0.56	45.178	0.68	54.822

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0005	0.0014	0.0092	0.0140	0.0275
2	0.0002	0.0006	0.0040	0.0060	0.0119
3	0.0007	0.0021	0.0137	0.0207	0.0419
4	0.0000	0.0001	0.0009	0.0013	0.0027
5	0.0008	0.0024	0.0157	0.0238	0.0499
6	0.0005	0.0017	0.0109	0.0165	0.0356
7	0.0002	0.0007	0.0048	0.0072	0.0159
8	0.0034	0.0103	0.0688	0.1229	0.2531
9	0.0010	0.0030	0.0193	0.0293	0.0649
10	0.0009	0.0026	0.0173	0.0261	0.0567
11	0.0001	0.0004	0.0024	0.0036	0.0077
12	0.0001	0.0003	0.0017	0.0026	0.0056
13	0.0004	0.0012	0.0077	0.0117	0.0256
14	0.0005	0.0014	0.0093	0.0140	0.0320
15	0.0001	0.0004	0.0027	0.0040	0.0094
16	0.0003	0.0011	0.0069	0.0104	0.0245
17	0.0002	0.0007	0.0045	0.0069	0.0163
Total	0.0100	0.0304	0.1997	0.3210	0.6810

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.8	0.01	0.9
Highway Segment	Collision with Fixed Object	0.30	23.9	0.32	25.4	0.61	49.3
Highway Segment	Collision with Other Object	0.02	1.7	0.06	4.9	0.08	6.6
Highway Segment	Other Single-vehicle Collision	0.09	6.9	0.05	3.8	0.13	10.7
Highway Segment	Collision with Parked Vehicle	0.01	0.5	0.01	0.6	0.01	1.1
Highway Segment	Total Single Vehicle Crashes	0.41	33.1	0.44	35.5	0.85	68.6
Highway Segment	Right-Angle Collision	0.01	0.4	0.00	0.3	0.01	0.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.01	0.4	0.01	0.5	0.01	0.8
Highway Segment	Rear-end Collision	0.11	9.1	0.17	13.4	0.28	22.4
Highway Segment	Sideswipe, Same Direction Collision	0.03	2.2	0.06	5.1	0.09	7.3
Highway Segment	Total Multiple Vehicle Crashes	0.15	12.1	0.24	19.4	0.39	31.4
Highway Segment	Total Highway Segment Crashes	0.56	45.2	0.68	54.8	1.24	100.0
	Total Crashes	0.56	45.2	0.68	54.8	1.24	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+51.000	for segment #1 (1000+00.000 to 1000+51.000), The ramp type for Ramp Alignment RGPSBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+51.000	1000+73.000	for segment #2 (1000+51.000 to 1000+73.000), The ramp type for Ramp Alignment RGPSBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+73.000	1001+51.000	for segment #3 (1000+73.000 to 1001+51.000), The ramp type for Ramp Alignment RGPSBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1001+51.000	1001+56.000	for segment #4 (1001+51.000 to 1001+56.000), The ramp type for Ramp Alignment RGPSBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1001+56.000	1002+51.000	for segment #5 (1001+56.000 to 1002+51.000), The ramp type for Ramp Alignment RGPSBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+51.000	1003+20.000	for segment #6 (1002+51.000 to 1003+20.000), The ramp type for Ramp Alignment RGPSBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+20.000	1003+51.000	for segment #7 (1003+20.000 to 1003+51.000), The ramp type for Ramp Alignment RGPSBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+51.000	1007+64.000	for segment #8 (1003+51.000 to 1007+64.000), The ramp type for Ramp Alignment RGPSBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1007+64.000	1008+90.000	for segment #9 (1007+64.000 to 1008+90.000), The ramp type for Ramp Alignment RGPSBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1008+90.000	1010+00.000	for segment #10 (1008+90.000 to 1010+00.000), The ramp type for Ramp Alignment RGPSBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1010+00.000	1010+15.000	for segment #11 (1010+00.000 to 1010+15.000), The ramp type for Ramp Alignment RGPSBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1010+15.000	1010+26.000	for segment #12 (1010+15.000 to 1010+26.000), The ramp type for Ramp Alignment RGPSBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1010+26.000	1010+77.000	for segment #13 (1010+26.000 to 1010+77.000), The ramp type for Ramp Alignment RGPSBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1010+77.000	1011+27.000	for segment #14 (1010+77.000 to 1011+27.000), The ramp type for Ramp Alignment RGPSBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1011+27.000	1011+41.000	for segment #15 (1011+27.000 to 1011+41.000), The ramp type for Ramp Alignment RGPSBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1011+41.000	1011+78.000	for segment #16 (1011+41.000 to 1011+78.000), The ramp type for Ramp Alignment RGPSBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1011+78.000	1012+02.965	for segment #17 (1011+78.000 to 1012+02.965), The ramp type for Ramp Alignment RGPSBNOLF0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:40 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:40:25 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBX710
Highway Comment: Imported from RGPSBX710.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:40:14 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1018+34.388
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1018+34.388
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

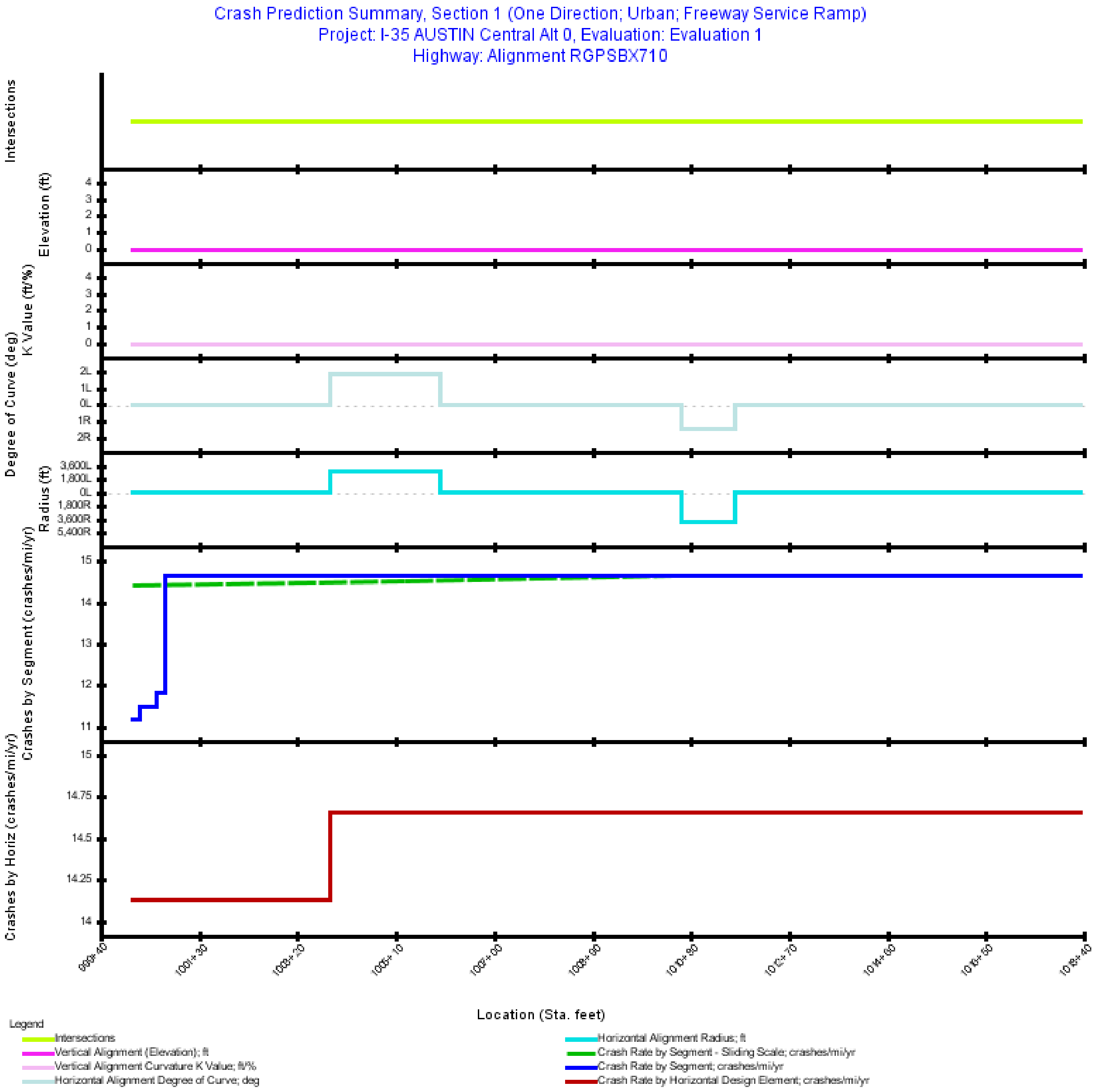

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1000+00.000	1000+16.000	16.00	0.0030	2030: 34,450
2	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1000+16.000	1000+48.000	32.00	0.0061	2030: 34,450
3	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1000+48.000	1000+64.000	16.00	0.0030	2030: 34,450
4	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1000+64.000	1018+34.388	1,770.39	0.3353	2030: 34,450

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.3474**
Average Future Road AADT (vpd)	**34,450**
Predicted Crashes	
Total Crashes	**5.05**
Fatal and Injury Crashes	**2.18**
Property-Damage-Only Crashes	**2.87**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**43**
Percent Property-Damage-Only Crashes (%)	**57**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**14.5464**
FI Crash Rate (crashes/mi/yr)	**6.2852**
PDO Crash Rate (crashes/mi/yr)	**8.2613**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**4.37**
Travel Crash Rate (crashes/million veh-mi)	**1.16**
Travel FI Crash Rate (crashes/million veh-mi)	**0.50**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.66**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+16.000	0.0030	0.034	0.0339	0.0141	0.0198	11.1842	0.89
2	1000+16.000	1000+48.000	0.0061	0.070	0.0697	0.0294	0.0403	11.5044	0.92
3	1000+48.000	1000+64.000	0.0030	0.036	0.0359	0.0153	0.0206	11.8349	0.94
4	1000+64.000	1018+34.388	0.3353	4.914	4.9143	2.1248	2.7895	14.6563	1.17
Total			0.3474	5.054	5.0538	2.1836	2.8701	14.5464	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1003+83.869	0.0727	1.027	1.0274	0.4427	0.5847	14.1313	1.12
Simple Curve 1	1003+83.869	1005+94.392	0.0399	0.584	0.5844	0.2527	0.3317	14.6563	1.17
Tangent	1005+94.392	1010+61.791	0.0885	1.297	1.2974	0.5610	0.7364	14.6563	1.17
Simple Curve 2	1010+61.791	1011+65.800	0.0197	0.289	0.2887	0.1248	0.1639	14.6563	1.17
Tangent	1011+65.800	1018+34.388	0.1266	1.856	1.8559	0.8024	1.0534	14.6563	1.17

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.05	2.18	43.208	2.87	56.792
Total	5.05	2.18	43.208	2.87	56.792
Average	5.05	2.18	43.208	2.87	56.792

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0004	0.0011	0.0038	0.0089	0.0198
2	0.0008	0.0023	0.0079	0.0185	0.0403
3	0.0004	0.0012	0.0041	0.0096	0.0206
4	0.0484	0.1467	0.5176	1.4122	2.7895
Total	0.0499	0.1512	0.5334	1.4491	2.8701

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.1	0.04	0.9	0.05	1.0
Highway Segment	Collision with Fixed Object	1.18	23.4	1.43	28.2	2.61	51.6
Highway Segment	Collision with Other Object	0.08	1.7	0.28	5.5	0.36	7.1
Highway Segment	Other Single-vehicle Collision	0.34	6.7	0.21	4.2	0.55	11.0
Highway Segment	Collision with Parked Vehicle	0.03	0.5	0.03	0.6	0.06	1.1
Highway Segment	Total Single Vehicle Crashes	1.64	32.4	1.99	39.5	3.63	71.8
Highway Segment	Right-Angle Collision	0.02	0.3	0.02	0.3	0.03	0.6
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.01	0.1
Highway Segment	Other Multi-vehicle Collision	0.02	0.3	0.02	0.4	0.04	0.8
Highway Segment	Rear-end Collision	0.41	8.1	0.60	12.0	1.01	20.1
Highway Segment	Sideswipe, Same Direction Collision	0.10	2.0	0.23	4.6	0.33	6.6
Highway Segment	Total Multiple Vehicle Crashes	0.55	10.8	0.88	17.3	1.42	28.2
Highway Segment	Total Highway Segment Crashes	2.18	43.2	2.87	56.8	5.05	100.0
	Total Crashes	2.18	43.2	2.87	56.8	5.05	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+16.000	for segment #1 (1000+00.000 to 1000+16.000), The ramp type for Ramp Alignment RGPSBX710 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+16.000	1000+48.000	for segment #2 (1000+16.000 to 1000+48.000), The ramp type for Ramp Alignment RGPSBX710 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+48.000	1000+64.000	for segment #3 (1000+48.000 to 1000+64.000), The ramp type for Ramp Alignment RGPSBX710 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+64.000	1018+34.388	for segment #4 (1000+64.000 to 1018+34.388), The ramp type for Ramp Alignment RGPSBX710 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1000+16.000	for segment #1 (1000+00.000 to 1000+16.000), traffic volume (34,450 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2EX
1000+16.000	1000+48.000	for segment #2 (1000+16.000 to 1000+48.000), traffic volume (34,450 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2EX
1000+48.000	1000+64.000	for segment #3 (1000+48.000 to 1000+64.000), traffic volume (34,450 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2EX
1000+64.000	1018+34.388	for segment #4 (1000+64.000 to 1018+34.388), traffic volume (34,450 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2EX

I-35 No-Build Model Elevated Freeway Ramps

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:16 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:16:12 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RCDNBXAIR0
Highway Comment: Imported from RCDNBXAIR0.xml
Highway Version: 1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu May 27 13:16:02 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1005+10.748
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

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- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1005+10.748
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

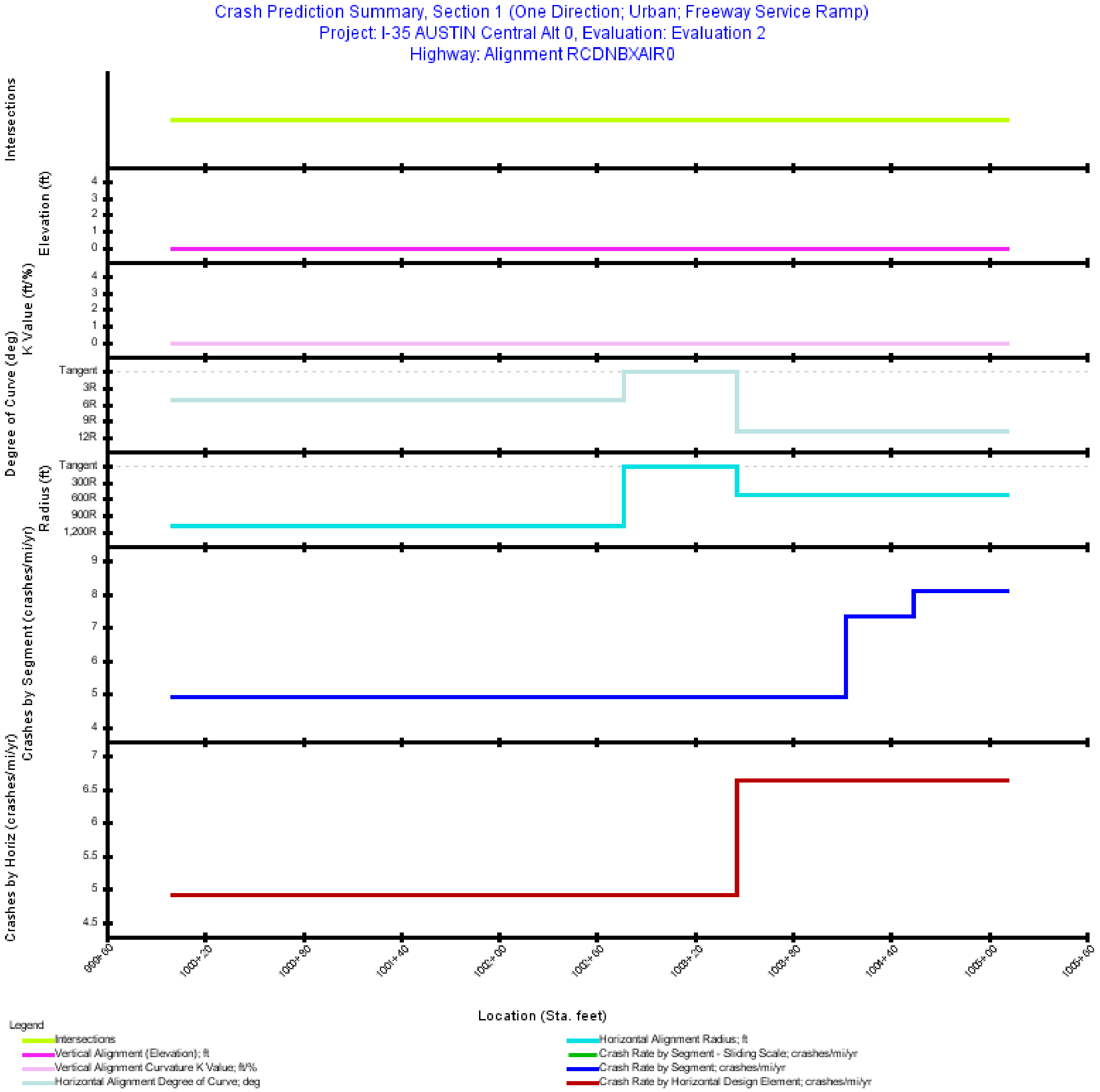

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1004+12.000	412.00	0.0780	2030: 8,000
2	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+12.000	1004+54.000	42.00	0.0080	2030: 8,000
3	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1004+54.000	1005+10.748	56.75	0.0107	2030: 8,000

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0967**
Average Future Road AADT (vpd)	**8,000**
Predicted Crashes	
Total Crashes	**0.53**
Fatal and Injury Crashes	**0.24**
Property-Damage-Only Crashes	**0.29**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**45**
Percent Property-Damage-Only Crashes (%)	**55**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.4736**
FI Crash Rate (crashes/mi/yr)	**2.4775**
PDO Crash Rate (crashes/mi/yr)	**2.9961**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.28**
Travel Crash Rate (crashes/million veh-mi)	**1.88**
Travel FI Crash Rate (crashes/million veh-mi)	**0.85**
Travel PDO Crash Rate (crashes/million veh-mi)	**1.03**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1004+12.000	0.0780	0.384	0.3842	0.1809	0.2033	4.9237	1.69
2	1004+12.000	1004+54.000	0.0080	0.058	0.0583	0.0286	0.0297	7.3263	2.51
3	1004+54.000	1005+10.748	0.0107	0.087	0.0870	0.0302	0.0568	8.0952	2.77
Total			0.0967	0.529	0.5295	0.2397	0.2898	5.4736	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1002+76.423	0.0524	0.258	0.2578	0.1214	0.1364	4.9237	1.69
Tangent	1002+76.423	1003+45.839	0.0131	0.065	0.0647	0.0305	0.0343	4.9237	1.69
Simple Curve 2	1003+45.839	1005+10.748	0.0312	0.207	0.2070	0.0878	0.1192	6.6269	2.27

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.53	0.24	45.263	0.29	54.737
Total	0.53	0.24	45.263	0.29	54.737
Average	0.53	0.24	45.263	0.29	54.737

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0045	0.0137	0.0593	0.1034	0.2033
2	0.0007	0.0021	0.0090	0.0169	0.0297
3	0.0007	0.0020	0.0071	0.0205	0.0568
Total	0.0058	0.0177	0.0753	0.1408	0.2898

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.1	0.01	1.3
Highway Segment	Collision with Fixed Object	0.17	31.6	0.19	36.3	0.36	68.0
Highway Segment	Collision with Other Object	0.01	2.2	0.04	7.1	0.05	9.3
Highway Segment	Other Single-vehicle Collision	0.05	9.1	0.03	5.4	0.08	14.5
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.8	0.01	1.5
Highway Segment	Total Single Vehicle Crashes	0.23	43.8	0.27	50.8	0.50	94.6
Highway Segment	Right-Angle Collision	0.00	0.0	0.00	0.1	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.0	0.00	0.1	0.00	0.1
Highway Segment	Rear-end Collision	0.01	1.1	0.01	2.7	0.02	3.8
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.3	0.01	1.1	0.01	1.3
Highway Segment	Total Multiple Vehicle Crashes	0.01	1.5	0.02	4.0	0.03	5.4
Highway Segment	Total Highway Segment Crashes	0.24	45.3	0.29	54.7	0.53	100.0
	Total Crashes	0.24	45.3	0.29	54.7	0.53	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1004+12.000	for segment #1 (1000+00.000 to 1004+12.000), The ramp type for Ramp Alignment RCDNBXAIR0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+12.000	1004+54.000	for segment #2 (1004+12.000 to 1004+54.000), The ramp type for Ramp Alignment RCDNBXAIR0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+12.000	1004+54.000	for segment #2 (1004+12.000 to 1004+54.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+12.000	1004+54.000	for segment #2 (1004+12.000 to 1004+54.000), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+54.000	1005+10.748	for segment #3 (1004+54.000 to 1005+10.748), The ramp type for Ramp Alignment RCDNBXAIR0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+54.000	1005+10.748	for segment #3 (1004+54.000 to 1005+10.748), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1004+54.000	1005+10.748	for segment #3 (1004+54.000 to 1005+10.748), Right shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

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Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:10:44 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RCDNBNMLK0
Highway Comment: Imported from RCDNBNMLK0.xml
Highway Version: 1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu May 27 13:10:34 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1006+59.799
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1006+59.799
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

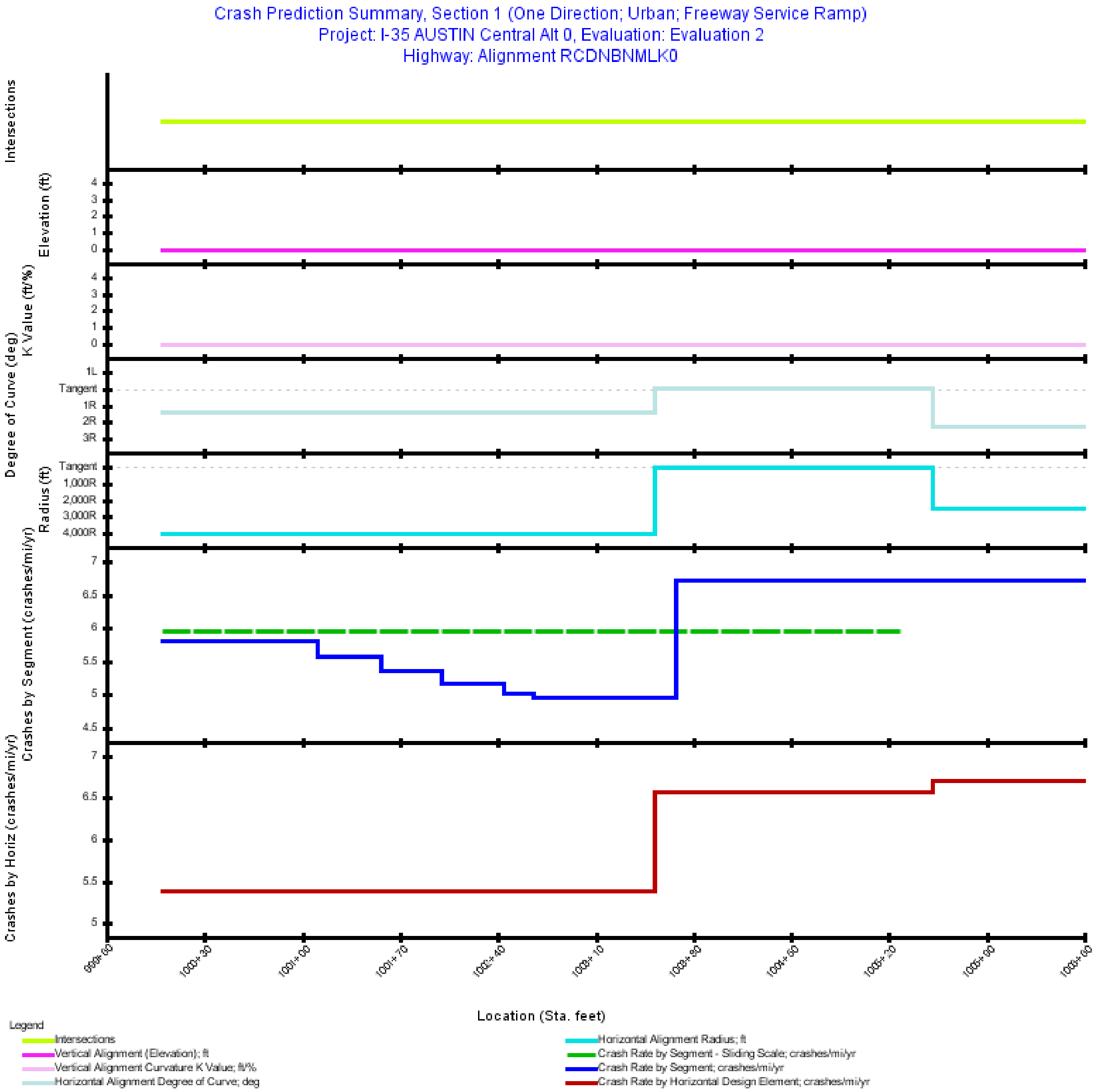

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1000+23.000	23.00	0.0044	2030: 15,550
2	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+23.000	1000+67.000	44.00	0.0083	2030: 15,550
3	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+67.000	1001+11.000	44.00	0.0083	2030: 15,550
4	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1001+11.000	1001+56.000	45.00	0.0085	2030: 15,550
5	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1001+56.000	1002+00.000	44.00	0.0083	2030: 15,550
6	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+00.000	1002+44.000	44.00	0.0083	2030: 15,550
7	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+44.000	1002+66.000	22.00	0.0042	2030: 15,550
8	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+66.000	1003+68.000	102.00	0.0193	2030: 15,550
9	Freeway Ramp and C-D Road Two-lane Ramp Entrance	Urban	1003+68.000	1006+59.799	291.80	0.0553	2030: 15,550

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1250**
Average Future Road AADT (vpd)	**15,550**
Predicted Crashes	
Total Crashes	**0.74**
Fatal and Injury Crashes	**0.28**
Property-Damage-Only Crashes	**0.46**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**38**
Percent Property-Damage-Only Crashes (%)	**62**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.9560**
FI Crash Rate (crashes/mi/yr)	**2.2555**
PDO Crash Rate (crashes/mi/yr)	**3.7005**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.71**
Travel Crash Rate (crashes/million veh-mi)	**1.05**
Travel FI Crash Rate (crashes/million veh-mi)	**0.40**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.65**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+23.000	0.0044	0.025	0.0253	0.0119	0.0133	5.8001	1.02
2	1000+23.000	1000+67.000	0.0083	0.048	0.0483	0.0228	0.0255	5.8001	1.02
3	1000+67.000	1001+11.000	0.0083	0.048	0.0483	0.0228	0.0255	5.7984	1.02
4	1001+11.000	1001+56.000	0.0085	0.048	0.0475	0.0221	0.0254	5.5757	0.98
5	1001+56.000	1002+00.000	0.0083	0.045	0.0447	0.0205	0.0242	5.3626	0.94
6	1002+00.000	1002+44.000	0.0083	0.043	0.0430	0.0194	0.0236	5.1609	0.91
7	1002+44.000	1002+66.000	0.0042	0.021	0.0209	0.0093	0.0116	5.0152	0.88
8	1002+66.000	1003+68.000	0.0193	0.096	0.0957	0.0425	0.0531	4.9515	0.87
9	1003+68.000	1006+59.799	0.0553	0.371	0.3706	0.1105	0.2601	6.7057	1.18
Total			0.1250	0.744	0.7443	0.2819	0.4624	5.9560	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1003+52.369	0.0667	0.359	0.3590	0.1649	0.1942	5.3798	0.95
Tangent	1003+52.369	1005+51.095	0.0376	0.247	0.2472	0.0758	0.1714	6.5678	1.16
Simple Curve 2	1005+51.095	1006+59.799	0.0206	0.138	0.1381	0.0412	0.0969	6.7057	1.18

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.74	0.28	37.870	0.46	62.130
Total	0.74	0.28	37.870	0.46	62.130
Average	0.74	0.28	37.870	0.46	62.130

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0002	0.0007	0.0044	0.0066	0.0133
2	0.0004	0.0013	0.0084	0.0127	0.0255
3	0.0004	0.0013	0.0084	0.0127	0.0255
4	0.0004	0.0012	0.0081	0.0123	0.0254
5	0.0004	0.0012	0.0075	0.0114	0.0242
6	0.0004	0.0011	0.0071	0.0108	0.0236
7	0.0002	0.0005	0.0034	0.0052	0.0116
8	0.0008	0.0024	0.0156	0.0237	0.0531
9	0.0019	0.0058	0.0308	0.0720	0.2601
Total	0.0051	0.0155	0.0938	0.1674	0.4624

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.8	0.01	0.9
Highway Segment	Collision with Fixed Object	0.14	18.8	0.19	25.3	0.33	44.1
Highway Segment	Collision with Other Object	0.01	1.3	0.04	4.9	0.05	6.2
Highway Segment	Other Single-vehicle Collision	0.04	5.4	0.03	3.8	0.07	9.2
Highway Segment	Collision with Parked Vehicle	0.00	0.4	0.00	0.6	0.01	1.0
Highway Segment	Total Single Vehicle Crashes	0.19	26.0	0.26	35.3	0.46	61.3
Highway Segment	Right-Angle Collision	0.00	0.4	0.00	0.5	0.01	0.8
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.1	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.4	0.01	0.6	0.01	1.0
Highway Segment	Rear-end Collision	0.07	8.9	0.14	18.5	0.20	27.4
Highway Segment	Sideswipe, Same Direction Collision	0.02	2.1	0.05	7.1	0.07	9.3
Highway Segment	Total Multiple Vehicle Crashes	0.09	11.8	0.20	26.8	0.29	38.7
Highway Segment	Total Highway Segment Crashes	0.28	37.9	0.46	62.1	0.74	100.0
	Total Crashes	0.28	37.9	0.46	62.1	0.74	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+23.000	for segment #1 (1000+00.000 to 1000+23.000), The ramp type for Ramp Alignment RCDNBNMLK0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1000+23.000	for segment #1 (1000+00.000 to 1000+23.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+00.000	1000+23.000	for segment #1 (1000+00.000 to 1000+23.000), Right shoulder width (0.26 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+23.000	1000+67.000	for segment #2 (1000+23.000 to 1000+67.000), The ramp type for Ramp Alignment RCDNBNMLK0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+23.000	1000+67.000	for segment #2 (1000+23.000 to 1000+67.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+23.000	1000+67.000	for segment #2 (1000+23.000 to 1000+67.000), Right shoulder width (1.02 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+67.000	1001+11.000	for segment #3 (1000+67.000 to 1001+11.000), The ramp type for Ramp Alignment RCDNBNMLK0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+67.000	1001+11.000	for segment #3 (1000+67.000 to 1001+11.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+11.000	1001+56.000	for segment #4 (1001+11.000 to 1001+56.000), The ramp type for Ramp Alignment RCDNBNMLK0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1001+11.000	1001+56.000	for segment #4 (1001+11.000 to 1001+56.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1001+56.000	1002+00.000	for segment #5 (1001+56.000 to 1002+00.000), The ramp type for Ramp Alignment RCDNBNMLK0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1001+56.000	1002+00.000	for segment #5 (1001+56.000 to 1002+00.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+00.000	1002+44.000	for segment #6 (1002+00.000 to 1002+44.000), The ramp type for Ramp Alignment RCDNBNMLK0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+00.000	1002+44.000	for segment #6 (1002+00.000 to 1002+44.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+44.000	1002+66.000	for segment #7 (1002+44.000 to 1002+66.000), The ramp type for Ramp Alignment RCDNBNMLK0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+44.000	1002+66.000	for segment #7 (1002+44.000 to 1002+66.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1002+66.000	1003+68.000	for segment #8 (1002+66.000 to 1003+68.000), The ramp type for Ramp Alignment RCDNBNMLK0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+66.000	1003+68.000	for segment #8 (1002+66.000 to 1003+68.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1003+68.000	1006+59.799	for segment #9 (1003+68.000 to 1006+59.799), The ramp type for Ramp Alignment RCDNBNMLK0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+68.000	1006+59.799	for segment #9 (1003+68.000 to 1006+59.799), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:17 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:16:54 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RCDSBNAIR0
Highway Comment: Imported from RCDSBNAIR0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:16:43 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1007+07.363
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1007+07.363
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

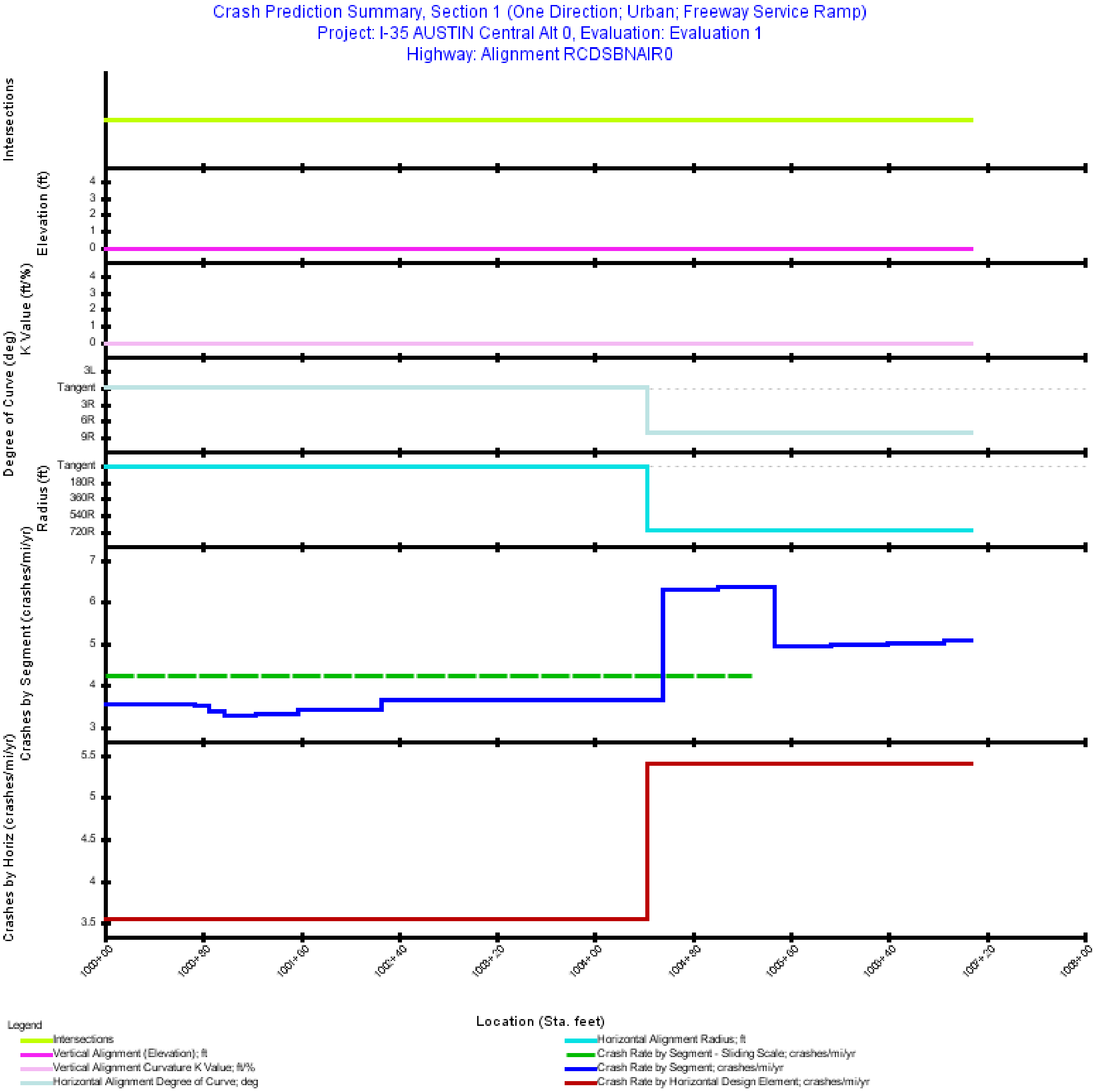

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1000+55.000	55.00	0.0104	2030: 8,700
2	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+55.000	1000+61.000	6.00	0.0011	2030: 8,700
3	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+61.000	1000+73.000	12.00	0.0023	2030: 8,700
4	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+73.000	1000+85.000	12.00	0.0023	2030: 8,700
5	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+85.000	1000+97.000	12.00	0.0023	2030: 8,700
6	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+97.000	1001+23.000	26.00	0.0049	2030: 8,700
7	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1001+23.000	1001+58.000	35.00	0.0066	2030: 8,700
8	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1001+58.000	1002+26.000	68.00	0.0129	2030: 8,700
9	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+26.000	1004+55.000	229.00	0.0434	2030: 8,700
10	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1004+55.000	1005+01.000	46.00	0.0087	2030: 8,700
11	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1005+01.000	1005+47.000	46.00	0.0087	2030: 8,700
12	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1005+47.000	1005+93.000	46.00	0.0087	2030: 8,700
13	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1005+93.000	1006+39.000	46.00	0.0087	2030: 8,700
14	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1006+39.000	1006+85.000	46.00	0.0087	2030: 8,700
15	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1006+85.000	1007+07.363	22.36	0.0042	2030: 8,700

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1340**
Average Future Road AADT (vpd)	**8,700**
Predicted Crashes	
Total Crashes	**0.57**
Fatal and Injury Crashes	**0.25**
Property-Damage-Only Crashes	**0.32**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**44**
Percent Property-Damage-Only Crashes (%)	**56**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**4.2400**
FI Crash Rate (crashes/mi/yr)	**1.8463**
PDO Crash Rate (crashes/mi/yr)	**2.3937**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.43**
Travel Crash Rate (crashes/million veh-mi)	**1.33**
Travel FI Crash Rate (crashes/million veh-mi)	**0.58**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.75**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+55.000	0.0104	0.037	0.0369	0.0162	0.0208	3.5454	1.12
2	1000+55.000	1000+61.000	0.0011	0.004	0.0040	0.0018	0.0023	3.5454	1.12
3	1000+61.000	1000+73.000	0.0023	0.008	0.0081	0.0035	0.0045	3.5454	1.12
4	1000+73.000	1000+85.000	0.0023	0.008	0.0080	0.0035	0.0045	3.5396	1.11
5	1000+85.000	1000+97.000	0.0023	0.008	0.0077	0.0033	0.0044	3.4047	1.07
6	1000+97.000	1001+23.000	0.0049	0.016	0.0162	0.0069	0.0093	3.2854	1.03
7	1001+23.000	1001+58.000	0.0066	0.022	0.0220	0.0094	0.0126	3.3180	1.04
8	1001+58.000	1002+26.000	0.0129	0.044	0.0440	0.0189	0.0250	3.4139	1.07
9	1002+26.000	1004+55.000	0.0434	0.159	0.1585	0.0689	0.0896	3.6546	1.15
10	1004+55.000	1005+01.000	0.0087	0.055	0.0550	0.0236	0.0314	6.3161	1.99
11	1005+01.000	1005+47.000	0.0087	0.056	0.0556	0.0242	0.0314	6.3790	2.01
12	1005+47.000	1005+93.000	0.0087	0.043	0.0433	0.0188	0.0244	4.9651	1.56
13	1005+93.000	1006+39.000	0.0087	0.043	0.0434	0.0191	0.0243	4.9820	1.57
14	1006+39.000	1006+85.000	0.0087	0.044	0.0438	0.0196	0.0243	5.0330	1.58
15	1006+85.000	1007+07.363	0.0042	0.021	0.0215	0.0097	0.0118	5.0716	1.60
Total			0.1340	0.568	0.5680	0.2474	0.3207	4.2400	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1004+42.914	0.0839	0.297	0.2971	0.1288	0.1683	3.5415	1.11
Simple Curve 1	1004+42.914	1007+07.363	0.0501	0.271	0.2710	0.1185	0.1524	5.4099	1.70

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.57	0.25	43.545	0.32	56.455
Total	0.57	0.25	43.545	0.32	56.455
Average	0.57	0.25	43.545	0.32	56.455

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0003	0.0008	0.0053	0.0099	0.0208
2	0.0000	0.0001	0.0006	0.0011	0.0023
3	0.0001	0.0002	0.0011	0.0022	0.0045
4	0.0001	0.0002	0.0011	0.0021	0.0045
5	0.0001	0.0002	0.0011	0.0020	0.0044
6	0.0001	0.0003	0.0022	0.0042	0.0093
7	0.0002	0.0005	0.0030	0.0057	0.0126
8	0.0003	0.0009	0.0062	0.0116	0.0250
9	0.0011	0.0033	0.0224	0.0421	0.0896
10	0.0004	0.0011	0.0077	0.0144	0.0314
11	0.0004	0.0012	0.0079	0.0147	0.0314
12	0.0003	0.0011	0.0069	0.0105	0.0244
13	0.0004	0.0011	0.0070	0.0106	0.0243
14	0.0004	0.0011	0.0072	0.0109	0.0243
15	0.0002	0.0005	0.0036	0.0054	0.0118
Total	0.0041	0.0125	0.0833	0.1474	0.3207

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.9	0.01	1.1
Highway Segment	Collision with Fixed Object	0.15	25.8	0.17	30.5	0.32	56.3
Highway Segment	Collision with Other Object	0.01	1.8	0.03	5.9	0.04	7.8
Highway Segment	Other Single-vehicle Collision	0.04	7.4	0.03	4.6	0.07	12.0
Highway Segment	Collision with Parked Vehicle	0.00	0.5	0.00	0.7	0.01	1.2
Highway Segment	Total Single Vehicle Crashes	0.20	35.7	0.24	42.7	0.45	78.4
Highway Segment	Right-Angle Collision	0.00	0.2	0.00	0.2	0.00	0.5
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.2	0.00	0.3	0.00	0.6
Highway Segment	Rear-end Collision	0.03	5.9	0.05	9.5	0.09	15.4
Highway Segment	Sideswipe, Same Direction Collision	0.01	1.4	0.02	3.7	0.03	5.1
Highway Segment	Total Multiple Vehicle Crashes	0.04	7.8	0.08	13.8	0.12	21.6
Highway Segment	Total Highway Segment Crashes	0.25	43.5	0.32	56.5	0.57	100.0
	Total Crashes	0.25	43.5	0.32	56.5	0.57	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+55.000	for segment #1 (1000+00.000 to 1000+55.000), The ramp type for Ramp Alignment RCDSBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1000+55.000	for segment #1 (1000+00.000 to 1000+55.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+55.000	1000+61.000	for segment #2 (1000+55.000 to 1000+61.000), The ramp type for Ramp Alignment RCDSBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+55.000	1000+61.000	for segment #2 (1000+55.000 to 1000+61.000), Left shoulder width (0.26 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+61.000	1000+73.000	for segment #3 (1000+61.000 to 1000+73.000), The ramp type for Ramp Alignment RCDSBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+61.000	1000+73.000	for segment #3 (1000+61.000 to 1000+73.000), Left shoulder width (1.02 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1000+73.000	1000+85.000	for segment #4 (1000+73.000 to 1000+85.000), The ramp type for Ramp Alignment RCDSBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+85.000	1000+97.000	for segment #5 (1000+85.000 to 1000+97.000), The ramp type for Ramp Alignment RCDSBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+97.000	1001+23.000	for segment #6 (1000+97.000 to 1001+23.000), The ramp type for Ramp Alignment RCDSBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1001+23.000	1001+58.000	for segment #7 (1001+23.000 to 1001+58.000), The ramp type for Ramp Alignment RCDSBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1001+58.000	1002+26.000	for segment #8 (1001+58.000 to 1002+26.000), The ramp type for Ramp Alignment RCDSBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+26.000	1004+55.000	for segment #9 (1002+26.000 to 1004+55.000), The ramp type for Ramp Alignment RCDSBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1004+55.000	1005+01.000	for segment #10 (1004+55.000 to 1005+01.000), The ramp type for Ramp Alignment RCDSBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1005+01.000	1005+47.000	for segment #11 (1005+01.000 to 1005+47.000), The ramp type for Ramp Alignment RCDSBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1005+47.000	1005+93.000	for segment #12 (1005+47.000 to 1005+93.000), The ramp type for Ramp Alignment RCDSBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1005+93.000	1006+39.000	for segment #13 (1005+93.000 to 1006+39.000), The ramp type for Ramp Alignment RCDSBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1006+39.000	1006+85.000	for segment #14 (1006+39.000 to 1006+85.000), The ramp type for Ramp Alignment RCDSBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1006+85.000	1007+07.363	for segment #15 (1006+85.000 to 1007+07.363), The ramp type for Ramp Alignment RCDSBNAIR0 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

May 27, 2021

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Report Overview

Report Generated: May 27, 2021 1:17 PM
Report Template: System: Single Page, 508 Compliant [System] (mlcpm5, Nov 11, 2020 4:35 PM)

Evaluation Date: Thu May 27 13:17:36 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 AUSTIN Central Alt 0
Project Comment: Created Fri May 14 16:42:30 CDT 2021
Project Unit System: U.S. Customary

Highway Title: Alignment RCDSBXMLK0
Highway Comment: Imported from RCDSBXMLK0.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu May 27 13:17:25 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1008+24.430
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1008+24.430
Functional Class: Freeway Service Ramp

Type of Alignment: One Direction

Model Category: Freeway Service Ramp

Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

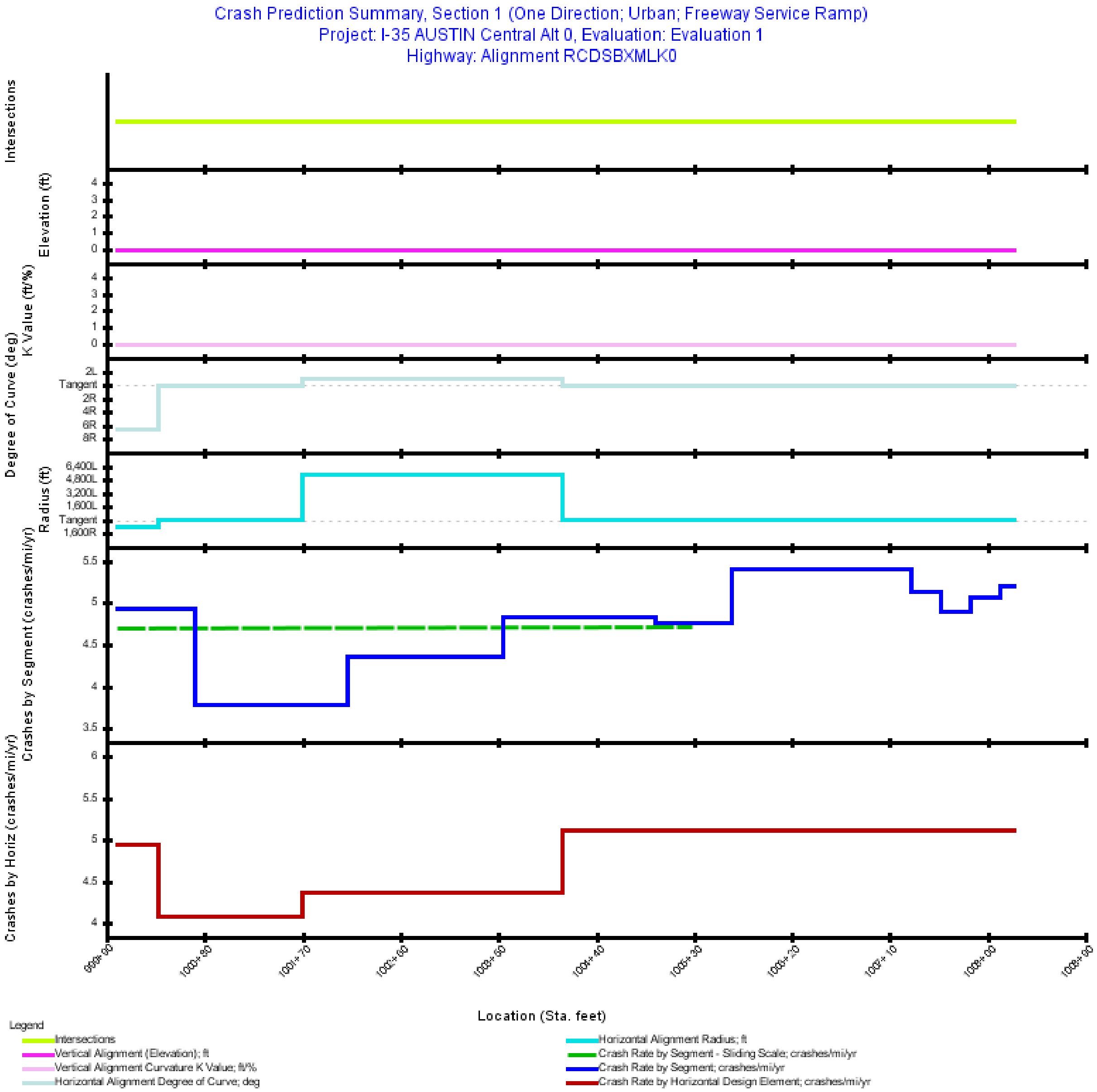

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1000+71.000	71.00	0.0134	2030: 12,450
2	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+71.000	1002+12.000	141.00	0.0267	2030: 12,450
3	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1002+12.000	1003+54.000	142.00	0.0269	2030: 12,450
4	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1003+54.000	1004+95.000	141.00	0.0267	2030: 12,450
5	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1004+95.000	1005+65.000	70.00	0.0133	2030: 12,450
6	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1005+65.000	1007+29.000	164.00	0.0311	2030: 12,450
7	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1007+29.000	1007+57.000	28.00	0.0053	2030: 12,450
8	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1007+57.000	1007+84.000	27.00	0.0051	2030: 12,450
9	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1007+84.000	1008+11.000	27.00	0.0051	2030: 12,450
10	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1008+11.000	1008+24.430	13.43	0.0025	2030: 12,450

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1561**
Average Future Road AADT (vpd)	**12,450**
Predicted Crashes	
Total Crashes	**0.74**
Fatal and Injury Crashes	**0.31**
Property-Damage-Only Crashes	**0.42**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**42**
Percent Property-Damage-Only Crashes (%)	**58**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**4.7145**
FI Crash Rate (crashes/mi/yr)	**1.9912**
PDO Crash Rate (crashes/mi/yr)	**2.7233**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.71**
Travel Crash Rate (crashes/million veh-mi)	**1.04**
Travel FI Crash Rate (crashes/million veh-mi)	**0.44**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.60**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+71.000	0.0134	0.066	0.0664	0.0312	0.0352	4.9381	1.09
2	1000+71.000	1002+12.000	0.0267	0.101	0.1007	0.0480	0.0528	3.7720	0.83
3	1002+12.000	1003+54.000	0.0269	0.117	0.1172	0.0555	0.0617	4.3576	0.96
4	1003+54.000	1004+95.000	0.0267	0.129	0.1290	0.0607	0.0684	4.8324	1.06
5	1004+95.000	1005+65.000	0.0133	0.063	0.0632	0.0295	0.0337	4.7664	1.05
6	1005+65.000	1007+29.000	0.0311	0.168	0.1680	0.0552	0.1129	5.4097	1.19
7	1007+29.000	1007+57.000	0.0053	0.027	0.0273	0.0090	0.0182	5.1411	1.13
8	1007+57.000	1007+84.000	0.0051	0.025	0.0251	0.0084	0.0166	4.9017	1.08
9	1007+84.000	1008+11.000	0.0051	0.026	0.0260	0.0089	0.0171	5.0759	1.12
10	1008+11.000	1008+24.430	0.0025	0.013	0.0133	0.0046	0.0087	5.2110	1.15
Total			0.1561	0.736	0.7361	0.3109	0.4252	4.7145	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1000+37.158	0.0070	0.035	0.0348	0.0163	0.0184	4.9381	1.09
Tangent	1000+37.158	1001+70.410	0.0252	0.103	0.1027	0.0487	0.0540	4.0682	0.89
Simple Curve 2	1001+70.410	1004+08.874	0.0452	0.197	0.1971	0.0932	0.1039	4.3647	0.96
Tangent	1004+08.874	1008+24.430	0.0787	0.402	0.4016	0.1527	0.2489	5.1025	1.12

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.74	0.31	42.235	0.42	57.765
Total	0.74	0.31	42.235	0.42	57.765
Average	0.74	0.31	42.235	0.42	57.765

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0009	0.0026	0.0110	0.0167	0.0352
2	0.0013	0.0040	0.0170	0.0257	0.0528
3	0.0014	0.0043	0.0185	0.0312	0.0617
4	0.0014	0.0044	0.0191	0.0358	0.0684
5	0.0007	0.0021	0.0093	0.0174	0.0337
6	0.0013	0.0039	0.0136	0.0365	0.1129
7	0.0002	0.0007	0.0023	0.0058	0.0182
8	0.0002	0.0007	0.0023	0.0053	0.0166
9	0.0002	0.0007	0.0024	0.0056	0.0171
10	0.0001	0.0004	0.0012	0.0029	0.0087
Total	0.0078	0.0236	0.0967	0.1829	0.4252

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.1	0.01	1.2
Highway Segment	Collision with Fixed Object	0.21	28.7	0.26	35.0	0.47	63.7
Highway Segment	Collision with Other Object	0.01	2.0	0.05	6.8	0.07	8.8
Highway Segment	Other Single-vehicle Collision	0.06	8.3	0.04	5.2	0.10	13.5
Highway Segment	Collision with Parked Vehicle	0.00	0.6	0.01	0.8	0.01	1.4
Highway Segment	Total Single Vehicle Crashes	0.29	39.8	0.36	48.8	0.65	88.6
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.2	0.00	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.2	0.00	0.3
Highway Segment	Rear-end Collision	0.01	1.8	0.04	6.2	0.06	8.0
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.4	0.02	2.4	0.02	2.8
Highway Segment	Total Multiple Vehicle Crashes	0.02	2.4	0.07	8.9	0.08	11.4
Highway Segment	Total Highway Segment Crashes	0.31	42.2	0.42	57.8	0.74	100.0
	Total Crashes	0.31	42.2	0.42	57.8	0.74	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+71.000	for segment #1 (1000+00.000 to 1000+71.000), The ramp type for Ramp Alignment RCDSBXMLK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+71.000	1002+12.000	for segment #2 (1000+71.000 to 1002+12.000), The ramp type for Ramp Alignment RCDSBXMLK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+12.000	1003+54.000	for segment #3 (1002+12.000 to 1003+54.000), The ramp type for Ramp Alignment RCDSBXMLK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1003+54.000	1004+95.000	for segment #4 (1003+54.000 to 1004+95.000), The ramp type for Ramp Alignment RCDSBXMLK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+95.000	1005+65.000	for segment #5 (1004+95.000 to 1005+65.000), The ramp type for Ramp Alignment RCDSBXMLK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+65.000	1007+29.000	for segment #6 (1005+65.000 to 1007+29.000), The ramp type for Ramp Alignment RCDSBXMLK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+65.000	1007+29.000	for segment #6 (1005+65.000 to 1007+29.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1007+29.000	1007+57.000	for segment #7 (1007+29.000 to 1007+57.000), The ramp type for Ramp Alignment RCDSBXMLK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1007+29.000	1007+57.000	for segment #7 (1007+29.000 to 1007+57.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1007+57.000	1007+84.000	for segment #8 (1007+57.000 to 1007+84.000), The ramp type for Ramp Alignment RCDSBXMLK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1007+57.000	1007+84.000	for segment #8 (1007+57.000 to 1007+84.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1007+84.000	1008+11.000	for segment #9 (1007+84.000 to 1008+11.000), The ramp type for Ramp Alignment RCDSBXMLK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1007+84.000	1008+11.000	for segment #9 (1007+84.000 to 1008+11.000), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1008+11.000	1008+24.430	for segment #10 (1008+11.000 to 1008+24.430), The ramp type for Ramp Alignment RCDSBXMLK0 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1008+11.000	1008+24.430	for segment #10 (1008+11.000 to 1008+24.430), Left shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

I-35 No-Build Model Frontage Road Intersections

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

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Evaluation Date: Thu Jul 22 15:21:47 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: 51st Street @ Cameron Road
Intersection Comment: Created Mon Mar 01 15:42:16 CST 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jul 22 15:21:33 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1010+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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Section Types

51st Street @ Cameron Road Evaluation

Intersection: 51st Street @ Cameron Road
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1010+00.000
Calibration Factor: 3SG=1.0;

Table 1. Evaluation Intersection (51st Street @ Cameron Road)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	51st Street @ Cameron Road (v1)	Urban/Suburban Arterial Intersection Three-Legged Signalized	1009+00.000	2030: 38,000	2030: 26,400	3	Signalized	2	2	0	0	true	false	false	3	0	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (51st Street @ Cameron Road)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**6.66**
Fatal and Injury Crashes	**1.95**
Property-Damage-Only Crashes	**4.71**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**29**
Percent Property-Damage-Only Crashes (%)	**71**

Table 3. Predicted Crash Frequencies by Year (51st Street @ Cameron Road)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	6.66	1.95	29.338	4.71	70.662
Total	6.66	1.95	29.338	4.71	70.662
Average	6.66	1.95	29.338	4.71	70.662

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (51st Street @ Cameron Road)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Collision with Animal	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Bicycle	0.07	1.1	0.00	0.0	0.07	1.1
Intersection	Collision with Fixed Object	0.08	1.3	0.24	3.6	0.33	4.9
Intersection	Non-Collision	0.03	0.4	0.00	0.1	0.03	0.5
Intersection	Collision with Other Object	0.01	0.2	0.02	0.3	0.03	0.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.01	0.1	0.01	0.2
Intersection	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Total Intersection Single Vehicle Crashes	0.20	3.0	0.27	4.1	0.47	7.1
Intersection	Angle Collision	0.49	7.4	0.91	13.6	1.40	21.0
Intersection	Head-on Collision	0.07	1.0	0.09	1.3	0.15	2.3
Intersection	Other Multi-vehicle Collision	0.10	1.5	0.88	13.2	0.98	14.7
Intersection	Rear-end Collision	0.96	14.4	2.42	36.4	3.38	50.8
Intersection	Sideswipe	0.13	2.0	0.14	2.1	0.28	4.1
Intersection	Total Intersection Multiple Vehicle Crashes	1.75	26.3	4.44	66.6	6.19	92.9
Intersection	Total Intersection Crashes	1.95	29.3	4.71	70.7	6.66	100.0
	Total Crashes	1.95	29.3	4.71	70.7	6.66	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1009+00.000	1009+00.000	for intersection #1 (1009+00.000 to 1009+00.000), minor road traffic volume (26,400 vpd) for 2030 is not within the model limit (16,400 vpd) for reliable results for intersection type 3SG

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Evaluation Date: Thu Jul 22 15:24:14 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Airport Blvd EAST
Intersection Comment: Created Tue Jun 29 09:20:12 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:24:02 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1007+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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Section Types

I-35 & Airport Blvd EAST Evaluation

Intersection: I-35 & Airport Blvd EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1007+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Airport Blvd EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Airport Blvd EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1006+00.000	2030: 48,700	2030: 26,650	4	Signalized	2	1	2	0	true	false	true	3	0	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Airport Blvd EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**12.28**
Fatal and Injury Crashes	**4.40**
Property-Damage-Only Crashes	**7.88**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**36**
Percent Property-Damage-Only Crashes (%)	**64**

Table 3. Predicted Crash Frequencies by Year (I-35 & Airport Blvd EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	12.28	4.40	35.830	7.88	64.170
Total	12.28	4.40	35.830	7.88	64.170
Average	12.28	4.40	35.830	7.88	64.170

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Airport Blvd EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Collision with Animal	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Bicycle	0.18	1.5	0.00	0.0	0.18	1.5
Intersection	Collision with Fixed Object	0.09	0.7	0.38	3.1	0.47	3.9
Intersection	Non-Collision	0.02	0.1	0.01	0.1	0.03	0.3
Intersection	Collision with Other Object	0.01	0.1	0.03	0.3	0.04	0.3
Intersection	Other Single-vehicle Collision	0.01	0.0	0.01	0.1	0.01	0.1
Intersection	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Total Intersection Single Vehicle Crashes	0.30	2.5	0.44	3.6	0.74	6.1
Intersection	Angle Collision	1.42	11.6	1.81	14.8	3.24	26.4
Intersection	Head-on Collision	0.20	1.6	0.22	1.8	0.42	3.5
Intersection	Other Multi-vehicle Collision	0.23	1.8	1.57	12.8	1.79	14.6
Intersection	Rear-end Collision	1.84	15.0	3.59	29.3	5.44	44.3
Intersection	Sideswipe	0.41	3.3	0.24	1.9	0.64	5.2
Intersection	Total Intersection Multiple Vehicle Crashes	4.10	33.4	7.44	60.6	11.54	93.9
Intersection	Total Intersection Crashes	4.40	35.8	7.88	64.2	12.28	100.0
	Total Crashes	4.40	35.8	7.88	64.2	12.28	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:37:44 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 38 1/2 St EAST
Intersection Comment: Created Tue Jun 29 09:47:45 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:37:35 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & 38 1/2 St EAST Evaluation

Intersection: I-35 & 38 1/2 St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 38 1/2 St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 38 1/2 St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 14,500	2030: 12,600	4	Signalized	1	0	2	0	true	false	false	3	1	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 38 1/2 St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**4.38**
Fatal and Injury Crashes	**0.93**
Property-Damage-Only Crashes	**3.46**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**21**
Percent Property-Damage-Only Crashes (%)	**79**

Table 3. Predicted Crash Frequencies by Year (I-35 & 38 1/2 St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.38	0.93	21.176	3.46	78.824
Total	4.38	0.93	21.176	3.46	78.824
Average	4.38	0.93	21.176	3.46	78.824

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 38 1/2 St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.73	16.7	2.53	57.8	3.27	74.5
Intersection	Collision with Bicycle	0.05	1.2	0.00	0.0	0.05	1.2
Intersection	Head-on Collision	0.03	0.8	0.10	2.4	0.14	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.6	0.04	0.9	0.07	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.07	1.7	0.08	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.6	0.20	4.7	0.23	5.2
Intersection	Sideswipe	0.05	1.2	0.50	11.4	0.55	12.6
Intersection	Total Intersection Total Vehicle Crashes	0.93	21.2	3.46	78.8	4.39	100.0
Intersection	Total Intersection Crashes	0.93	21.2	3.46	78.8	4.39	100.0
	Total Crashes	0.93	21.2	3.46	78.8	4.39	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Generated: Aug 24, 2022 3:23 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:38:13 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 32nd St EAST
Intersection Comment: Created Tue Jun 29 09:59:14 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:38:04 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

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- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

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Section Types

I-35 & 32nd St EAST Evaluation

Intersection: I-35 & 32nd St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 3SG=1.0;

Table 1. Evaluation Intersection (I-35 & 32nd St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 32nd St EAST (v1)	Urban/Suburban Arterial Intersection Three-Legged Signalized	1001+00.000	2030: 22,750	2030: 6,250	3	Signalized	2	0	3	0	true	false	false	0	0	3

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 32nd St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**2.61**
Fatal and Injury Crashes	**0.59**
Property-Damage-Only Crashes	**2.02**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**23**
Percent Property-Damage-Only Crashes (%)	**77**

Table 3. Predicted Crash Frequencies by Year (I-35 & 32nd St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.61	0.59	22.633	2.02	77.367
Total	2.61	0.59	22.633	2.02	77.367
Average	2.61	0.59	22.633	2.02	77.367

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 32nd St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.49	18.7	1.15	44.2	1.64	62.9
Intersection	Collision with Bicycle	0.04	1.6	0.00	0.0	0.04	1.6
Intersection	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Other Multi-vehicle Collision	0.00	0.0	0.14	5.5	0.14	5.5
Intersection	Other Single-vehicle Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.06	2.3	0.29	11.1	0.35	13.4
Intersection	Sideswipe	0.00	0.0	0.43	16.6	0.43	16.6
Intersection	Total Intersection Total Vehicle Crashes	0.59	22.6	2.02	77.3	2.61	100.0
Intersection	Total Intersection Crashes	0.59	22.6	2.02	77.3	2.61	100.0
	Total Crashes	0.59	22.6	2.02	77.3	2.61	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Evaluation Date: Thu Jul 22 15:38:48 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Manor Rd EAST
Intersection Comment: Created Tue Jun 29 10:10:06 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:38:36 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & Manor Rd EAST Evaluation

Intersection: I-35 & Manor Rd EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Manor Rd EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Manor Rd EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 13,000	2030: 9,300	4	Signalized	2	1	2	0	true	false	true	5	0	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Manor Rd EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**3.70**
Fatal and Injury Crashes	**0.79**
Property-Damage-Only Crashes	**2.90**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**21**
Percent Property-Damage-Only Crashes (%)	**79**

Table 3. Predicted Crash Frequencies by Year (I-35 & Manor Rd EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	3.70	0.79	21.478	2.90	78.522
Total	3.70	0.79	21.478	2.90	78.522
Average	3.70	0.79	21.478	2.90	78.522

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Manor Rd EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.63	17.0	2.13	57.5	2.76	74.5
Intersection	Collision with Bicycle	0.04	1.2	0.00	0.0	0.04	1.2
Intersection	Head-on Collision	0.03	0.8	0.09	2.4	0.12	3.1
Intersection	Other Multi-vehicle Collision	0.02	0.6	0.04	0.9	0.06	1.6
Intersection	Other Single-vehicle Collision	0.01	0.1	0.06	1.6	0.07	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.02	0.6	0.17	4.6	0.19	5.2
Intersection	Sideswipe	0.04	1.2	0.42	11.4	0.47	12.6
Intersection	Total Intersection Total Vehicle Crashes	0.80	21.5	2.90	78.5	3.70	100.0
Intersection	Total Intersection Crashes	0.80	21.5	2.90	78.5	3.70	100.0
	Total Crashes	0.80	21.5	2.90	78.5	3.70	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:39:16 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & MLK Jr Blvd EAST
Intersection Comment: Created Tue Jun 29 10:24:34 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:39:07 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1006+50.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & MLK Jr Blvd EAST Evaluation

Intersection: I-35 & MLK Jr Blvd EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1006+50.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & MLK Jr Blvd EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & MLK Jr Blvd EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1005+50.000	2030: 16,400	2030: 22,750	4	Signalized	2	1	2	0	true	false	true	4	0	6

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & MLK Jr Blvd EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**7.93**
Fatal and Injury Crashes	**1.66**
Property-Damage-Only Crashes	**6.28**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**21**
Percent Property-Damage-Only Crashes (%)	**79**

Table 3. Predicted Crash Frequencies by Year (I-35 & MLK Jr Blvd EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	7.93	1.66	20.879	6.28	79.121
Total	7.93	1.66	20.879	6.28	79.121
Average	7.93	1.66	20.879	6.28	79.121

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & MLK Jr Blvd EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.31	16.5	4.60	58.0	5.91	74.5
Intersection	Collision with Bicycle	0.09	1.2	0.00	0.0	0.09	1.2
Intersection	Head-on Collision	0.06	0.8	0.19	2.4	0.25	3.1
Intersection	Other Multi-vehicle Collision	0.05	0.6	0.07	0.9	0.12	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.13	1.7	0.14	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.05	0.6	0.37	4.7	0.42	5.3
Intersection	Sideswipe	0.09	1.2	0.91	11.5	1.00	12.6
Intersection	Total Intersection Total Vehicle Crashes	1.66	20.9	6.28	79.1	7.93	100.0
Intersection	Total Intersection Crashes	1.66	20.9	6.28	79.1	7.93	100.0
	Total Crashes	1.66	20.9	6.28	79.1	7.93	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Generated: Aug 24, 2022 3:26 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:39:43 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 15th St EAST
Intersection Comment: Created Tue Jun 29 10:37:20 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:39:34 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

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Section Types

I-35 & 15th St EAST Evaluation

Intersection: I-35 & 15th St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 3SG=1.0;

Table 1. Evaluation Intersection (I-35 & 15th St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 15th St EAST (v1)	Urban/Suburban Arterial Intersection Three-Legged Signalized	1001+00.000	2030: 17,650	2030: 15,150	3	Signalized	2	0	3	0	true	false	true	1	0	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 15th St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**4.11**
Fatal and Injury Crashes	**1.04**
Property-Damage-Only Crashes	**3.07**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**25**
Percent Property-Damage-Only Crashes (%)	**75**

Table 3. Predicted Crash Frequencies by Year (I-35 & 15th St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.11	1.04	25.412	3.07	74.588
Total	4.11	1.04	25.412	3.07	74.588
Average	4.11	1.04	25.412	3.07	74.588

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 15th St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.87	21.2	1.75	42.6	2.62	63.8
Intersection	Collision with Bicycle	0.07	1.6	0.00	0.0	0.07	1.6
Intersection	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Other Multi-vehicle Collision	0.00	0.0	0.22	5.3	0.22	5.3
Intersection	Other Single-vehicle Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.11	2.6	0.44	10.7	0.55	13.3
Intersection	Sideswipe	0.00	0.0	0.66	16.0	0.66	16.0
Intersection	Total Intersection Total Vehicle Crashes	1.04	25.4	3.06	74.6	4.11	100.0
Intersection	Total Intersection Crashes	1.04	25.4	3.06	74.6	4.11	100.0
	Total Crashes	1.04	25.4	3.06	74.6	4.11	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Evaluation Date: Thu Jul 22 15:40:09 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 12th St EAST
Intersection Comment: Created Tue Jun 29 10:43:54 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:40:00 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & 12th St EAST Evaluation

Intersection: I-35 & 12th St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 12th St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 12th St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 19,700	2030: 11,150	4	Signalized	2	0	2	0	true	false	false	5	0	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 12th St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**4.66**
Fatal and Injury Crashes	**0.94**
Property-Damage-Only Crashes	**3.72**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & 12th St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.66	0.94	20.198	3.72	79.802
Total	4.66	0.94	20.198	3.72	79.802
Average	4.66	0.94	20.198	3.72	79.802

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 12th St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.74	15.9	2.73	58.5	3.47	74.4
Intersection	Collision with Bicycle	0.06	1.2	0.00	0.0	0.06	1.2
Intersection	Head-on Collision	0.04	0.7	0.11	2.4	0.15	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.6	0.04	1.0	0.07	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.08	1.7	0.08	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.6	0.22	4.7	0.25	5.3
Intersection	Sideswipe	0.05	1.1	0.54	11.6	0.59	12.7
Intersection	Total Intersection Total Vehicle Crashes	0.94	20.2	3.72	79.8	4.66	100.0
Intersection	Total Intersection Crashes	0.94	20.2	3.72	79.8	4.66	100.0
	Total Crashes	0.94	20.2	3.72	79.8	4.66	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:40:39 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 11th St EAST
Intersection Comment: Created Tue Jun 29 10:51:52 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:40:30 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & 11th St EAST Evaluation

Intersection: I-35 & 11th St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 11th St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 11th St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 19,700	2030: 15,850	4	Signalized	2	0	2	0	true	false	false	6	1	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 11th St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**5.52**
Fatal and Injury Crashes	**1.12**
Property-Damage-Only Crashes	**4.40**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & 11th St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.52	1.12	20.252	4.40	79.748
Total	5.52	1.12	20.252	4.40	79.748
Average	5.52	1.12	20.252	4.40	79.748

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 11th St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.88	16.0	3.23	58.4	4.11	74.4
Intersection	Collision with Bicycle	0.07	1.2	0.00	0.0	0.07	1.2
Intersection	Head-on Collision	0.04	0.7	0.13	2.4	0.17	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.6	0.05	1.0	0.08	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.09	1.7	0.10	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.6	0.26	4.7	0.29	5.3
Intersection	Sideswipe	0.06	1.1	0.64	11.6	0.70	12.7
Intersection	Total Intersection Total Vehicle Crashes	1.12	20.3	4.40	79.7	5.52	100.0
Intersection	Total Intersection Crashes	1.12	20.3	4.40	79.7	5.52	100.0
	Total Crashes	1.12	20.3	4.40	79.7	5.52	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Generated: Aug 24, 2022 3:28 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:41:04 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 8th St EAST
Intersection Comment: Created Tue Jun 29 11:01:56 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:40:56 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

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Section Types

I-35 & 8th St EAST Evaluation

Intersection: I-35 & 8th St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 8th St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 8th St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 37,750	2030: 6,300	4	Signalized	1	0	2	20	true	false	false	3	9	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 8th St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**4.63**
Fatal and Injury Crashes	**0.92**
Property-Damage-Only Crashes	**3.71**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & 8th St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.63	0.92	19.897	3.71	80.103
Total	4.63	0.92	19.897	3.71	80.103
Average	4.63	0.92	19.897	3.71	80.103

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 8th St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.65	13.9	2.72	58.7	3.37	72.6
Intersection	Collision with Bicycle	0.05	1.2	0.00	0.0	0.05	1.2
Intersection	Head-on Collision	0.03	0.7	0.11	2.4	0.14	3.1
Intersection	Other Multi-vehicle Collision	0.02	0.5	0.04	1.0	0.07	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.08	1.7	0.08	1.8
Intersection	Collision with Pedestrian	0.10	2.1	0.00	0.0	0.10	2.1
Intersection	Rear-end Collision	0.02	0.5	0.22	4.7	0.24	5.2
Intersection	Sideswipe	0.05	1.0	0.54	11.6	0.58	12.6
Intersection	Total Intersection Total Vehicle Crashes	0.92	19.9	3.71	80.1	4.63	100.0
Intersection	Total Intersection Crashes	0.92	19.9	3.71	80.1	4.63	100.0
	Total Crashes	0.92	19.9	3.71	80.1	4.63	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

Report Generated: Aug 24, 2022 3:29 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:45:09 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 7th St EAST
Intersection Comment: Created Tue Jun 29 13:04:21 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:45:00 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & 7th St EAST Evaluation

Intersection: I-35 & 7th St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 7th St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 7th St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 37,750	2030: 15,800	4	Signalized	1	1	2	20	true	false	true	3	11	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 7th St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**8.90**
Fatal and Injury Crashes	**1.78**
Property-Damage-Only Crashes	**7.12**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & 7th St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	8.90	1.78	19.964	7.12	80.036
Total	8.90	1.78	19.964	7.12	80.036
Average	8.90	1.78	19.964	7.12	80.036

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 7th St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.25	14.1	5.22	58.7	6.47	72.7
Intersection	Collision with Bicycle	0.10	1.2	0.00	0.0	0.10	1.2
Intersection	Head-on Collision	0.06	0.7	0.21	2.4	0.27	3.1
Intersection	Other Multi-vehicle Collision	0.04	0.5	0.09	1.0	0.13	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.15	1.7	0.16	1.8
Intersection	Collision with Pedestrian	0.18	2.0	0.00	0.0	0.18	2.0
Intersection	Rear-end Collision	0.04	0.5	0.42	4.7	0.47	5.2
Intersection	Sideswipe	0.09	1.0	1.03	11.6	1.12	12.6
Intersection	Total Intersection Total Vehicle Crashes	1.78	20.0	7.12	80.0	8.90	100.0
Intersection	Total Intersection Crashes	1.78	20.0	7.12	80.0	8.90	100.0
	Total Crashes	1.78	20.0	7.12	80.0	8.90	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:52:25 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 6th St EAST
Intersection Comment: Created Tue Jun 29 11:45:41 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 3
Evaluation Comment: Created Thu Jul 22 15:52:17 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & 6th St EAST Evaluation

Intersection: I-35 & 6th St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 6th St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 6th St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 28,000	2030: 17,050	4	Signalized	2	0	2	20	true	false	true	3	11	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 6th St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**7.46**
Fatal and Injury Crashes	**1.58**
Property-Damage-Only Crashes	**5.88**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**21**
Percent Property-Damage-Only Crashes (%)	**79**

Table 3. Predicted Crash Frequencies by Year (I-35 & 6th St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	7.46	1.58	21.190	5.88	78.810
Total	7.46	1.58	21.190	5.88	78.810
Average	7.46	1.58	21.190	5.88	78.810

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 6th St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.10	14.7	4.31	57.8	5.40	72.5
Intersection	Collision with Bicycle	0.09	1.2	0.00	0.0	0.09	1.2
Intersection	Head-on Collision	0.05	0.7	0.18	2.4	0.23	3.0
Intersection	Other Multi-vehicle Collision	0.04	0.5	0.07	0.9	0.11	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.12	1.7	0.13	1.8
Intersection	Collision with Pedestrian	0.18	2.5	0.00	0.0	0.18	2.5
Intersection	Rear-end Collision	0.04	0.5	0.35	4.6	0.39	5.2
Intersection	Sideswipe	0.08	1.0	0.85	11.4	0.93	12.5
Intersection	Total Intersection Total Vehicle Crashes	1.58	21.2	5.88	78.8	7.46	100.0
Intersection	Total Intersection Crashes	1.58	21.2	5.88	78.8	7.46	100.0
	Total Crashes	1.58	21.2	5.88	78.8	7.46	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Generated: Aug 24, 2022 3:31 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:42:17 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Cesar Chavez St EAST
Intersection Comment: Created Tue Jun 29 12:05:44 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:42:07 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

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Section Types

I-35 & Cesar Chavez St EAST Evaluation

Intersection: I-35 & Cesar Chavez St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Cesar Chavez St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Cesar Chavez St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 25,950	2030: 24,850	4	Signalized	2	1	2	0	true	false	false	5	8	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Cesar Chavez St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**7.93**
Fatal and Injury Crashes	**1.54**
Property-Damage-Only Crashes	**6.38**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**19**
Percent Property-Damage-Only Crashes (%)	**81**

Table 3. Predicted Crash Frequencies by Year (I-35 & Cesar Chavez St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	7.93	1.54	19.485	6.38	80.515
Total	7.93	1.54	19.485	6.38	80.515
Average	7.93	1.54	19.485	6.38	80.515

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Cesar Chavez St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.21	15.3	4.68	59.0	5.89	74.3
Intersection	Collision with Bicycle	0.09	1.2	0.00	0.0	0.09	1.2
Intersection	Head-on Collision	0.06	0.7	0.19	2.4	0.25	3.1
Intersection	Other Multi-vehicle Collision	0.04	0.5	0.08	1.0	0.12	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.13	1.7	0.14	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.04	0.5	0.38	4.8	0.42	5.3
Intersection	Sideswipe	0.09	1.1	0.93	11.7	1.01	12.8
Intersection	Total Intersection Total Vehicle Crashes	1.55	19.5	6.38	80.5	7.93	100.0
Intersection	Total Intersection Crashes	1.55	19.5	6.38	80.5	7.93	100.0
	Total Crashes	1.55	19.5	6.38	80.5	7.93	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Evaluation Date: Thu Jul 22 15:42:51 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Holly St EAST
Intersection Comment: Created Tue Jun 29 12:15:36 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:42:43 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & Holly St EAST Evaluation

Intersection: I-35 & Holly St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Holly St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Holly St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 23,350	2030: 7,400	4	Signalized	1	1	2	0	true	false	true	3	11	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Holly St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**3.99**
Fatal and Injury Crashes	**0.78**
Property-Damage-Only Crashes	**3.20**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Holly St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	3.99	0.78	19.620	3.20	80.380
Total	3.99	0.78	19.620	3.20	80.380
Average	3.99	0.78	19.620	3.20	80.380

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Holly St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.61	15.4	2.35	58.9	2.96	74.3
Intersection	Collision with Bicycle	0.05	1.2	0.00	0.0	0.05	1.2
Intersection	Head-on Collision	0.03	0.7	0.10	2.4	0.12	3.1
Intersection	Other Multi-vehicle Collision	0.02	0.6	0.04	1.0	0.06	1.5
Intersection	Other Single-vehicle Collision	0.00	0.1	0.07	1.7	0.07	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.02	0.6	0.19	4.7	0.21	5.3
Intersection	Sideswipe	0.04	1.1	0.47	11.7	0.51	12.7
Intersection	Total Intersection Total Vehicle Crashes	0.78	19.6	3.20	80.4	3.99	100.0
Intersection	Total Intersection Crashes	0.78	19.6	3.20	80.4	3.99	100.0
	Total Crashes	0.78	19.6	3.20	80.4	3.99	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:43:23 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Riverside Dr EAST
Intersection Comment: Created Tue Jun 29 12:38:59 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:43:11 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1005+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & Riverside Dr EAST Evaluation

Intersection: I-35 & Riverside Dr EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1005+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Riverside Dr EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Riverside Dr EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1004+00.000	2030: 36,000	2030: 61,350	4	Signalized	2	0	2	0	true	false	false	2	0	6

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Riverside Dr EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**13.77**
Fatal and Injury Crashes	**2.57**
Property-Damage-Only Crashes	**11.20**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**19**
Percent Property-Damage-Only Crashes (%)	**81**

Table 3. Predicted Crash Frequencies by Year (I-35 & Riverside Dr EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	13.77	2.57	18.659	11.20	81.341
Total	13.77	2.57	18.659	11.20	81.341
Average	13.77	2.57	18.659	11.20	81.341

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Riverside Dr EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	2.01	14.6	8.21	59.6	10.22	74.2
Intersection	Collision with Bicycle	0.16	1.2	0.00	0.0	0.16	1.2
Intersection	Head-on Collision	0.09	0.7	0.34	2.4	0.43	3.1
Intersection	Other Multi-vehicle Collision	0.07	0.5	0.13	1.0	0.21	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.23	1.7	0.25	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.07	0.5	0.66	4.8	0.73	5.3
Intersection	Sideswipe	0.14	1.0	1.62	11.8	1.77	12.8
Intersection	Total Intersection Total Vehicle Crashes	2.57	18.7	11.20	81.3	13.77	100.0
Intersection	Total Intersection Crashes	2.57	18.7	11.20	81.3	13.77	100.0
	Total Crashes	2.57	18.7	11.20	81.3	13.77	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Generated: Aug 24, 2022 3:33 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Tue Jul 19 10:54:04 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Woodland Ave EAST
Intersection Comment: Created Tue Jun 29 12:46:07 CDT 2021
Intersection Version: v1

Evaluation Title: 2022 deflection
Evaluation Comment: Created Tue Jul 19 10:53:52 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & Woodland Ave EAST Evaluation

Intersection: I-35 & Woodland Ave EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Woodland Ave EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Woodland Ave EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 14,350	2030: 8,900	4	Signalized	2	1	2	0	true	false	false	0	0	3

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Woodland Ave EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**2.99**
Fatal and Injury Crashes	**0.63**
Property-Damage-Only Crashes	**2.36**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**21**
Percent Property-Damage-Only Crashes (%)	**79**

Table 3. Predicted Crash Frequencies by Year (I-35 & Woodland Ave EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.99	0.63	21.154	2.36	78.846
Total	2.99	0.63	21.154	2.36	78.846
Average	2.99	0.63	21.154	2.36	78.846

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Woodland Ave EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.50	16.7	1.73	57.8	2.23	74.5
Intersection	Collision with Bicycle	0.04	1.2	0.00	0.0	0.04	1.2
Intersection	Head-on Collision	0.02	0.8	0.07	2.4	0.09	3.1
Intersection	Other Multi-vehicle Collision	0.02	0.6	0.03	0.9	0.05	1.5
Intersection	Other Single-vehicle Collision	0.00	0.1	0.05	1.7	0.05	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.02	0.6	0.14	4.7	0.16	5.2
Intersection	Sideswipe	0.04	1.2	0.34	11.4	0.38	12.6
Intersection	Total Intersection Total Vehicle Crashes	0.63	21.2	2.36	78.8	2.99	100.0
Intersection	Total Intersection Crashes	0.63	21.2	2.36	78.8	2.99	100.0
	Total Crashes	0.63	21.2	2.36	78.8	2.99	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Generated: Aug 24, 2022 3:34 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:44:32 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Oltorf St EAST
Intersection Comment: Created Tue Jun 29 12:52:34 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:44:23 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1005+80.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & Oltorf St EAST Evaluation

Intersection: I-35 & Oltorf St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1005+80.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Oltorf St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Oltorf St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1004+80.000	2030: 23,950	2030: 31,450	4	Signalized	1	1	2	0	true	false	true	5	0	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Oltorf St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**7.61**
Fatal and Injury Crashes	**1.50**
Property-Damage-Only Crashes	**6.10**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Oltorf St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	7.61	1.50	19.761	6.10	80.239
Total	7.61	1.50	19.761	6.10	80.239
Average	7.61	1.50	19.761	6.10	80.239

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Oltorf St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.18	15.5	4.47	58.8	5.66	74.3
Intersection	Collision with Bicycle	0.09	1.2	0.00	0.0	0.09	1.2
Intersection	Head-on Collision	0.06	0.7	0.18	2.4	0.24	3.1
Intersection	Other Multi-vehicle Collision	0.04	0.6	0.07	1.0	0.12	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.13	1.7	0.14	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.04	0.6	0.36	4.7	0.40	5.3
Intersection	Sideswipe	0.08	1.1	0.89	11.6	0.97	12.7
Intersection	Total Intersection Total Vehicle Crashes	1.50	19.8	6.10	80.2	7.61	100.0
Intersection	Total Intersection Crashes	1.50	19.8	6.10	80.2	7.61	100.0
	Total Crashes	1.50	19.8	6.10	80.2	7.61	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Fri Jul 22 16:32:22 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Woodward St EAST
Intersection Comment: Created Tue Jun 29 13:01:03 CDT 2021
Intersection Version: v1

Evaluation Title: 20220722
Evaluation Comment: Created Fri Jul 22 16:32:06 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & Woodward St EAST Evaluation

Intersection: I-35 & Woodward St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Woodward St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Woodward St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 17,550	2030: 15,700	4	Signalized	2	0	2	0	true	false	false	0	0	7

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Woodward St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**5.82**
Fatal and Injury Crashes	**1.20**
Property-Damage-Only Crashes	**4.62**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**21**
Percent Property-Damage-Only Crashes (%)	**79**

Table 3. Predicted Crash Frequencies by Year (I-35 & Woodward St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.82	1.20	20.608	4.62	79.391
Total	5.82	1.20	20.608	4.62	79.391
Average	5.82	1.20	20.608	4.62	79.391

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Woodward St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.95	16.3	3.39	58.2	4.33	74.4
Intersection	Collision with Bicycle	0.07	1.2	0.00	0.0	0.07	1.2
Intersection	Head-on Collision	0.04	0.8	0.14	2.4	0.18	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.6	0.06	1.0	0.09	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.10	1.7	0.10	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.6	0.27	4.7	0.31	5.3
Intersection	Sideswipe	0.07	1.1	0.67	11.5	0.74	12.7
Intersection	Total Intersection Total Vehicle Crashes	1.20	20.6	4.62	79.4	5.82	100.0
Intersection	Total Intersection Crashes	1.20	20.6	4.62	79.4	5.82	100.0
	Total Crashes	1.20	20.6	4.62	79.4	5.82	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

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Evaluation Date: Thu Jul 22 15:45:21 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 51st Street
Intersection Comment: Created Wed Mar 03 10:40:11 CST 2021
Intersection Version: v1

Evaluation Title: Evaluation 5
Evaluation Comment: Created Thu Jul 22 15:45:13 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1010+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

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Section Types

I-35 & 51st Street Evaluation

Intersection: I-35 & 51st Street
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1010+00.000
Calibration Factor: USA 42R=1.0;

Table 1. Evaluation Roundabout - Site (I-35 & 51st Street)

Inter. No.	Title	Type	Area Type	Legs	Location (Sta. ft)	Entering AADT
1	I-35 & 51st Street (v1)	Roundabout 42R - Roundabout with 4 legs and two circulating lanes	Urban	4	1005+00.000	Leg 1: 2030: 20,300; Leg 2: 2030: 19,760; Leg 3: 2030: 0; Leg 4: 2030: 7,462

Table 2. Predicted Roundabout Crash Rates and Frequencies Summary (I-35 & 51st Street)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**16.36**
Fatal and Injury Crashes	**1.27**
Property-Damage-Only Crashes	**15.09**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**8**
Percent Property-Damage-Only Crashes (%)	**92**

Table 3. Predicted Crash Frequencies and Rates by Roundabout (I-35 & 51st Street)

Segment Number/Intersection Name/Cross Road	Location (Sta. ft)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Travel Crash Rate (crashes/million veh)
I-35 & 51st Street (v1)	1005+00.000	16.357	16.3565	1.2668	15.0896	0.95

Table 4. Predicted Crash Severity by Roundabout (I-35 & 51st Street)

Seg. No.	Type	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	Roundabout	0.0082	0.0814	0.3231	0.8542	15.0896

Table 5. Predicted Crash Frequencies by Year (I-35 & 51st Street)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	16.36	1.27	7.745	15.09	92.255
Total	16.36	1.27	7.745	15.09	92.255
Average	16.36	1.27	7.745	15.09	92.255

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Roundabout Crash Type Distribution (I-35 & 51st Street)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Collision with Animal	0.00	0.0	0.04	0.3	0.04	0.3
Intersection	Collision with Fixed Object	0.16	1.0	2.08	12.7	2.24	13.7
Intersection	Collision with Other Object	0.00	0.0	0.03	0.2	0.03	0.2
Intersection	Other Single-vehicle Collision	0.16	1.0	0.56	3.4	0.72	4.4
Intersection	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Total Single Vehicle Crashes	0.32	2.0	2.72	16.6	3.04	18.5
Intersection	Angle Collision	0.18	1.1	2.63	16.0	2.81	17.1
Intersection	Head-on Collision	0.01	0.1	0.07	0.5	0.09	0.5
Intersection	Other Multiple-vehicle Collision	0.19	1.2	3.00	18.3	3.19	19.5
Intersection	Rear-end Collision	0.34	2.1	2.69	16.4	3.02	18.5
Intersection	Sideswipe	0.22	1.4	4.00	24.4	4.22	25.8
Intersection	Total Multiple Vehicle Crashes	0.95	5.8	12.39	75.7	13.34	81.5
Intersection	Total Intersection Crashes	1.27	7.7	15.11	92.3	16.37	100.0
	Total Crashes	1.27	7.7	15.11	92.3	16.37	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 7. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1005+00.000	1005+00.000	for intersection #1 (1005+00.000 to 1005+00.000), minor road traffic volume (38,000 vpd) for 2030 is not within the model limit (19,371 vpd) for reliable results for intersection type 42R

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

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Report Overview

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Evaluation Date: Thu Jul 22 15:23:57 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Airport Blvd WEST
Intersection Comment: Created Mon Jun 28 14:07:32 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:21:53 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1007+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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Section Types

I-35 & Airport Blvd WEST Evaluation

Intersection: I-35 & Airport Blvd WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1007+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Airport Blvd WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Airport Blvd WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 48,700	2030: 23,300	4	Signalized	2	0	2	0	true	false	false	3	0	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Airport Blvd WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**12.40**
Fatal and Injury Crashes	**4.45**
Property-Damage-Only Crashes	**7.95**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**36**
Percent Property-Damage-Only Crashes (%)	**64**

Table 3. Predicted Crash Frequencies by Year (I-35 & Airport Blvd WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	12.40	4.45	35.887	7.95	64.113
Total	12.40	4.45	35.887	7.95	64.113
Average	12.40	4.45	35.887	7.95	64.113

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Airport Blvd WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Collision with Animal	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Bicycle	0.18	1.5	0.00	0.0	0.18	1.5
Intersection	Collision with Fixed Object	0.09	0.7	0.39	3.1	0.48	3.8
Intersection	Non-Collision	0.02	0.1	0.01	0.1	0.03	0.3
Intersection	Collision with Other Object	0.01	0.1	0.03	0.2	0.04	0.3
Intersection	Other Single-vehicle Collision	0.01	0.0	0.01	0.1	0.01	0.1
Intersection	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Total Intersection Single Vehicle Crashes	0.30	2.5	0.44	3.6	0.75	6.0
Intersection	Angle Collision	1.44	11.6	1.83	14.8	3.27	26.4
Intersection	Head-on Collision	0.20	1.6	0.23	1.8	0.43	3.5
Intersection	Other Multi-vehicle Collision	0.23	1.8	1.58	12.8	1.81	14.6
Intersection	Rear-end Collision	1.86	15.0	3.63	29.2	5.49	44.3
Intersection	Sideswipe	0.41	3.3	0.24	1.9	0.65	5.2
Intersection	Total Intersection Multiple Vehicle Crashes	4.14	33.4	7.51	60.5	11.65	94.0
Intersection	Total Intersection Crashes	4.45	35.9	7.95	64.1	12.40	100.0
	Total Crashes	4.45	35.9	7.95	64.1	12.40	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Evaluation Date: Thu Jul 22 15:37:31 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 38 1/2 St WEST
Intersection Comment: Created Tue Jun 29 09:42:04 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:37:20 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

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- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & 38 1/2 St WEST Evaluation

Intersection: I-35 & 38 1/2 St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 38 1/2 St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 38 1/2 St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 17,750	2030: 11,100	4	Signalized	1	0	2	0	true	false	false	3	1	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 38 1/2 St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**4.31**
Fatal and Injury Crashes	**0.89**
Property-Damage-Only Crashes	**3.43**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**21**
Percent Property-Damage-Only Crashes (%)	**79**

Table 3. Predicted Crash Frequencies by Year (I-35 & 38 1/2 St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.31	0.89	20.519	3.43	79.481
Total	4.31	0.89	20.519	3.43	79.481
Average	4.31	0.89	20.519	3.43	79.481

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 38 1/2 St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.70	16.2	2.51	58.2	3.21	74.4
Intersection	Collision with Bicycle	0.05	1.2	0.00	0.0	0.05	1.2
Intersection	Head-on Collision	0.03	0.8	0.10	2.4	0.14	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.6	0.04	1.0	0.07	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.07	1.7	0.08	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.6	0.20	4.7	0.23	5.3
Intersection	Sideswipe	0.05	1.1	0.50	11.5	0.55	12.7
Intersection	Total Intersection Total Vehicle Crashes	0.89	20.5	3.43	79.5	4.31	100.0
Intersection	Total Intersection Crashes	0.89	20.5	3.43	79.5	4.31	100.0
	Total Crashes	0.89	20.5	3.43	79.5	4.31	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Generated: Aug 24, 2022 3:22 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:37:59 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 32nd St WEST
Intersection Comment: Created Tue Jun 29 09:50:34 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:37:49 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & 32nd St WEST Evaluation

Intersection: I-35 & 32nd St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 32nd St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 32nd St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 22,900	2030: 10,500	4	Signalized	1	1	2	0	true	false	false	0	0	3

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 32nd St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**3.72**
Fatal and Injury Crashes	**0.73**
Property-Damage-Only Crashes	**2.99**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & 32nd St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	3.72	0.73	19.731	2.99	80.269
Total	3.72	0.73	19.731	2.99	80.269
Average	3.72	0.73	19.731	2.99	80.269

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 32nd St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.58	15.5	2.19	58.8	2.77	74.3
Intersection	Collision with Bicycle	0.04	1.2	0.00	0.0	0.04	1.2
Intersection	Head-on Collision	0.03	0.7	0.09	2.4	0.12	3.1
Intersection	Other Multi-vehicle Collision	0.02	0.6	0.04	1.0	0.06	1.5
Intersection	Other Single-vehicle Collision	0.00	0.1	0.06	1.7	0.07	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.02	0.6	0.18	4.7	0.20	5.3
Intersection	Sideswipe	0.04	1.1	0.43	11.6	0.47	12.7
Intersection	Total Intersection Total Vehicle Crashes	0.73	19.7	2.99	80.3	3.72	100.0
Intersection	Total Intersection Crashes	0.73	19.7	2.99	80.3	3.72	100.0
	Total Crashes	0.73	19.7	2.99	80.3	3.72	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

Report Generated: Aug 24, 2022 3:23 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:38:32 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Manor Rd WEST
Intersection Comment: Created Tue Jun 29 10:04:08 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:38:19 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & Manor Rd WEST Evaluation

Intersection: I-35 & Manor Rd WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Manor Rd WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Manor Rd WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 15,150	2030: 8,600	4	Signalized	2	0	2	0	true	false	true	5	0	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Manor Rd WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**4.33**
Fatal and Injury Crashes	**0.91**
Property-Damage-Only Crashes	**3.42**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**21**
Percent Property-Damage-Only Crashes (%)	**79**

Table 3. Predicted Crash Frequencies by Year (I-35 & Manor Rd WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.33	0.91	20.976	3.42	79.024
Total	4.33	0.91	20.976	3.42	79.024
Average	4.33	0.91	20.976	3.42	79.024

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Manor Rd WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.72	16.6	2.51	57.9	3.22	74.5
Intersection	Collision with Bicycle	0.05	1.2	0.00	0.0	0.05	1.2
Intersection	Head-on Collision	0.03	0.8	0.10	2.4	0.14	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.6	0.04	0.9	0.07	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.07	1.7	0.08	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.6	0.20	4.7	0.23	5.3
Intersection	Sideswipe	0.05	1.2	0.50	11.5	0.55	12.6
Intersection	Total Intersection Total Vehicle Crashes	0.91	21.0	3.42	79.0	4.33	100.0
Intersection	Total Intersection Crashes	0.91	21.0	3.42	79.0	4.33	100.0
	Total Crashes	0.91	21.0	3.42	79.0	4.33	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:39:03 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & MLK Jr Blvd WEST
Intersection Comment: Created Tue Jun 29 10:14:37 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:38:52 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & MLK Jr Blvd WEST Evaluation

Intersection: I-35 & MLK Jr Blvd WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & MLK Jr Blvd WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & MLK Jr Blvd WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 24,000	2030: 30,850	4	Signalized	2	1	2	0	true	false	true	4	0	6

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & MLK Jr Blvd WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**12.00**
Fatal and Injury Crashes	**2.37**
Property-Damage-Only Crashes	**9.63**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & MLK Jr Blvd WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	12.00	2.37	19.752	9.63	80.248
Total	12.00	2.37	19.752	9.63	80.248
Average	12.00	2.37	19.752	9.63	80.248

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & MLK Jr Blvd WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.86	15.5	7.06	58.8	8.92	74.3
Intersection	Collision with Bicycle	0.14	1.2	0.00	0.0	0.14	1.2
Intersection	Head-on Collision	0.09	0.7	0.29	2.4	0.38	3.1
Intersection	Other Multi-vehicle Collision	0.07	0.6	0.12	1.0	0.18	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.20	1.7	0.22	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.07	0.6	0.57	4.7	0.64	5.3
Intersection	Sideswipe	0.13	1.1	1.40	11.6	1.53	12.7
Intersection	Total Intersection Total Vehicle Crashes	2.37	19.8	9.63	80.2	12.00	100.0
Intersection	Total Intersection Crashes	2.37	19.8	9.63	80.2	12.00	100.0
	Total Crashes	2.37	19.8	9.63	80.2	12.00	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Generated: Aug 24, 2022 3:25 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Fri Jul 23 12:42:41 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 15th St WEST
Intersection Comment: Created Tue Jun 29 10:33:31 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 3
Evaluation Comment: Created Fri Jul 23 12:42:32 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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Section Types

I-35 & 15th St WEST Evaluation

Intersection: I-35 & 15th St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 15th St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 15th St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 24,500	2030: 31,050	4	Signalized	1	2	2	0	true	false	true	1	0	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 15th St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**8.52**
Fatal and Injury Crashes	**1.68**
Property-Damage-Only Crashes	**6.84**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & 15th St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	8.52	1.68	19.691	6.84	80.309
Total	8.52	1.68	19.691	6.84	80.309
Average	8.52	1.68	19.691	6.84	80.309

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 15th St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.32	15.5	5.01	58.9	6.33	74.3
Intersection	Collision with Bicycle	0.10	1.2	0.00	0.0	0.10	1.2
Intersection	Head-on Collision	0.06	0.7	0.20	2.4	0.27	3.1
Intersection	Other Multi-vehicle Collision	0.05	0.6	0.08	1.0	0.13	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.14	1.7	0.15	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.05	0.6	0.40	4.7	0.45	5.3
Intersection	Sideswipe	0.09	1.1	0.99	11.6	1.08	12.7
Intersection	Total Intersection Total Vehicle Crashes	1.68	19.7	6.84	80.3	8.52	100.0
Intersection	Total Intersection Crashes	1.68	19.7	6.84	80.3	8.52	100.0
	Total Crashes	1.68	19.7	6.84	80.3	8.52	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

Report Generated: Aug 24, 2022 3:26 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:39:55 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 12th St WEST
Intersection Comment: Created Tue Jun 29 10:39:20 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:39:47 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & 12th St WEST Evaluation

Intersection: I-35 & 12th St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 12th St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 12th St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 26,850	2030: 9,800	4	Signalized	2	0	2	0	true	false	false	5	0	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 12th St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**6.51**
Fatal and Injury Crashes	**1.25**
Property-Damage-Only Crashes	**5.26**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**19**
Percent Property-Damage-Only Crashes (%)	**81**

Table 3. Predicted Crash Frequencies by Year (I-35 & 12th St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	6.51	1.25	19.246	5.26	80.754
Total	6.51	1.25	19.246	5.26	80.754
Average	6.51	1.25	19.246	5.26	80.754

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 12th St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.98	15.1	3.85	59.2	4.84	74.3
Intersection	Collision with Bicycle	0.08	1.2	0.00	0.0	0.08	1.2
Intersection	Head-on Collision	0.05	0.7	0.16	2.4	0.20	3.1
Intersection	Other Multi-vehicle Collision	0.04	0.5	0.06	1.0	0.10	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.11	1.7	0.12	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.04	0.5	0.31	4.8	0.34	5.3
Intersection	Sideswipe	0.07	1.1	0.76	11.7	0.83	12.8
Intersection	Total Intersection Total Vehicle Crashes	1.25	19.3	5.26	80.7	6.51	100.0
Intersection	Total Intersection Crashes	1.25	19.3	5.26	80.7	6.51	100.0
	Total Crashes	1.25	19.3	5.26	80.7	6.51	100.0

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Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:40:26 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 11th St WEST
Intersection Comment: Created Tue Jun 29 10:46:27 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:40:13 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & 11th St WEST Evaluation

Intersection: I-35 & 11th St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 11th St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 11th St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 26,850	2030: 15,850	4	Signalized	2	0	2	0	true	false	false	5	1	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 11th St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**6.58**
Fatal and Injury Crashes	**1.27**
Property-Damage-Only Crashes	**5.31**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**19**
Percent Property-Damage-Only Crashes (%)	**81**

Table 3. Predicted Crash Frequencies by Year (I-35 & 11th St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	6.58	1.27	19.317	5.31	80.683
Total	6.58	1.27	19.317	5.31	80.683
Average	6.58	1.27	19.317	5.31	80.683

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 11th St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.00	15.2	3.89	59.1	4.89	74.3
Intersection	Collision with Bicycle	0.08	1.2	0.00	0.0	0.08	1.2
Intersection	Head-on Collision	0.05	0.7	0.16	2.4	0.21	3.1
Intersection	Other Multi-vehicle Collision	0.04	0.5	0.06	1.0	0.10	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.11	1.7	0.12	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.04	0.5	0.31	4.8	0.35	5.3
Intersection	Sideswipe	0.07	1.1	0.77	11.7	0.84	12.8
Intersection	Total Intersection Total Vehicle Crashes	1.27	19.3	5.31	80.7	6.58	100.0
Intersection	Total Intersection Crashes	1.27	19.3	5.31	80.7	6.58	100.0
	Total Crashes	1.27	19.3	5.31	80.7	6.58	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Generated: Aug 24, 2022 3:28 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:40:52 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 8th St WEST
Intersection Comment: Created Tue Jun 29 10:53:53 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:40:43 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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Section Types

I-35 & 8th St WEST Evaluation

Intersection: I-35 & 8th St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 8th St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 8th St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 31,600	2030: 12,550	4	Signalized	1	1	2	20	true	false	false	3	15	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 8th St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**5.83**
Fatal and Injury Crashes	**1.20**
Property-Damage-Only Crashes	**4.64**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & 8th St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.83	1.20	20.483	4.64	79.517
Total	5.83	1.20	20.483	4.64	79.517
Average	5.83	1.20	20.483	4.64	79.517

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 8th St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.84	14.4	3.40	58.3	4.24	72.7
Intersection	Collision with Bicycle	0.07	1.2	0.00	0.0	0.07	1.2
Intersection	Head-on Collision	0.04	0.7	0.14	2.4	0.18	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.5	0.06	1.0	0.09	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.10	1.7	0.10	1.8
Intersection	Collision with Pedestrian	0.12	2.1	0.00	0.0	0.12	2.1
Intersection	Rear-end Collision	0.03	0.5	0.27	4.7	0.30	5.2
Intersection	Sideswipe	0.06	1.0	0.67	11.5	0.73	12.5
Intersection	Total Intersection Total Vehicle Crashes	1.20	20.5	4.64	79.5	5.84	100.0
Intersection	Total Intersection Crashes	1.20	20.5	4.64	79.5	5.84	100.0
	Total Crashes	1.20	20.5	4.64	79.5	5.84	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Generated: Aug 24, 2022 3:29 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:41:18 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 7th St WEST
Intersection Comment: Created Tue Jun 29 11:18:30 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:41:09 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & 7th St WEST Evaluation

Intersection: I-35 & 7th St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 7th St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 7th St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 28,250	2030: 21,900	4	Signalized	1	0	2	20	true	false	true	3	14	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 7th St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**6.64**
Fatal and Injury Crashes	**1.74**
Property-Damage-Only Crashes	**4.90**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**26**
Percent Property-Damage-Only Crashes (%)	**74**

Table 3. Predicted Crash Frequencies by Year (I-35 & 7th St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	6.64	1.74	26.220	4.90	73.780
Total	6.64	1.74	26.220	4.90	73.780
Average	6.64	1.74	26.220	4.90	73.780

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 7th St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.22	18.4	3.59	54.1	4.82	72.5
Intersection	Collision with Bicycle	0.08	1.1	0.00	0.0	0.08	1.1
Intersection	Head-on Collision	0.06	0.9	0.15	2.2	0.20	3.1
Intersection	Other Multi-vehicle Collision	0.04	0.7	0.06	0.9	0.10	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.10	1.5	0.11	1.7
Intersection	Collision with Pedestrian	0.20	3.1	0.00	0.0	0.20	3.1
Intersection	Rear-end Collision	0.04	0.7	0.29	4.4	0.33	5.0
Intersection	Sideswipe	0.09	1.3	0.71	10.7	0.80	12.0
Intersection	Total Intersection Total Vehicle Crashes	1.74	26.2	4.90	73.8	6.65	100.0
Intersection	Total Intersection Crashes	1.74	26.2	4.90	73.8	6.65	100.0
	Total Crashes	1.74	26.2	4.90	73.8	6.65	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	for intersection #1 (1001+00.000 to 1001+00.000), major road traffic volume (28,250 vpd) for 2030 is not within the model limit (24,300 vpd) for reliable results for intersection type 4SG

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:52:12 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 6th St WEST
Intersection Comment: Created Tue Jun 29 11:26:20 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 3
Evaluation Comment: Created Thu Jul 22 15:52:03 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & 6th St WEST Evaluation

Intersection: I-35 & 6th St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 6th St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 6th St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 28,250	2030: 15,800	4	Signalized	2	1	2	20	true	false	true	3	11	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 6th St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**5.27**
Fatal and Injury Crashes	**1.15**
Property-Damage-Only Crashes	**4.12**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**22**
Percent Property-Damage-Only Crashes (%)	**78**

Table 3. Predicted Crash Frequencies by Year (I-35 & 6th St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.27	1.15	21.892	4.12	78.108
Total	5.27	1.15	21.892	4.12	78.108
Average	5.27	1.15	21.892	4.12	78.108

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 6th St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.77	14.5	3.02	57.2	3.78	71.8
Intersection	Collision with Bicycle	0.06	1.1	0.00	0.0	0.06	1.1
Intersection	Head-on Collision	0.04	0.7	0.12	2.3	0.16	3.0
Intersection	Other Multi-vehicle Collision	0.03	0.5	0.05	0.9	0.08	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.09	1.6	0.09	1.7
Intersection	Collision with Pedestrian	0.18	3.4	0.00	0.0	0.18	3.4
Intersection	Rear-end Collision	0.03	0.5	0.24	4.6	0.27	5.1
Intersection	Sideswipe	0.05	1.0	0.60	11.3	0.65	12.3
Intersection	Total Intersection Total Vehicle Crashes	1.15	21.9	4.12	78.1	5.27	100.0
Intersection	Total Intersection Crashes	1.15	21.9	4.12	78.1	5.27	100.0
	Total Crashes	1.15	21.9	4.12	78.1	5.27	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:42:03 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Cesar Chavez St WEST
Intersection Comment: Created Tue Jun 29 12:00:34 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:41:48 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1005+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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Section Types

I-35 & Cesar Chavez St WEST Evaluation

Intersection: I-35 & Cesar Chavez St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1005+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Cesar Chavez St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Cesar Chavez St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 21,500	2030: 34,800	4	Signalized	2	2	2	0	true	false	false	4	8	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Cesar Chavez St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**7.78**
Fatal and Injury Crashes	**1.56**
Property-Damage-Only Crashes	**6.22**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Cesar Chavez St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	7.78	1.56	20.104	6.22	79.896
Total	7.78	1.56	20.104	6.22	79.896
Average	7.78	1.56	20.104	6.22	79.896

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Cesar Chavez St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.23	15.8	4.56	58.6	5.79	74.4
Intersection	Collision with Bicycle	0.09	1.2	0.00	0.0	0.09	1.2
Intersection	Head-on Collision	0.06	0.7	0.19	2.4	0.24	3.1
Intersection	Other Multi-vehicle Collision	0.04	0.6	0.07	1.0	0.12	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.13	1.7	0.14	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.04	0.6	0.37	4.7	0.41	5.3
Intersection	Sideswipe	0.09	1.1	0.90	11.6	0.99	12.7
Intersection	Total Intersection Total Vehicle Crashes	1.57	20.1	6.22	79.9	7.78	100.0
Intersection	Total Intersection Crashes	1.57	20.1	6.22	79.9	7.78	100.0
	Total Crashes	1.57	20.1	6.22	79.9	7.78	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:43:06 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Riverside Dr WEST
Intersection Comment: Created Tue Jun 29 12:18:32 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:42:56 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1005+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & Riverside Dr WEST Evaluation

Intersection: I-35 & Riverside Dr WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1005+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Riverside Dr WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Riverside Dr WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 26,650	2030: 52,700	4	Signalized	2	0	2	0	true	false	false	2	0	6

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Riverside Dr WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**12.00**
Fatal and Injury Crashes	**2.34**
Property-Damage-Only Crashes	**9.66**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Riverside Dr WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	12.00	2.34	19.518	9.66	80.482
Total	12.00	2.34	19.518	9.66	80.482
Average	12.00	2.34	19.518	9.66	80.482

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Riverside Dr WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.84	15.3	7.08	59.0	8.92	74.3
Intersection	Collision with Bicycle	0.14	1.2	0.00	0.0	0.14	1.2
Intersection	Head-on Collision	0.09	0.7	0.29	2.4	0.38	3.1
Intersection	Other Multi-vehicle Collision	0.07	0.6	0.12	1.0	0.18	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.20	1.7	0.22	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.07	0.6	0.57	4.7	0.64	5.3
Intersection	Sideswipe	0.13	1.1	1.40	11.7	1.53	12.7
Intersection	Total Intersection Total Vehicle Crashes	2.35	19.5	9.66	80.5	12.01	100.0
Intersection	Total Intersection Crashes	2.35	19.5	9.66	80.5	12.01	100.0
	Total Crashes	2.35	19.5	9.66	80.5	12.01	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Evaluation Date: Thu Jul 22 15:43:38 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Woodland Ave WEST
Intersection Comment: Created Tue Jun 29 12:43:38 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:43:27 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & Woodland Ave WEST Evaluation

Intersection: I-35 & Woodland Ave WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Woodland Ave WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Woodland Ave WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 26,950	2030: 8,650	4	Signalized	1	1	2	0	true	false	false	0	0	3

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Woodland Ave WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**3.67**
Fatal and Injury Crashes	**0.70**
Property-Damage-Only Crashes	**2.96**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**19**
Percent Property-Damage-Only Crashes (%)	**81**

Table 3. Predicted Crash Frequencies by Year (I-35 & Woodland Ave WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	3.67	0.70	19.216	2.96	80.784
Total	3.67	0.70	19.216	2.96	80.784
Average	3.67	0.70	19.216	2.96	80.784

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Woodland Ave WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.55	15.1	2.17	59.2	2.73	74.3
Intersection	Collision with Bicycle	0.04	1.2	0.00	0.0	0.04	1.2
Intersection	Head-on Collision	0.03	0.7	0.09	2.4	0.12	3.1
Intersection	Other Multi-vehicle Collision	0.02	0.5	0.04	1.0	0.06	1.5
Intersection	Other Single-vehicle Collision	0.00	0.1	0.06	1.7	0.07	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.02	0.5	0.17	4.8	0.20	5.3
Intersection	Sideswipe	0.04	1.1	0.43	11.7	0.47	12.8
Intersection	Total Intersection Total Vehicle Crashes	0.71	19.2	2.96	80.8	3.67	100.0
Intersection	Total Intersection Crashes	0.71	19.2	2.96	80.8	3.67	100.0
	Total Crashes	0.71	19.2	2.96	80.8	3.67	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

Report Generated: Aug 24, 2022 3:33 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 22 15:44:19 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Oltorf St WEST
Intersection Comment: Created Tue Jun 29 12:47:15 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jul 22 15:44:09 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1005+80.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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Section Types

I-35 & Oltorf St WEST Evaluation

Intersection: I-35 & Oltorf St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1005+80.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Oltorf St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Oltorf St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 20,750	2030: 26,400	4	Signalized	2	1	2	0	true	false	true	4	0	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Oltorf St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**6.77**
Fatal and Injury Crashes	**1.37**
Property-Damage-Only Crashes	**5.41**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Oltorf St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	6.77	1.37	20.171	5.41	79.829
Total	6.77	1.37	20.171	5.41	79.829
Average	6.77	1.37	20.171	5.41	79.829

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Oltorf St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.08	15.9	3.96	58.5	5.04	74.4
Intersection	Collision with Bicycle	0.08	1.2	0.00	0.0	0.08	1.2
Intersection	Head-on Collision	0.05	0.7	0.16	2.4	0.21	3.1
Intersection	Other Multi-vehicle Collision	0.04	0.6	0.07	1.0	0.10	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.11	1.7	0.12	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.04	0.6	0.32	4.7	0.36	5.3
Intersection	Sideswipe	0.08	1.1	0.78	11.6	0.86	12.7
Intersection	Total Intersection Total Vehicle Crashes	1.37	20.2	5.41	79.8	6.77	100.0
Intersection	Total Intersection Crashes	1.37	20.2	5.41	79.8	6.77	100.0
	Total Crashes	1.37	20.2	5.41	79.8	6.77	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

Report Generated: Aug 24, 2022 3:34 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Tue Jul 19 10:42:35 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - No Build
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Woodward St WEST
Intersection Comment: Created Tue Jun 29 12:55:39 CDT 2021
Intersection Version: v1

Evaluation Title: 2022 bike lane added
Evaluation Comment: Created Tue Jul 19 10:42:22 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & Woodward St WEST Evaluation

Intersection: I-35 & Woodward St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Woodward St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Woodward St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 19,900	2030: 15,700	4	Signalized	2	1	2	0	true	false	false	0	0	7

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Woodward St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**4.60**
Fatal and Injury Crashes	**0.93**
Property-Damage-Only Crashes	**3.67**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Woodward St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.60	0.93	20.219	3.67	79.781
Total	4.60	0.93	20.219	3.67	79.781
Average	4.60	0.93	20.219	3.67	79.781

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Woodward St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.73	15.9	2.69	58.5	3.42	74.4
Intersection	Collision with Bicycle	0.06	1.2	0.00	0.0	0.06	1.2
Intersection	Head-on Collision	0.03	0.7	0.11	2.4	0.14	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.6	0.04	1.0	0.07	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.08	1.7	0.08	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.6	0.22	4.7	0.24	5.3
Intersection	Sideswipe	0.05	1.1	0.53	11.6	0.58	12.7
Intersection	Total Intersection Total Vehicle Crashes	0.93	20.2	3.67	79.8	4.60	100.0
Intersection	Total Intersection Crashes	0.93	20.2	3.67	79.8	4.60	100.0
	Total Crashes	0.93	20.2	3.67	79.8	4.60	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

I-35 Build Alternative 2 Model Buffer-Separated GP Lanes

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Generated: Aug 24, 2022 3:38 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:56:22 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL2
Highway Comment: Imported from CENTRAL2.xml
Highway Version: 1

Evaluation Title: Section 1
Evaluation Comment: Created Thu Jun 23 11:55:40 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1086+14.425

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1086+14.425
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_MV=1.0; FI_SV=1.0; PDO_MV=1.0; PDO_SV=1.0;

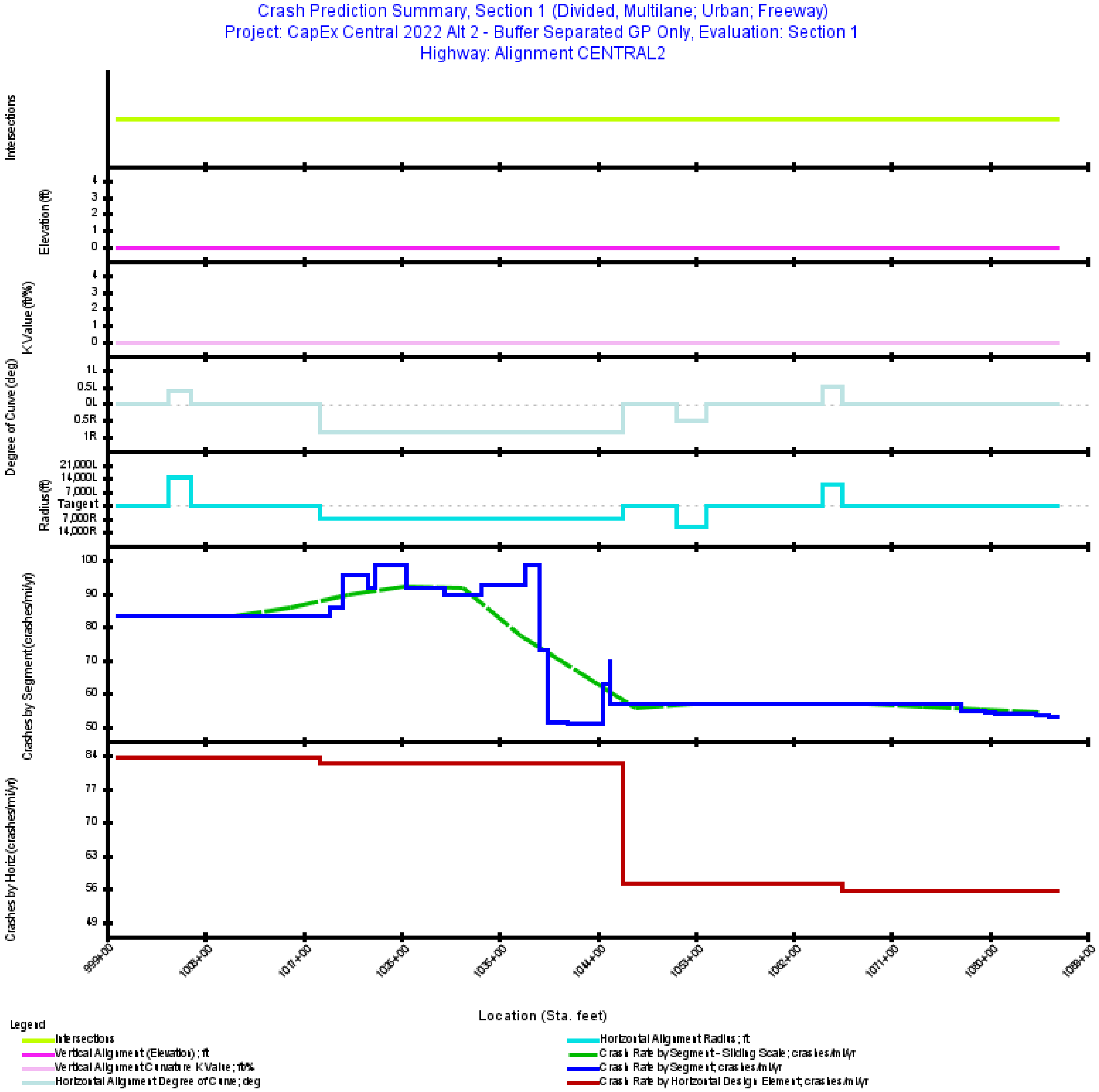

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Eight-lane Freeway	Urban	1000+00.000	1019+50.000	1,950.00	0.3693	2030: 203,650	46.00	Non-Traversable Median	54.50
2	Eight-lane Freeway	Urban	1019+50.000	1020+63.580	113.58	0.0215	2030: 203,650	56.64	Non-Traversable Median	60.64
3	Nine-lane Freeway	Urban	1020+63.580	1022+98.000	234.42	0.0444	2030: 210,700	61.65	Non-Traversable Median	65.65
4	Nine-lane Freeway	Urban	1022+98.000	1023+61.570	63.57	0.0120	2030: 210,700	65.93	Non-Traversable Median	69.93
5	Ten-lane Freeway	Urban	1023+61.570	1026+45.000	283.43	0.0537	2030: 224,050	70.93	Non-Traversable Median	74.93
6	Ten-lane Freeway	Urban	1026+45.000	1029+93.000	348.00	0.0659	2030: 224,050	80.01	Non-Traversable Median	84.01
7	Ten-lane Freeway	Urban	1029+93.000	1033+41.000	348.00	0.0659	2030: 224,050	90.02	Non-Traversable Median	94.00
8	Ten-lane Freeway	Urban	1033+41.000	1037+33.000	392.00	0.0742	2030: 224,050	89.98	Non-Traversable Median	93.98
9	Ten-lane Freeway	Urban	1037+33.000	1038+65.500	132.50	0.0251	2030: 224,050	83.30	Non-Traversable Median	87.30
10	Nine-lane Freeway	Urban	1038+65.500	1039+48.030	82.53	0.0156	2030: 179,650	80.56	Non-Traversable Median	84.56
11	Eight-lane Freeway	Urban	1039+48.030	1041+26.000	177.97	0.0337	2030: 142,550	77.24	Non-Traversable Median	81.24
12	Eight-lane Freeway	Urban	1041+26.000	1044+52.820	326.82	0.0619	2030: 142,550	70.81	Non-Traversable Median	74.81
13	Eight-lane Freeway	Urban	1044+52.820	1045+10.700	57.88	0.0110	2030: 148,350	65.91	Non-Traversable Median	69.91
14	Eight-lane Freeway	Urban	1045+10.700	1045+21.090	10.39	0.0020	2030: 148,350	65.04	Non-Traversable Median	69.04
15	Eight-lane Freeway	Urban	1045+21.090	1077+37.380	3,216.29	0.6091	2030: 153,000	57.00	Non-Traversable Median	64.95
16	Eight-lane Freeway	Urban	1077+37.380	1079+57.380	220.00	0.0417	2030: 153,000	57.00	Non-Traversable Median	61.28
17	Eight-lane Freeway	Urban	1079+57.380	1080+44.000	86.62	0.0164	2030: 153,000	57.00	Non-Traversable Median	61.78
18	Eight-lane Freeway	Urban	1080+44.000	1084+27.000	383.00	0.0725	2030: 153,000	57.00	Non-Traversable Median	63.00
19	Eight-lane Freeway	Urban	1084+27.000	1085+37.030	110.03	0.0208	2030: 153,000	57.00	Non-Traversable Median	64.29
20	Eight-lane Freeway	Urban	1085+37.030	1086+14.425	77.39	0.0147	2030: 153,000	57.00	Non-Traversable Median	64.68

Table 2. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**1.6315**
Average Future Road AADT (vpd)	**179,139**
Predicted Crashes	
Total Crashes	**115.16**
Fatal and Injury Crashes	**31.96**
Property-Damage-Only Crashes	**83.19**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**28**
Percent Property-Damage-Only Crashes (%)	**72**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**70.5819**
FI Crash Rate (crashes/mi/yr)	**19.5903**
PDO Crash Rate (crashes/mi/yr)	**50.9916**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**106.68**
Travel Crash Rate (crashes/million veh-mi)	**1.08**
Travel FI Crash Rate (crashes/million veh-mi)	**0.30**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.78**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 3. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1019+50.000	0.3693	30.806	30.8062	8.1976	22.6086	83.4136	1.12
2	1019+50.000	1020+63.580	0.0215	1.845	1.8446	0.4891	1.3555	85.7499	1.15
3	1020+63.580	1022+98.000	0.0444	4.237	4.2365	1.1458	3.0907	95.4220	1.24
4	1022+98.000	1023+61.570	0.0120	1.104	1.1043	0.2990	0.8053	91.7192	1.19
5	1023+61.570	1026+45.000	0.0537	5.296	5.2958	1.4542	3.8415	98.6542	1.21
6	1026+45.000	1029+93.000	0.0659	6.032	6.0324	1.6584	4.3740	91.5268	1.12
7	1029+93.000	1033+41.000	0.0659	5.896	5.8957	1.6206	4.2751	89.4519	1.09
8	1033+41.000	1037+33.000	0.0742	6.870	6.8697	1.8876	4.9821	92.5313	1.13
9	1037+33.000	1038+65.500	0.0251	2.477	2.4768	0.6796	1.7972	98.6970	1.21
10	1038+65.500	1039+48.030	0.0156	1.143	1.1429	0.3226	0.8202	73.1177	1.11
11	1039+48.030	1041+26.000	0.0337	1.730	1.7300	0.5023	1.2278	51.3265	0.99
12	1041+26.000	1044+52.820	0.0619	3.172	3.1720	0.9205	2.2514	51.2456	0.98
13	1044+52.820	1045+10.700	0.0110	0.689	0.6890	0.1993	0.4897	62.8551	1.16
14	1045+10.700	1045+21.090	0.0020	0.137	0.1374	0.0399	0.0975	69.8341	1.29
15	1045+21.090	1077+37.380	0.6091	34.735	34.7346	9.9757	24.7589	57.0218	1.02
16	1077+37.380	1079+57.380	0.0417	2.281	2.2811	0.6528	1.6283	54.7465	0.98
17	1079+57.380	1080+44.000	0.0164	0.895	0.8946	0.2559	0.6386	54.5295	0.98
18	1080+44.000	1084+27.000	0.0725	3.917	3.9172	1.1197	2.7975	54.0021	0.97
19	1084+27.000	1085+37.030	0.0208	1.114	1.1139	0.3181	0.7958	53.4540	0.96
20	1085+37.030	1086+14.425	0.0147	0.781	0.7811	0.2230	0.5581	53.2880	0.95
Total			1.6315	115.156	115.1558	31.9619	83.1939	70.5819	1.08

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1004+60.391	0.0872	7.273	7.2733	1.9354	5.3378	83.4136	1.12
Simple Curve 1	1004+60.391	1006+71.434	0.0400	3.334	3.3341	0.8872	2.4469	83.4136	1.12
Tangent	1006+71.434	1018+60.043	0.2251	18.778	18.7777	4.9968	13.7809	83.4136	1.12
Simple Curve 2	1018+60.043	1046+35.497	0.5257	43.284	43.2838	11.9520	31.3318	82.3428	1.12
Tangent	1046+35.497	1051+30.487	0.0937	5.346	5.3457	1.5353	3.8104	57.0218	1.02
Simple Curve 3	1051+30.487	1054+01.577	0.0513	2.928	2.9277	0.8408	2.0868	57.0218	1.02
Tangent	1054+01.577	1064+70.393	0.2024	11.543	11.5428	3.3150	8.2277	57.0218	1.02
Simple Curve 4	1064+70.393	1066+47.381	0.0335	1.911	1.9114	0.5489	1.3624	57.0218	1.02
Tangent	1066+47.381	1086+14.425	0.3725	20.759	20.7594	5.9504	14.8090	55.7231	1.00

Table 5. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	115.16	31.96	27.755	83.19	72.245
Total	115.16	31.96	27.755	83.19	72.245
Average	115.16	31.96	27.755	83.19	72.245

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.1697	0.3478	2.6049	5.0752	22.6086
2	0.0115	0.0243	0.1652	0.2881	1.3555
3	0.0269	0.0568	0.3870	0.6750	3.0907
4	0.0070	0.0148	0.1010	0.1761	0.8053
5	0.0342	0.0721	0.4912	0.8567	3.8415
6	0.0390	0.0822	0.5602	0.9770	4.3740
7	0.0381	0.0804	0.5474	0.9547	4.2751
8	0.0443	0.0936	0.6376	1.1121	4.9821
9	0.0160	0.0337	0.2296	0.4003	1.7972
10	0.0076	0.0160	0.1090	0.1901	0.8202
11	0.0118	0.0249	0.1697	0.2959	1.2278
12	0.0216	0.0456	0.3110	0.5423	2.2514
13	0.0047	0.0099	0.0673	0.1174	0.4897
14	0.0009	0.0020	0.0135	0.0235	0.0975
15	0.2072	0.4249	3.1747	6.1689	24.7589
16	0.0132	0.0269	0.2050	0.4077	1.6283
17	0.0052	0.0105	0.0804	0.1598	0.6386
18	0.0226	0.0462	0.3517	0.6992	2.7975
19	0.0064	0.0131	0.0999	0.1987	0.7958
20	0.0045	0.0092	0.0701	0.1393	0.5581
Total	0.6924	1.4349	10.3765	19.4581	83.1939

Table 7. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.04	0.0	0.64	0.6	0.69	0.6
Highway Segment	Collision with Fixed Object	7.81	6.8	20.88	18.1	28.69	24.9
Highway Segment	Collision with Other Object	0.55	0.5	4.05	3.5	4.61	4.0
Highway Segment	Other Single-vehicle Collision	2.25	2.0	3.12	2.7	5.37	4.7
Highway Segment	Collision with Parked Vehicle	0.16	0.1	0.47	0.4	0.63	0.5
Highway Segment	Total Single Vehicle Crashes	10.82	9.4	29.16	25.3	39.98	34.7
Highway Segment	Right-Angle Collision	0.66	0.6	0.97	0.8	1.63	1.4
Highway Segment	Head-on Collision	0.17	0.1	0.11	0.1	0.28	0.2
Highway Segment	Other Multi-vehicle Collision	0.66	0.6	1.30	1.1	1.95	1.7
Highway Segment	Rear-end Collision	15.86	13.8	37.29	32.4	53.14	46.1
Highway Segment	Sideswipe, Same Direction Collision	3.81	3.3	14.37	12.5	18.18	15.8
Highway Segment	Total Multiple Vehicle Crashes	21.14	18.4	54.04	46.9	75.18	65.3
Highway Segment	Total Highway Segment Crashes	31.96	27.8	83.19	72.2	115.16	100.0
	Total Crashes	31.96	27.8	83.19	72.2	115.16	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1019+50.000	Information: for segment #1 (1000+00.000 to 1019+50.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1000+00.000	1019+50.000	Information: for segment #1 (1000+00.000 to 1019+50.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1000+00.000	1019+50.000	Information: for segment #1 (1000+00.000 to 1019+50.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1000+00.000	1019+50.000	Information: for segment #1 (1000+00.000 to 1019+50.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1019+50.000	1020+63.580	Information: for segment #2 (1019+50.000 to 1020+63.580), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1019+50.000	1020+63.580	Information: for segment #2 (1019+50.000 to 1020+63.580), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1019+50.000	1020+63.580	Information: for segment #2 (1019+50.000 to 1020+63.580), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1019+50.000	1020+63.580	Information: for segment #2 (1019+50.000 to 1020+63.580), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1020+63.580	1022+98.000	Information: for segment #3 (1020+63.580 to 1022+98.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1020+63.580	1022+98.000	Information: for segment #3 (1020+63.580 to 1022+98.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1020+63.580	1022+98.000	Information: for segment #3 (1020+63.580 to 1022+98.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1020+63.580	1022+98.000	Information: for segment #3 (1020+63.580 to 1022+98.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1022+98.000	1023+61.570	Information: for segment #4 (1022+98.000 to 1023+61.570), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1022+98.000	1023+61.570	Information: for segment #4 (1022+98.000 to 1023+61.570), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1022+98.000	1023+61.570	Information: for segment #4 (1022+98.000 to 1023+61.570), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1022+98.000	1023+61.570	Information: for segment #4 (1022+98.000 to 1023+61.570), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1023+61.570	1026+45.000	Information: for segment #5 (1023+61.570 to 1026+45.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1023+61.570	1026+45.000	Information: for segment #5 (1023+61.570 to 1026+45.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1023+61.570	1026+45.000	Information: for segment #5 (1023+61.570 to 1026+45.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1023+61.570	1026+45.000	Information: for segment #5 (1023+61.570 to 1026+45.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1026+45.000	1029+93.000	Information: for segment #6 (1026+45.000 to 1029+93.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1026+45.000	1029+93.000	Information: for segment #6 (1026+45.000 to 1029+93.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1026+45.000	1029+93.000	Information: for segment #6 (1026+45.000 to 1029+93.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1026+45.000	1029+93.000	Information: for segment #6 (1026+45.000 to 1029+93.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1029+93.000	1033+41.000	Information: for segment #7 (1029+93.000 to 1033+41.000), Effective median width (94.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1029+93.000	1033+41.000	Information: for segment #7 (1029+93.000 to 1033+41.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1029+93.000	1033+41.000	Information: for segment #7 (1029+93.000 to 1033+41.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1029+93.000	1033+41.000	Information: for segment #7 (1029+93.000 to 1033+41.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1029+93.000	1033+41.000	Information: for segment #7 (1029+93.000 to 1033+41.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1033+41.000	1037+33.000	Information: for segment #8 (1033+41.000 to 1037+33.000), Effective median width (93.98 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1033+41.000	1037+33.000	Information: for segment #8 (1033+41.000 to 1037+33.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1033+41.000	1037+33.000	Information: for segment #8 (1033+41.000 to 1037+33.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1033+41.000	1037+33.000	Information: for segment #8 (1033+41.000 to 1037+33.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1033+41.000	1037+33.000	Information: for segment #8 (1033+41.000 to 1037+33.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1037+33.000	1038+65.500	Information: for segment #9 (1037+33.000 to 1038+65.500), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1037+33.000	1038+65.500	Information: for segment #9 (1037+33.000 to 1038+65.500), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1037+33.000	1038+65.500	Information: for segment #9 (1037+33.000 to 1038+65.500), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1037+33.000	1038+65.500	Information: for segment #9 (1037+33.000 to 1038+65.500), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+65.500	1039+48.030	Information: for segment #10 (1038+65.500 to 1039+48.030), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+65.500	1039+48.030	Information: for segment #10 (1038+65.500 to 1039+48.030), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+65.500	1039+48.030	Information: for segment #10 (1038+65.500 to 1039+48.030), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+65.500	1039+48.030	Information: for segment #10 (1038+65.500 to 1039+48.030), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1039+48.030	1041+26.000	Information: for segment #11 (1039+48.030 to 1041+26.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1039+48.030	1041+26.000	Information: for segment #11 (1039+48.030 to 1041+26.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1039+48.030	1041+26.000	Information: for segment #11 (1039+48.030 to 1041+26.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1039+48.030	1041+26.000	Information: for segment #11 (1039+48.030 to 1041+26.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1041+26.000	1044+52.820	Information: for segment #12 (1041+26.000 to 1044+52.820), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1041+26.000	1044+52.820	Information: for segment #12 (1041+26.000 to 1044+52.820), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1041+26.000	1044+52.820	Information: for segment #12 (1041+26.000 to 1044+52.820), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1041+26.000	1044+52.820	Information: for segment #12 (1041+26.000 to 1044+52.820), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1044+52.820	1045+10.700	Information: for segment #13 (1044+52.820 to 1045+10.700), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1044+52.820	1045+10.700	Information: for segment #13 (1044+52.820 to 1045+10.700), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1044+52.820	1045+10.700	Information: for segment #13 (1044+52.820 to 1045+10.700), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1044+52.820	1045+10.700	Information: for segment #13 (1044+52.820 to 1045+10.700), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1045+10.700	1045+21.090	Information: for segment #14 (1045+10.700 to 1045+21.090), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1045+10.700	1045+21.090	Information: for segment #14 (1045+10.700 to 1045+21.090), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1045+10.700	1045+21.090	Information: for segment #14 (1045+10.700 to 1045+21.090), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1045+10.700	1045+21.090	Information: for segment #14 (1045+10.700 to 1045+21.090), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1045+21.090	1077+37.380	Information: for segment #15 (1045+21.090 to 1077+37.380), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1045+21.090	1077+37.380	Information: for segment #15 (1045+21.090 to 1077+37.380), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1045+21.090	1077+37.380	Information: for segment #15 (1045+21.090 to 1077+37.380), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1045+21.090	1077+37.380	Information: for segment #15 (1045+21.090 to 1077+37.380), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1077+37.380	1079+57.380	Information: for segment #16 (1077+37.380 to 1079+57.380), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1077+37.380	1079+57.380	Information: for segment #16 (1077+37.380 to 1079+57.380), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1077+37.380	1079+57.380	Information: for segment #16 (1077+37.380 to 1079+57.380), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1077+37.380	1079+57.380	Information: for segment #16 (1077+37.380 to 1079+57.380), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1079+57.380	1080+44.000	Information: for segment #17 (1079+57.380 to 1080+44.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1079+57.380	1080+44.000	Information: for segment #17 (1079+57.380 to 1080+44.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1079+57.380	1080+44.000	Information: for segment #17 (1079+57.380 to 1080+44.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1079+57.380	1080+44.000	Information: for segment #17 (1079+57.380 to 1080+44.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1080+44.000	1084+27.000	Information: for segment #18 (1080+44.000 to 1084+27.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1080+44.000	1084+27.000	Information: for segment #18 (1080+44.000 to 1084+27.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1080+44.000	1084+27.000	Information: for segment #18 (1080+44.000 to 1084+27.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1080+44.000	1084+27.000	Information: for segment #18 (1080+44.000 to 1084+27.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1084+27.000	1085+37.030	Information: for segment #19 (1084+27.000 to 1085+37.030), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1084+27.000	1085+37.030	Information: for segment #19 (1084+27.000 to 1085+37.030), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1084+27.000	1085+37.030	Information: for segment #19 (1084+27.000 to 1085+37.030), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1084+27.000	1085+37.030	Information: for segment #19 (1084+27.000 to 1085+37.030), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1085+37.030	1086+14.425	Information: for segment #20 (1085+37.030 to 1086+14.425), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1085+37.030	1086+14.425	Information: for segment #20 (1085+37.030 to 1086+14.425), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1085+37.030	1086+14.425	Information: for segment #20 (1085+37.030 to 1086+14.425), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1085+37.030	1086+14.425	Information: for segment #20 (1085+37.030 to 1086+14.425), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1020+63.580	1022+98.000	Information: for segment #3 (1020+63.580 to 1022+98.000), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1022+98.000	1023+61.570	Information: for segment #4 (1022+98.000 to 1023+61.570), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1038+65.500	1039+48.030	Information: for segment #10 (1038+65.500 to 1039+48.030), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

Report Generated: Aug 24, 2022 3:39 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:58:02 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL2
Highway Comment: Imported from CENTRAL2.xml
Highway Version: 1

Evaluation Title: Section 2
Evaluation Comment: Created Thu Jun 23 11:57:01 CDT 2022

Minimum Location: 1137+96.210
Maximum Location: 1160+88.270

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1137+96.210
Evaluation End Location: 1160+88.270
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_EX=1.0; FI_MV=1.0; FI_SV=1.0; PDO_EX=1.0; PDO_MV=1.0; PDO_SV=1.0;

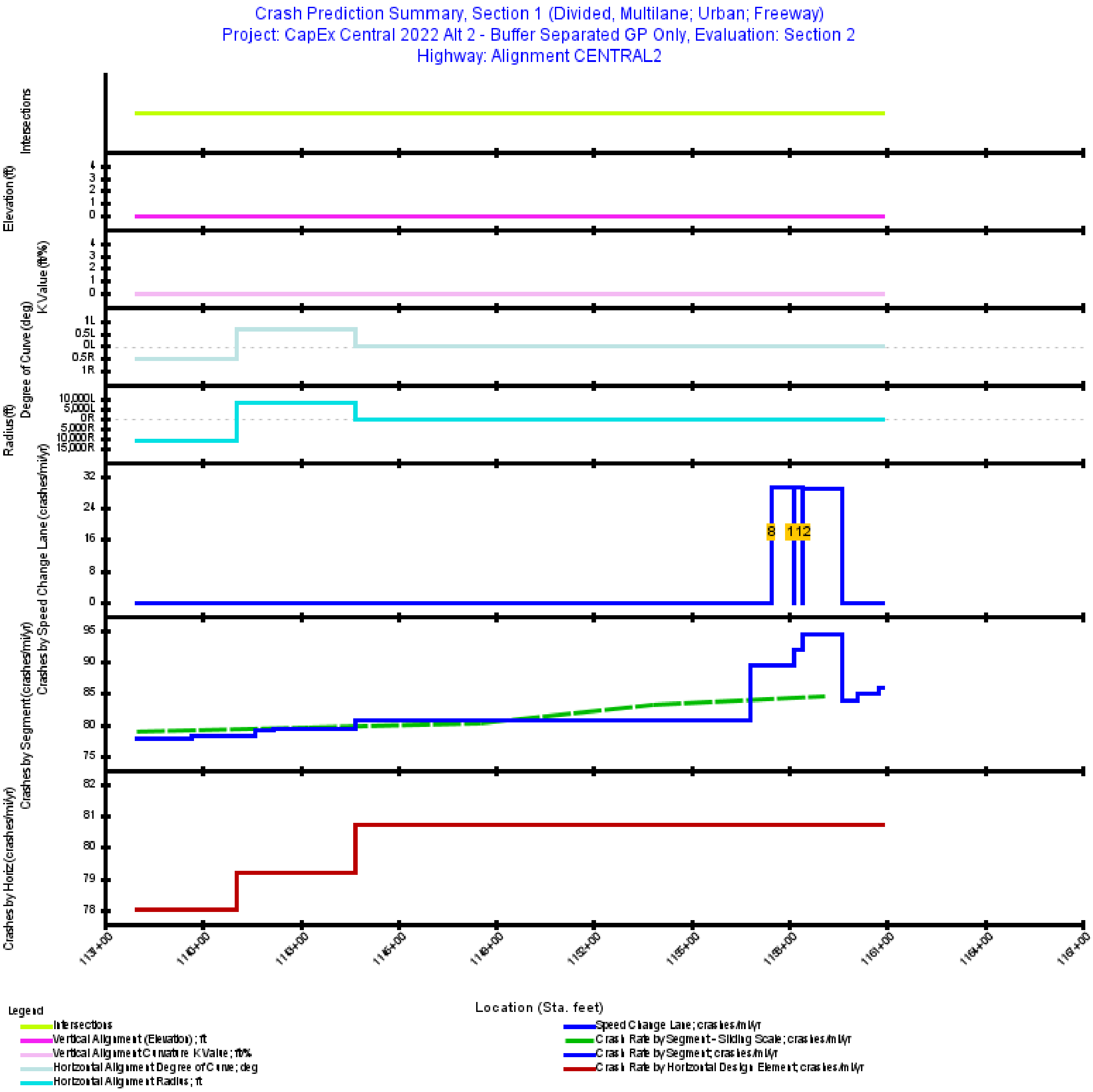

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Ten-lane Freeway	Urban	1137+96.210	1138+94.210	98.00	0.0186	2030: 216,900	66.00	Non-Traversable Median	73.18
2	Ten-lane Freeway	Urban	1138+94.210	1139+65.400	71.19	0.0135	2030: 216,900	66.00	Non-Traversable Median	72.86
3	Ten-lane Freeway	Urban	1139+65.400	1141+60.170	194.77	0.0369	2030: 216,900	66.00	Non-Traversable Median	71.98
4	Ten-lane Freeway	Urban	1141+60.170	1142+18.210	58.04	0.0110	2030: 216,900	66.00	Non-Traversable Median	71.11
5	Ten-lane Freeway	Urban	1142+18.210	1144+70.090	251.88	0.0477	2030: 216,900	66.00	Non-Traversable Median	70.50
6	Ten-lane Freeway	Urban	1144+70.090	1156+78.710	1,208.62	0.2289	2030: 216,900	66.00	Non-Traversable Median	70.00
7	Ten-lane Freeway	Urban	1156+78.710	1158+15.730	137.02	0.0260	2030: 216,900	66.00	Non-Traversable Median	70.35
9	Ten-lane Freeway	Urban	1158+15.730	1158+42.210	26.48	0.0050	2030: 216,900	66.00	Non-Traversable Median	70.85
11	Ten-lane Freeway	Urban	1158+42.210	1159+61.730	119.52	0.0226	2030: 216,900	66.00	Non-Traversable Median	71.73
13	Nine-lane Freeway	Urban	1159+61.730	1160+08.210	46.48	0.0088	2030: 200,650	66.00	Non-Traversable Median	72.73
14	Nine-lane Freeway	Urban	1160+08.210	1160+75.280	67.07	0.0127	2030: 200,650	66.00	Non-Traversable Median	73.41
15	Nine-lane Freeway	Urban	1160+75.280	1160+88.270	12.99	0.0025	2030: 200,650	66.00	Non-Traversable Median	73.86

Table 2. Evaluation Freeway - Speed Change Lanes (Speed Change)

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
8	Ten-lane Freeway Speed Change	Exit	1157+46.730	1158+15.730	69.00	0.0131	2030: 216,900	66.00	Non-Traversable Median	70.52
10	Ten-lane Freeway Speed Change	Exit	1158+15.730	1158+42.210	26.48	0.0050	2030: 216,900	66.00	Non-Traversable Median	70.85
12	Ten-lane Freeway Speed Change	Exit	1158+42.210	1159+61.730	119.52	0.0226	2030: 216,900	66.00	Non-Traversable Median	71.73

Table 3. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**0.4137**
Average Future Road AADT (vpd)	**215,959**
Predicted Crashes	
Total Crashes	**33.59**
Fatal and Injury Crashes	**9.29**
Property-Damage-Only Crashes	**24.29**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**28**
Percent Property-Damage-Only Crashes (%)	**72**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**81.1726**
FI Crash Rate (crashes/mi/yr)	**22.4628**
PDO Crash Rate (crashes/mi/yr)	**58.7098**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**32.61**
Travel Crash Rate (crashes/million veh-mi)	**1.03**
Travel FI Crash Rate (crashes/million veh-mi)	**0.28**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.74**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Table 4. Predicted Freeway Speed Change Lane Crash Rates and Frequencies Summary (Speed Change)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Length (mi)	**0.0407**
Average Future Road AADT (vpd)	**108,450**
Predicted Crashes	
Total Crashes	**1.19**
Fatal and Injury Crashes	**0.39**
Property-Damage-Only Crashes	**0.80**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**32**
Percent Property-Damage-Only Crashes (%)	**68**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**29.2018**
FI Crash Rate (crashes/mi/yr)	**9.4735**
PDO Crash Rate (crashes/mi/yr)	**19.7282**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.61**
Travel Crash Rate (crashes/million veh-mi)	**0.74**
Travel FI Crash Rate (crashes/million veh-mi)	**0.24**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.50**

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 5. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1137+96.210	1138+94.210	0.0186	1.446	1.4456	0.3988	1.0468	77.8843	0.98
2	1138+94.210	1139+65.400	0.0135	1.049	1.0491	0.2894	0.7597	77.8079	0.98
3	1139+65.400	1141+60.170	0.0369	2.887	2.8868	0.7964	2.0905	78.2591	0.99
4	1141+60.170	1142+18.210	0.0110	0.869	0.8694	0.2398	0.6297	79.0952	1.00
5	1142+18.210	1144+70.090	0.0477	3.788	3.7882	1.0451	2.7430	79.4088	1.00
6	1144+70.090	1156+78.710	0.2289	18.480	18.4797	5.1244	13.3553	80.7306	1.02
7	1156+78.710	1158+15.730	0.0194	1.739	1.7387	0.4831	1.2556	89.5462	1.13
9	1158+15.730	1158+42.210	0.0025	0.231	0.2305	0.0640	0.1665	91.9239	1.16
11	1158+42.210	1159+61.730	0.0113	1.068	1.0679	0.2961	0.7718	94.3550	1.19
13	1159+61.730	1160+08.210	0.0088	0.738	0.7382	0.2027	0.5355	83.8555	1.15
14	1160+08.210	1160+75.280	0.0127	1.079	1.0792	0.2961	0.7831	84.9580	1.16
15	1160+75.280	1160+88.270	0.0025	0.211	0.2113	0.0579	0.1533	85.8697	1.17
Total			0.4137	33.584	33.5845	9.2938	24.2907	81.1726	1.03

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 6. Predicted Crash Frequencies and Rates by Freeway Speed Change Lane (Speed Change)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
8	1157+46.730	1158+15.730	0.0131	0.384	0.3838	0.1246	0.2592	29.3682	0.74
10	1158+15.730	1158+42.210	0.0050	0.147	0.1469	0.0477	0.0992	29.2904	0.74
12	1158+42.210	1159+61.730	0.0226	0.658	0.6584	0.2135	0.4449	29.0861	0.73
Total			0.0407	1.189	1.1891	0.3858	0.8033	29.2018	0.74

Note: *Travel Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 7. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1137+96.210	1141+05.636	0.0586	4.573	4.5732	1.2616	3.3117	78.0366	0.99
Simple Curve 2	1141+05.636	1144+70.088	0.0690	5.466	5.4659	1.5079	3.9580	79.1868	1.00
Tangent	1144+70.088	1160+88.270	0.3065	24.735	24.7345	6.9101	17.8244	80.7069	1.15

Table 8. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	34.77	9.68	27.836	25.09	72.164
Total	34.77	9.68	27.836	25.09	72.164
Average	34.77	9.68	27.836	25.09	72.164

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 9. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0094	0.0198	0.1347	0.2349	1.0468
2	0.0068	0.0143	0.0978	0.1705	0.7597
3	0.0187	0.0395	0.2690	0.4692	2.0905
4	0.0056	0.0119	0.0810	0.1413	0.6297
5	0.0246	0.0518	0.3530	0.6157	2.7430
6	0.1036	0.2112	1.6095	3.2000	13.3553
7	0.0098	0.0199	0.1517	0.3017	1.2556
9	0.0013	0.0026	0.0201	0.0400	0.1665
11	0.0060	0.0122	0.0930	0.1849	0.7718
13	0.0041	0.0084	0.0637	0.1266	0.5355
14	0.0060	0.0122	0.0930	0.1849	0.7831
15	0.0012	0.0024	0.0182	0.0362	0.1533
Total	0.1970	0.4062	2.9848	5.7058	24.2907

Table 10. Predicted Crash Severity by Speed Change Lane (Speed Change)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
8	0.0025	0.0051	0.0391	0.0778	0.2592
10	0.0010	0.0020	0.0150	0.0298	0.0992
12	0.0043	0.0088	0.0671	0.1333	0.4449
Total	0.0078	0.0159	0.1212	0.2409	0.8033

Table 11. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.0	0.18	0.5	0.20	0.6
Highway Segment	Collision with Fixed Object	2.33	6.9	5.99	17.8	8.32	24.8
Highway Segment	Collision with Other Object	0.16	0.5	1.16	3.5	1.33	4.0
Highway Segment	Other Single-vehicle Collision	0.67	2.0	0.90	2.7	1.56	4.7
Highway Segment	Collision with Parked Vehicle	0.05	0.1	0.13	0.4	0.18	0.5
Highway Segment	Total Single Vehicle Crashes	3.22	9.6	8.37	24.9	11.59	34.5
Highway Segment	Right-Angle Collision	0.19	0.6	0.29	0.9	0.47	1.4
Highway Segment	Head-on Collision	0.05	0.1	0.03	0.1	0.08	0.2
Highway Segment	Other Multi-vehicle Collision	0.19	0.6	0.38	1.1	0.57	1.7
Highway Segment	Rear-end Collision	4.55	13.6	10.99	32.7	15.54	46.3
Highway Segment	Sideswipe, Same Direction Collision	1.09	3.3	4.24	12.6	5.33	15.9
Highway Segment	Total Multiple Vehicle Crashes	6.07	18.1	15.93	47.4	22.00	65.5
Highway Segment	Total Highway Segment Crashes	9.29	27.7	24.29	72.3	33.59	100.0
	Total Crashes	9.29	27.7	24.29	72.3	33.59	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 12. Predicted Exit Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.01	0.5	0.01	0.5
Highway Segment	Collision with Fixed Object	0.08	6.4	0.17	14.0	0.24	20.3
Highway Segment	Collision with Other Object	0.01	0.5	0.02	2.0	0.03	2.5
Highway Segment	Other Single-vehicle Collision	0.02	1.6	0.02	1.6	0.04	3.1
Highway Segment	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Total Single Vehicle Crashes	0.10	8.5	0.21	18.0	0.32	26.5
Highway Segment	Right-Angle Collision	0.00	0.4	0.01	0.8	0.01	1.2
Highway Segment	Head-on Collision	0.00	0.2	0.00	0.1	0.00	0.3
Highway Segment	Other Multi-vehicle Collision	0.01	0.5	0.01	1.1	0.02	1.6
Highway Segment	Rear-end Collision	0.21	17.8	0.45	38.2	0.67	56.0
Highway Segment	Sideswipe, Same Direction Collision	0.06	5.1	0.11	9.3	0.17	14.4
Highway Segment	Total Multiple Vehicle Crashes	0.28	24.0	0.59	49.5	0.87	73.5
Highway Segment	Total Highway Segment Crashes	0.39	32.4	0.80	67.6	1.19	100.0
	Total Crashes	0.39	32.4	0.80	67.6	1.19	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 13. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1137+96.210	1138+94.210	Information: for segment #1 (1137+96.210 to 1138+94.210), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1137+96.210	1138+94.210	Information: for segment #1 (1137+96.210 to 1138+94.210), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1137+96.210	1138+94.210	Information: for segment #1 (1137+96.210 to 1138+94.210), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1137+96.210	1138+94.210	Information: for segment #1 (1137+96.210 to 1138+94.210), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1138+94.210	1139+65.400	Information: for segment #2 (1138+94.210 to 1139+65.400), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1138+94.210	1139+65.400	Information: for segment #2 (1138+94.210 to 1139+65.400), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1138+94.210	1139+65.400	Information: for segment #2 (1138+94.210 to 1139+65.400), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1138+94.210	1139+65.400	Information: for segment #2 (1138+94.210 to 1139+65.400), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1139+65.400	1141+60.170	Information: for segment #3 (1139+65.400 to 1141+60.170), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1139+65.400	1141+60.170	Information: for segment #3 (1139+65.400 to 1141+60.170), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1139+65.400	1141+60.170	Information: for segment #3 (1139+65.400 to 1141+60.170), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1139+65.400	1141+60.170	Information: for segment #3 (1139+65.400 to 1141+60.170), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1141+60.170	1142+18.210	Information: for segment #4 (1141+60.170 to 1142+18.210), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1141+60.170	1142+18.210	Information: for segment #4 (1141+60.170 to 1142+18.210), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1141+60.170	1142+18.210	Information: for segment #4 (1141+60.170 to 1142+18.210), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1141+60.170	1142+18.210	Information: for segment #4 (1141+60.170 to 1142+18.210), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1142+18.210	1144+70.090	Information: for segment #5 (1142+18.210 to 1144+70.090), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1142+18.210	1144+70.090	Information: for segment #5 (1142+18.210 to 1144+70.090), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1142+18.210	1144+70.090	Information: for segment #5 (1142+18.210 to 1144+70.090), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1142+18.210	1144+70.090	Information: for segment #5 (1142+18.210 to 1144+70.090), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1144+70.090	1156+78.710	Information: for segment #6 (1144+70.090 to 1156+78.710), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1144+70.090	1156+78.710	Information: for segment #6 (1144+70.090 to 1156+78.710), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1144+70.090	1156+78.710	Information: for segment #6 (1144+70.090 to 1156+78.710), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1144+70.090	1156+78.710	Information: for segment #6 (1144+70.090 to 1156+78.710), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1156+78.710	1158+15.730	Information: for segment #7 (1156+78.710 to 1158+15.730), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1156+78.710	1158+15.730	Information: for segment #7 (1156+78.710 to 1158+15.730), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1156+78.710	1158+15.730	Information: for segment #7 (1156+78.710 to 1158+15.730), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1156+78.710	1158+15.730	Information: for segment #7 (1156+78.710 to 1158+15.730), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+15.730	1158+42.210	Information: for segment #9 (1158+15.730 to 1158+42.210), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+15.730	1158+42.210	Information: for segment #9 (1158+15.730 to 1158+42.210), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+15.730	1158+42.210	Information: for segment #9 (1158+15.730 to 1158+42.210), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+15.730	1158+42.210	Information: for segment #9 (1158+15.730 to 1158+42.210), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+42.210	1159+61.730	Information: for segment #11 (1158+42.210 to 1159+61.730), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+42.210	1159+61.730	Information: for segment #11 (1158+42.210 to 1159+61.730), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+42.210	1159+61.730	Information: for segment #11 (1158+42.210 to 1159+61.730), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+42.210	1159+61.730	Information: for segment #11 (1158+42.210 to 1159+61.730), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1159+61.730	1160+08.210	Information: for segment #13 (1159+61.730 to 1160+08.210), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1159+61.730	1160+08.210	Information: for segment #13 (1159+61.730 to 1160+08.210), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1159+61.730	1160+08.210	Information: for segment #13 (1159+61.730 to 1160+08.210), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1159+61.730	1160+08.210	Information: for segment #13 (1159+61.730 to 1160+08.210), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+08.210	1160+75.280	Information: for segment #14 (1160+08.210 to 1160+75.280), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+08.210	1160+75.280	Information: for segment #14 (1160+08.210 to 1160+75.280), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+08.210	1160+75.280	Information: for segment #14 (1160+08.210 to 1160+75.280), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+08.210	1160+75.280	Information: for segment #14 (1160+08.210 to 1160+75.280), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+75.280	1160+88.270	Information: for segment #15 (1160+75.280 to 1160+88.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1160+75.280	1160+88.270	Information: for segment #15 (1160+75.280 to 1160+88.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+75.280	1160+88.270	Information: for segment #15 (1160+75.280 to 1160+88.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+75.280	1160+88.270	Information: for segment #15 (1160+75.280 to 1160+88.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1157+46.730	1158+15.730	Information: for segment #8 (1157+46.730 to 1158+15.730), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+15.730	1158+42.210	Information: for segment #10 (1158+15.730 to 1158+42.210), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+42.210	1159+61.730	Information: for segment #12 (1158+42.210 to 1159+61.730), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1159+61.730	1160+08.210	Information: for segment #13 (1159+61.730 to 1160+08.210), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1160+08.210	1160+75.280	Information: for segment #14 (1160+08.210 to 1160+75.280), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1160+75.280	1160+88.270	Information: for segment #15 (1160+75.280 to 1160+88.270), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

Report Generated: Aug 24, 2022 3:39 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:59:13 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL2
Highway Comment: Imported from CENTRAL2.xml
Highway Version: 1

Evaluation Title: Section 3
Evaluation Comment: Created Thu Jun 23 11:58:20 CDT 2022

Minimum Location: 1181+39.215
Maximum Location: 1301+70.260

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1181+39.215
Evaluation End Location: 1301+70.260
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_MV=1.0; FI_SV=1.0; PDO_MV=1.0; PDO_SV=1.0;

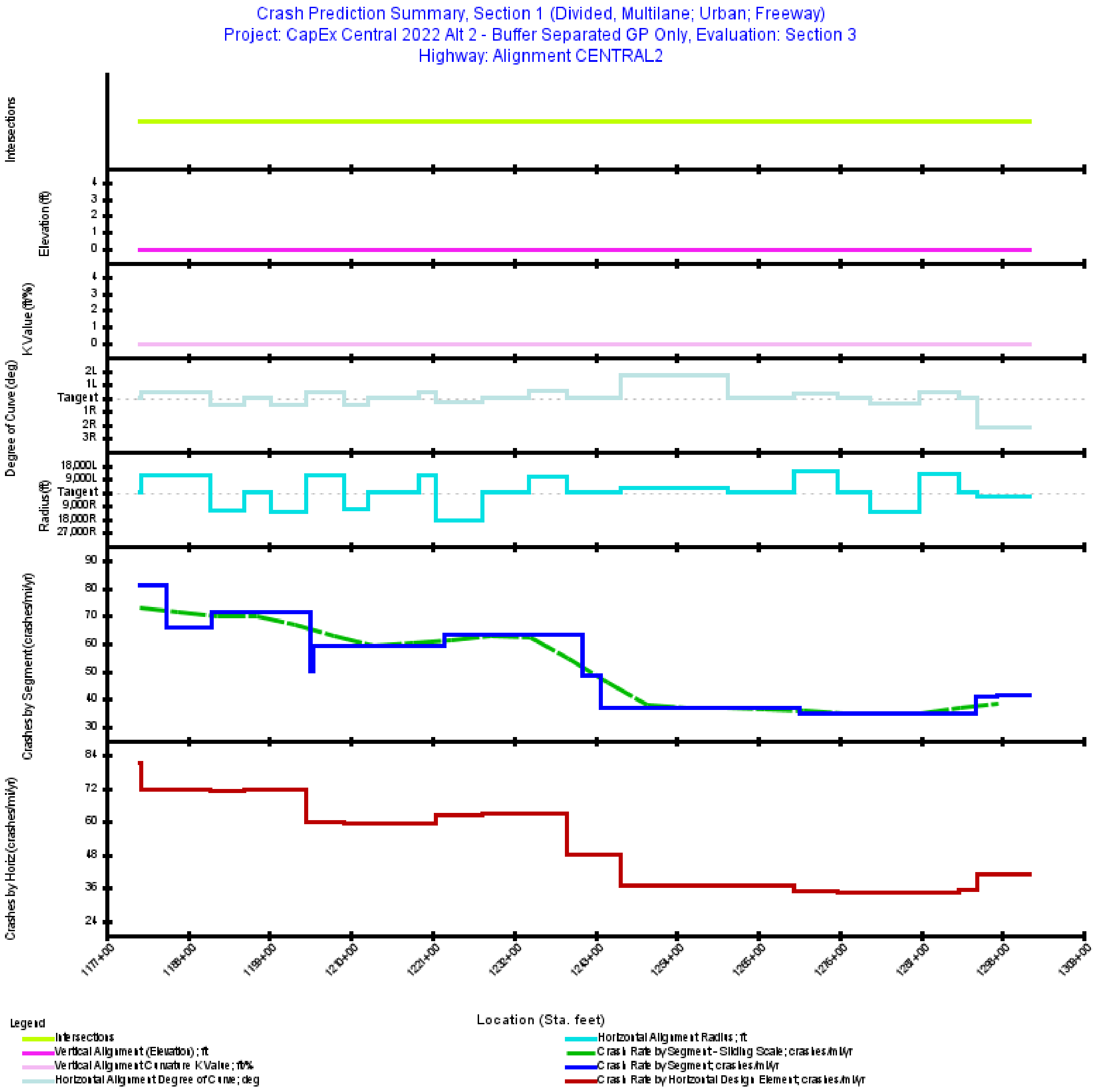

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Seven-lane Freeway	Urban	1181+39.215	1185+16.760	377.55	0.0715	2030: 181,000	58.00	Non-Traversable Median	66.00
2	Six-lane Freeway	Urban	1185+16.760	1191+27.480	610.72	0.1157	2030: 163,350	58.00	Non-Traversable Median	66.00
3	Seven-lane Freeway	Urban	1191+27.480	1204+51.660	1,324.18	0.2508	2030: 168,950	58.00	Non-Traversable Median	66.00
4	Six-lane Freeway	Urban	1204+51.660	1204+99.010	47.35	0.0090	2030: 135,350	58.00	Non-Traversable Median	66.00
5	Seven-lane Freeway	Urban	1204+99.010	1222+62.550	1,763.54	0.3340	2030: 155,300	58.00	Non-Traversable Median	66.22
6	Eight-lane Freeway	Urban	1222+62.550	1241+21.390	1,858.84	0.3521	2030: 163,000	62.00	Non-Traversable Median	67.88
7	Seven-lane Freeway	Urban	1241+21.390	1243+70.050	248.66	0.0471	2030: 130,600	60.89	Non-Traversable Median	68.89
8	Six-lane Freeway	Urban	1243+70.050	1270+59.215	2,689.16	0.5093	2030: 105,100	56.10	Non-Traversable Median	70.74
9	Six-lane Freeway	Urban	1270+59.215	1294+38.280	2,379.07	0.4506	2030: 105,100	65.00	Non-Traversable Median	75.00
10	Six-lane Freeway	Urban	1294+38.280	1297+26.215	287.93	0.0545	2030: 105,100	69.00	Non-Traversable Median	77.50
11	Six-lane Freeway	Urban	1297+26.215	1301+70.260	444.05	0.0841	2030: 105,100	69.00	Non-Traversable Median	78.77

Table 2. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**2.2786**
Average Future Road AADT (vpd)	**134,417**
Predicted Crashes	
Total Crashes	**116.18**
Fatal and Injury Crashes	**32.09**
Property-Damage-Only Crashes	**84.09**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**28**
Percent Property-Damage-Only Crashes (%)	**72**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**50.9863**
FI Crash Rate (crashes/mi/yr)	**14.0810**
PDO Crash Rate (crashes/mi/yr)	**36.9052**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**111.79**
Travel Crash Rate (crashes/million veh-mi)	**1.04**
Travel FI Crash Rate (crashes/million veh-mi)	**0.29**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.75**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.
Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 3. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1181+39.215	1185+16.760	0.0715	5.798	5.7980	1.5222	4.2759	81.0859	1.23
2	1185+16.760	1191+27.480	0.1157	7.616	7.6157	1.9521	5.6636	65.8415	1.10
3	1191+27.480	1204+51.660	0.2508	17.922	17.9216	4.7926	13.1290	71.4603	1.16
4	1204+51.660	1204+99.010	0.0090	0.447	0.4471	0.1202	0.3269	49.8584	1.01
5	1204+99.010	1222+62.550	0.3340	19.798	19.7982	5.3872	14.4110	59.2755	1.05
6	1222+62.550	1241+21.390	0.3521	22.207	22.2067	6.2872	15.9196	63.0778	1.06
7	1241+21.390	1243+70.050	0.0471	2.291	2.2911	0.6531	1.6380	48.6486	1.02
8	1243+70.050	1270+59.215	0.5093	18.782	18.7818	5.3217	13.4602	36.8769	0.96
9	1270+59.215	1294+38.280	0.4506	15.619	15.6191	4.4548	11.1643	34.6644	0.90
10	1294+38.280	1297+26.215	0.0545	2.228	2.2281	0.6244	1.6037	40.8572	1.06
11	1297+26.215	1301+70.260	0.0841	3.470	3.4701	0.9698	2.5003	41.2620	1.08
Total			2.2786	116.178	116.1776	32.0852	84.0925	50.9863	1.04

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1181+39.215	1181+65.772	0.0050	0.408	0.4078	0.1071	0.3008	81.0859	1.23
Simple Curve 1	1181+65.772	1191+08.412	0.1785	12.768	12.7681	3.3062	9.4619	71.5177	1.15
Simple Curve 2	1191+08.412	1195+55.770	0.0847	6.034	6.0343	1.6111	4.4233	71.2208	1.16
Tangent	1195+55.770	1199+27.159	0.0703	5.026	5.0264	1.3442	3.6823	71.4603	1.16
Simple Curve 3	1199+27.159	1203+92.707	0.0882	6.301	6.3008	1.6850	4.6158	71.4603	1.16
Simple Curve 4	1203+92.707	1209+17.267	0.0993	5.941	5.9405	1.6113	4.3293	59.7948	1.05
Simple Curve 5	1209+17.267	1212+36.361	0.0604	3.582	3.5823	0.9748	2.6075	59.2755	1.05
Tangent	1212+36.361	1219+22.461	0.1299	7.702	7.7024	2.0959	5.6066	59.2755	1.05
Simple Curve 6	1219+22.461	1221+54.111	0.0439	2.601	2.6006	0.7076	1.8930	59.2755	1.05
Simple Curve 7	1221+54.111	1227+72.169	0.1171	7.306	7.3056	2.0549	5.2506	62.4107	1.06
Tangent	1227+72.169	1234+11.553	0.1211	7.638	7.6384	2.1626	5.4758	63.0778	1.06
Simple Curve 8	1234+11.553	1239+25.969	0.0974	6.146	6.1455	1.7399	4.4056	63.0778	1.06
Tangent	1239+25.969	1246+43.446	0.1359	6.535	6.5352	1.8551	4.6801	48.0931	1.01
Simple Curve 9	1246+43.446	1260+99.318	0.2757	10.168	10.1682	2.8811	7.2871	36.8769	0.96
Tangent	1260+99.318	1269+94.455	0.1695	6.252	6.2519	1.7714	4.4805	36.8769	0.96
Simple Curve 10	1269+94.455	1275+78.714	0.1107	3.863	3.8629	1.1009	2.7620	34.9097	0.91
Tangent	1275+78.714	1280+14.318	0.0825	2.860	2.8598	0.8157	2.0442	34.6644	0.90
Simple Curve 11	1280+14.318	1286+74.447	0.1250	4.334	4.3339	1.2361	3.0978	34.6644	0.90
Simple Curve 12	1286+74.447	1292+07.157	0.1009	3.497	3.4974	0.9975	2.4999	34.6644	0.90
Tangent	1292+07.157	1294+70.453	0.0499	1.766	1.7663	0.5025	1.2638	35.4211	0.92
Simple Curve 13	1294+70.453	1301+70.260	0.1325	5.449	5.4492	1.5244	3.9248	41.1141	1.07

Table 5. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	116.18	32.09	27.617	84.09	72.383
Total	116.18	32.09	27.617	84.09	72.383
Average	116.18	32.09	27.617	84.09	72.383

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0354	0.0745	0.5117	0.9006	4.2759
2	0.0459	0.0968	0.6594	1.1500	5.6636
3	0.1080	0.2258	1.5872	2.8717	13.1290
4	0.0028	0.0060	0.0406	0.0708	0.3269
5	0.1195	0.2488	1.7702	3.2488	14.4110
6	0.1382	0.2871	2.0570	3.8049	15.9196
7	0.0132	0.0269	0.2051	0.4078	1.6380
8	0.1172	0.2437	1.7429	3.2178	13.4602
9	0.1004	0.2099	1.4753	2.6692	11.1643
10	0.0144	0.0303	0.2093	0.3704	1.6037
11	0.0228	0.0481	0.3276	0.5713	2.5003
Total	0.7178	1.4978	10.5863	19.2833	84.0925

Table 7. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.05	0.0	0.71	0.6	0.76	0.7
Highway Segment	Collision with Fixed Object	8.44	7.3	23.23	20.0	31.67	27.3
Highway Segment	Collision with Other Object	0.60	0.5	4.51	3.9	5.11	4.4
Highway Segment	Other Single-vehicle Collision	2.43	2.1	3.47	3.0	5.90	5.1
Highway Segment	Collision with Parked Vehicle	0.17	0.2	0.52	0.4	0.69	0.6
Highway Segment	Total Single Vehicle Crashes	11.69	10.1	32.45	27.9	44.13	38.0
Highway Segment	Right-Angle Collision	0.63	0.5	0.93	0.8	1.56	1.3
Highway Segment	Head-on Collision	0.16	0.1	0.10	0.1	0.27	0.2
Highway Segment	Other Multi-vehicle Collision	0.63	0.5	1.24	1.1	1.87	1.6
Highway Segment	Rear-end Collision	15.30	13.2	35.63	30.7	50.93	43.8
Highway Segment	Sideswipe, Same Direction Collision	3.67	3.2	13.74	11.8	17.41	15.0
Highway Segment	Total Multiple Vehicle Crashes	20.40	17.6	51.65	44.5	72.04	62.0
Highway Segment	Total Highway Segment Crashes	32.09	27.6	84.09	72.4	116.18	100.0
	Total Crashes	32.09	27.6	84.09	72.4	116.18	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1181+39.215	1185+16.760	Information: for segment #1 (1181+39.215 to 1185+16.760), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1181+39.215	1185+16.760	Information: for segment #1 (1181+39.215 to 1185+16.760), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1181+39.215	1185+16.760	Information: for segment #1 (1181+39.215 to 1185+16.760), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1181+39.215	1185+16.760	Information: for segment #1 (1181+39.215 to 1185+16.760), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1185+16.760	1191+27.480	Information: for segment #2 (1185+16.760 to 1191+27.480), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1185+16.760	1191+27.480	Information: for segment #2 (1185+16.760 to 1191+27.480), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1185+16.760	1191+27.480	Information: for segment #2 (1185+16.760 to 1191+27.480), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1185+16.760	1191+27.480	Information: for segment #2 (1185+16.760 to 1191+27.480), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1191+27.480	1204+51.660	Information: for segment #3 (1191+27.480 to 1204+51.660), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1191+27.480	1204+51.660	Information: for segment #3 (1191+27.480 to 1204+51.660), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1191+27.480	1204+51.660	Information: for segment #3 (1191+27.480 to 1204+51.660), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1191+27.480	1204+51.660	Information: for segment #3 (1191+27.480 to 1204+51.660), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1204+51.660	1204+99.010	Information: for segment #4 (1204+51.660 to 1204+99.010), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1204+51.660	1204+99.010	Information: for segment #4 (1204+51.660 to 1204+99.010), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1204+51.660	1204+99.010	Information: for segment #4 (1204+51.660 to 1204+99.010), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1204+51.660	1204+99.010	Information: for segment #4 (1204+51.660 to 1204+99.010), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1204+99.010	1222+62.550	Information: for segment #5 (1204+99.010 to 1222+62.550), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1204+99.010	1222+62.550	Information: for segment #5 (1204+99.010 to 1222+62.550), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1204+99.010	1222+62.550	Information: for segment #5 (1204+99.010 to 1222+62.550), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1204+99.010	1222+62.550	Information: for segment #5 (1204+99.010 to 1222+62.550), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1222+62.550	1241+21.390	Information: for segment #6 (1222+62.550 to 1241+21.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1222+62.550	1241+21.390	Information: for segment #6 (1222+62.550 to 1241+21.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1222+62.550	1241+21.390	Information: for segment #6 (1222+62.550 to 1241+21.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1222+62.550	1241+21.390	Information: for segment #6 (1222+62.550 to 1241+21.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1241+21.390	1243+70.050	Information: for segment #7 (1241+21.390 to 1243+70.050), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1241+21.390	1243+70.050	Information: for segment #7 (1241+21.390 to 1243+70.050), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1241+21.390	1243+70.050	Information: for segment #7 (1241+21.390 to 1243+70.050), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1241+21.390	1243+70.050	Information: for segment #7 (1241+21.390 to 1243+70.050), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1243+70.050	1270+59.215	Information: for segment #8 (1243+70.050 to 1270+59.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1243+70.050	1270+59.215	Information: for segment #8 (1243+70.050 to 1270+59.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1243+70.050	1270+59.215	Information: for segment #8 (1243+70.050 to 1270+59.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1243+70.050	1270+59.215	Information: for segment #8 (1243+70.050 to 1270+59.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1270+59.215	1294+38.280	Information: for segment #9 (1270+59.215 to 1294+38.280), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1270+59.215	1294+38.280	Information: for segment #9 (1270+59.215 to 1294+38.280), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1270+59.215	1294+38.280	Information: for segment #9 (1270+59.215 to 1294+38.280), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1270+59.215	1294+38.280	Information: for segment #9 (1270+59.215 to 1294+38.280), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+38.280	1297+26.215	Information: for segment #10 (1294+38.280 to 1297+26.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+38.280	1297+26.215	Information: for segment #10 (1294+38.280 to 1297+26.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+38.280	1297+26.215	Information: for segment #10 (1294+38.280 to 1297+26.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+38.280	1297+26.215	Information: for segment #10 (1294+38.280 to 1297+26.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1297+26.215	1301+70.260	Information: for segment #11 (1297+26.215 to 1301+70.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1297+26.215	1301+70.260	Information: for segment #11 (1297+26.215 to 1301+70.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1297+26.215	1301+70.260	Information: for segment #11 (1297+26.215 to 1301+70.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1297+26.215	1301+70.260	Information: for segment #11 (1297+26.215 to 1301+70.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1181+39.215	1185+16.760	Warning: for segment #1 (1181+39.215 to 1185+16.760), traffic volume (181,000 vpd) for 2030 is not within the model limit (180,000 vpd) for reliable results for segment type 6F

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1181+39.215	1185+16.760	Information: for segment #1 (1181+39.215 to 1185+16.760), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1191+27.480	1204+51.660	Information: for segment #3 (1191+27.480 to 1204+51.660), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1204+99.010	1222+62.550	Information: for segment #5 (1204+99.010 to 1222+62.550), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1241+21.390	1243+70.050	Information: for segment #7 (1241+21.390 to 1243+70.050), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

Report Generated: Aug 24, 2022 3:40 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 12:00:27 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL2
Highway Comment: Imported from CENTRAL2.xml
Highway Version: 1

Evaluation Title: Section 4
Evaluation Comment: Created Thu Jun 23 11:59:39 CDT 2022

Minimum Location: 1343+13.390
Maximum Location: 1418+67.223

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1343+13.390
Evaluation End Location: 1418+67.223
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_EN=1.0; FI_EX=1.0; FI_MV=1.0; FI_SV=1.0; PDO_EN=1.0; PDO_EX=1.0; PDO_MV=1.0; PDO_SV=1.0;

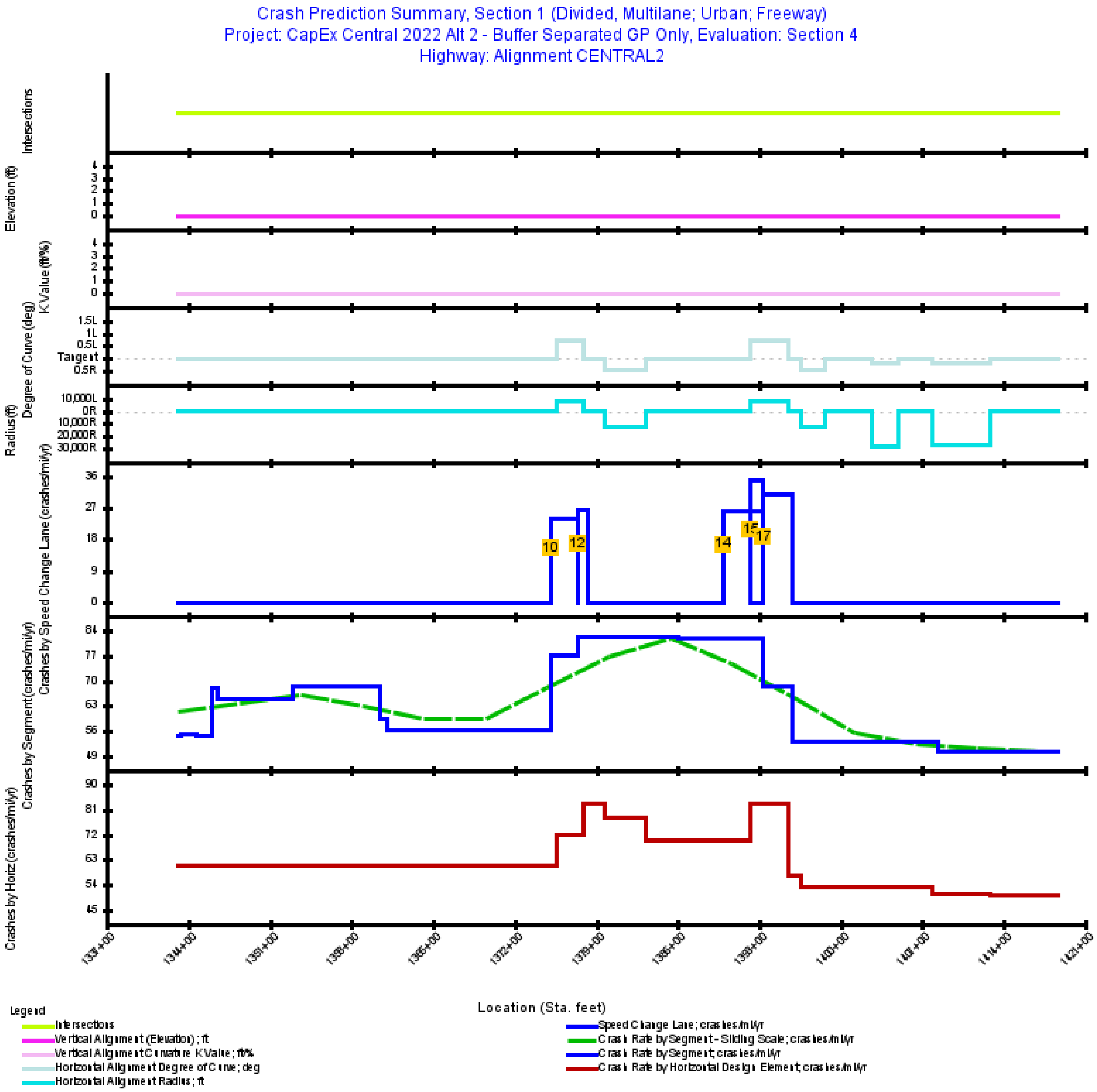

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Eight-lane Freeway	Urban	1343+13.390	1343+39.350	25.96	0.0049	2030: 158,050	58.00	Non-Traversable Median	67.95
2	Eight-lane Freeway	Urban	1343+39.350	1344+71.390	132.04	0.0250	2030: 158,050	58.00	Non-Traversable Median	67.37
3	Eight-lane Freeway	Urban	1344+71.390	1346+07.390	136.00	0.0258	2030: 158,050	58.00	Non-Traversable Median	66.61
4	Ten-lane Freeway	Urban	1346+07.390	1346+47.920	40.53	0.0077	2030: 185,350	58.00	Non-Traversable Median	66.11
5	Ten-lane Freeway	Urban	1346+47.920	1352+90.390	642.47	0.1217	2030: 185,350	57.92	Non-Traversable Median	64.50
6	Ten-lane Freeway	Urban	1352+90.390	1360+45.180	754.79	0.1430	2030: 185,350	54.00	Non-Traversable Median	62.50
7	Nine-lane Freeway	Urban	1360+45.180	1361+05.390	60.21	0.0114	2030: 172,950	54.00	Non-Traversable Median	62.00
8	Eight-lane Freeway	Urban	1361+05.390	1375+07.630	1,402.24	0.2656	2030: 158,850	54.00	Non-Traversable Median	62.00
9	Eight-lane Freeway	Urban	1375+07.630	1377+39.570	231.94	0.0439	2030: 182,900	54.00	Non-Traversable Median	62.00
11	Nine-lane Freeway	Urban	1377+39.570	1386+00.390	860.82	0.1630	2030: 203,000	54.00	Non-Traversable Median	62.50
13	Nine-lane Freeway	Urban	1386+00.390	1393+33.520	733.13	0.1389	2030: 203,000	58.00	Non-Traversable Median	64.50
16	Eight-lane Freeway	Urban	1393+33.520	1395+79.430	245.91	0.0466	2030: 168,550	58.00	Non-Traversable Median	66.00
18	Seven-lane Freeway	Urban	1395+79.430	1408+12.390	1,232.96	0.2335	2030: 147,550	58.00	Non-Traversable Median	69.50
19	Seven-lane Freeway	Urban	1408+12.390	1408+39.350	26.96	0.0051	2030: 147,550	65.18	Non-Traversable Median	73.18
20	Eight-lane Freeway	Urban	1408+39.350	1418+67.223	1,027.87	0.1947	2030: 147,550	70.00	Non-Traversable Median	75.67

Table 2. Evaluation Freeway - Speed Change Lanes (Speed Change)

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
10	Eight-lane Freeway Speed Change	Exit	1375+07.630	1377+39.570	231.94	0.0439	2030: 182,900	54.00	Non-Traversable Median	62.00
12	Nine-lane Freeway Speed Change	Exit	1377+39.570	1378+27.630	88.06	0.0167	2030: 203,000	54.00	Non-Traversable Median	62.00
14	Nine-lane Freeway Speed Change	Exit	1389+88.520	1393+33.520	345.00	0.0653	2030: 203,000	58.00	Non-Traversable Median	66.00
15	Nine-lane Freeway Speed Change	Entrance	1392+24.430	1393+33.520	109.09	0.0207	2030: 203,000	58.00	Non-Traversable Median	66.00
17	Eight-lane Freeway Speed Change	Entrance	1393+33.520	1395+79.430	245.91	0.0466	2030: 168,550	58.00	Non-Traversable Median	66.00

Table 3. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**1.3341**
Average Future Road AADT (vpd)	**169,533**
Predicted Crashes	
Total Crashes	**83.23**
Fatal and Injury Crashes	**23.49**
Property-Damage-Only Crashes	**59.74**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**28**
Percent Property-Damage-Only Crashes (%)	**72**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**62.3882**
FI Crash Rate (crashes/mi/yr)	**17.6085**
PDO Crash Rate (crashes/mi/yr)	**44.7796**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**82.55**
Travel Crash Rate (crashes/million veh-mi)	**1.01**
Travel FI Crash Rate (crashes/million veh-mi)	**0.28**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.72**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Table 4. Predicted Freeway Speed Change Lane Crash Rates and Frequencies Summary (Speed Change)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Length (mi)	**0.1932**
Average Future Road AADT (vpd)	**95,062**
Predicted Crashes	
Total Crashes	**5.36**
Fatal and Injury Crashes	**1.76**
Property-Damage-Only Crashes	**3.60**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**33**
Percent Property-Damage-Only Crashes (%)	**67**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**27.7288**
FI Crash Rate (crashes/mi/yr)	**9.1059**
PDO Crash Rate (crashes/mi/yr)	**18.6229**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**6.70**
Travel Crash Rate (crashes/million veh-mi)	**0.80**
Travel FI Crash Rate (crashes/million veh-mi)	**0.26**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.54**

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 5. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1343+13.390	1343+39.350	0.0049	0.270	0.2697	0.0745	0.1951	54.8496	0.95
2	1343+39.350	1344+71.390	0.0250	1.376	1.3756	0.3803	0.9953	55.0089	0.95
3	1344+71.390	1346+07.390	0.0258	1.414	1.4137	0.3951	1.0186	54.8864	0.95
4	1346+07.390	1346+47.920	0.0077	0.522	0.5217	0.1530	0.3687	67.9657	1.00
5	1346+47.920	1352+90.390	0.1217	7.912	7.9125	2.3252	5.5872	65.0269	0.96
6	1352+90.390	1360+45.180	0.1430	9.769	9.7693	2.8720	6.8973	68.3394	1.01
7	1360+45.180	1361+05.390	0.0114	0.676	0.6756	0.1936	0.4820	59.2497	0.94
8	1361+05.390	1375+07.630	0.2656	14.913	14.9130	4.2205	10.6925	56.1535	0.97
9	1375+07.630	1377+39.570	0.0220	1.695	1.6949	0.4644	1.2305	77.1673	1.16
11	1377+39.570	1386+00.390	0.1547	12.718	12.7178	3.4906	9.2272	82.2120	1.11
13	1386+00.390	1393+33.520	0.0958	7.843	7.8425	2.1541	5.6884	81.8210	1.10
16	1393+33.520	1395+79.430	0.0233	1.598	1.5984	0.4472	1.1512	68.6410	1.12
18	1395+79.430	1408+12.390	0.2335	12.415	12.4155	3.4131	9.0025	53.1681	0.99
19	1408+12.390	1408+39.350	0.0051	0.271	0.2713	0.0746	0.1967	53.1243	0.99
20	1408+39.350	1418+67.223	0.1947	9.838	9.8379	2.8326	7.0053	50.5353	0.94
Total			1.3341	83.230	83.2295	23.4908	59.7387	62.3882	1.01

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 6. Predicted Crash Frequencies and Rates by Freeway Speed Change Lane (Speed Change)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
10	1375+07.630	1377+39.570	0.0439	1.053	1.0526	0.3194	0.7332	23.9627	0.72
12	1377+39.570	1378+27.630	0.0167	0.439	0.4389	0.1330	0.3059	26.3183	0.71
14	1389+88.520	1393+33.520	0.0653	1.706	1.7061	0.5129	1.1933	26.1114	0.70
15	1392+24.430	1393+33.520	0.0207	0.720	0.7198	0.2608	0.4590	34.8377	0.94
17	1393+33.520	1395+79.430	0.0466	1.439	1.4392	0.5330	0.9062	30.9017	1.00
Total			0.1932	5.357	5.3567	1.7591	3.5976	27.7288	0.80

Note: *Travel Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 7. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1343+13.390	1375+66.020	0.6160	37.543	37.5429	10.8116	26.7313	60.9434	0.99
Simple Curve 1	1375+66.020	1377+90.504	0.0425	3.062	3.0622	0.8699	2.1923	72.0258	1.86
Tangent	1377+90.504	1379+73.892	0.0347	2.894	2.8944	0.7997	2.0947	83.3349	1.25
Simple Curve 2	1379+73.892	1383+26.747	0.0668	5.213	5.2131	1.4308	3.7823	78.0069	1.11
Tangent	1383+26.747	1392+20.762	0.1693	11.828	11.8276	3.2776	8.5500	69.8532	1.29
Simple Curve 3	1392+20.762	1395+42.746	0.0610	5.068	5.0681	1.5937	3.4744	83.1087	2.33
Tangent	1395+42.746	1396+53.147	0.0209	1.196	1.1955	0.3503	0.8452	57.1734	1.36
Simple Curve 4	1396+53.147	1398+62.242	0.0396	2.106	2.1055	0.5788	1.5267	53.1681	0.99
Tangent	1398+62.242	1402+65.418	0.0764	4.060	4.0599	1.1161	2.9438	53.1681	0.99
Simple Curve 5	1402+65.418	1404+94.572	0.0434	2.308	2.3075	0.6343	1.6732	53.1681	0.99
Tangent	1404+94.572	1407+89.943	0.0559	2.974	2.9743	0.8176	2.1567	53.1681	0.99
Simple Curve 6	1407+89.943	1412+79.861	0.0928	4.713	4.7135	1.3506	3.3628	50.7984	0.94
Tangent	1412+79.861	1418+67.223	0.1112	5.622	5.6217	1.6186	4.0031	50.5353	0.94

Table 8. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	88.59	25.25	28.503	63.34	71.497
Total	88.59	25.25	28.503	63.34	71.497
Average	88.59	25.25	28.503	63.34	71.497

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 9. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0015	0.0031	0.0234	0.0465	0.1951
2	0.0077	0.0157	0.1194	0.2375	0.9953
3	0.0080	0.0163	0.1241	0.2468	1.0186
4	0.0031	0.0063	0.0481	0.0956	0.3687
5	0.0470	0.0958	0.7303	1.4520	5.5872
6	0.0581	0.1184	0.9021	1.7934	6.8973
7	0.0039	0.0080	0.0608	0.1209	0.4820
8	0.0854	0.1740	1.3256	2.6356	10.6925
9	0.0105	0.0220	0.1541	0.2778	1.2305
11	0.0757	0.1568	1.1348	2.1233	9.2272
13	0.0436	0.0888	0.6768	1.3449	5.6884
16	0.0103	0.0216	0.1495	0.2659	1.1512
18	0.0730	0.1508	1.1023	2.0869	9.0025
19	0.0018	0.0037	0.0252	0.0439	0.1967
20	0.0611	0.1265	0.9185	1.7265	7.0053
Total	0.4907	1.0078	7.4951	14.4973	59.7387

Table 10. Predicted Crash Severity by Speed Change Lane (Speed Change)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
10	0.0072	0.0151	0.1060	0.1910	0.7332
12	0.0029	0.0061	0.0436	0.0804	0.3059
14	0.0109	0.0225	0.1651	0.3144	1.1933
15	0.0061	0.0129	0.0881	0.1536	0.4590
17	0.0122	0.0257	0.1782	0.3169	0.9062
Total	0.0394	0.0824	0.5809	1.0564	3.5976

Table 11. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.03	0.0	0.48	0.6	0.51	0.6
Highway Segment	Collision with Fixed Object	5.98	7.2	15.57	18.7	21.55	25.9
Highway Segment	Collision with Other Object	0.42	0.5	3.02	3.6	3.44	4.1
Highway Segment	Other Single-vehicle Collision	1.72	2.1	2.33	2.8	4.05	4.9
Highway Segment	Collision with Parked Vehicle	0.12	0.1	0.35	0.4	0.47	0.6
Highway Segment	Total Single Vehicle Crashes	8.28	10.0	21.75	26.1	30.03	36.1
Highway Segment	Right-Angle Collision	0.47	0.6	0.68	0.8	1.16	1.4
Highway Segment	Head-on Collision	0.12	0.1	0.08	0.1	0.20	0.2
Highway Segment	Other Multi-vehicle Collision	0.47	0.6	0.91	1.1	1.38	1.7
Highway Segment	Rear-end Collision	11.41	13.7	26.21	31.5	37.62	45.2
Highway Segment	Sideswipe, Same Direction Collision	2.74	3.3	10.11	12.1	12.84	15.4
Highway Segment	Total Multiple Vehicle Crashes	15.21	18.3	37.99	45.6	53.20	63.9
Highway Segment	Total Highway Segment Crashes	23.49	28.2	59.74	71.8	83.23	100.0
	Total Crashes	23.49	28.2	59.74	71.8	83.23	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 12. Predicted Exit Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.02	0.5	0.02	0.5
Highway Segment	Collision with Fixed Object	0.19	5.9	0.46	14.5	0.65	20.4
Highway Segment	Collision with Other Object	0.01	0.5	0.07	2.1	0.08	2.6
Highway Segment	Other Single-vehicle Collision	0.05	1.5	0.05	1.6	0.10	3.1
Highway Segment	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Total Single Vehicle Crashes	0.25	7.9	0.60	18.6	0.85	26.5
Highway Segment	Right-Angle Collision	0.01	0.3	0.03	0.8	0.04	1.2
Highway Segment	Head-on Collision	0.01	0.2	0.00	0.1	0.01	0.3
Highway Segment	Other Multi-vehicle Collision	0.01	0.5	0.04	1.1	0.05	1.6
Highway Segment	Rear-end Collision	0.53	16.6	1.26	39.4	1.79	56.0
Highway Segment	Sideswipe, Same Direction Collision	0.15	4.8	0.31	9.6	0.46	14.4
Highway Segment	Total Multiple Vehicle Crashes	0.71	22.3	1.64	51.2	2.35	73.5
Highway Segment	Total Highway Segment Crashes	0.96	30.2	2.23	69.8	3.20	100.0
	Total Crashes	0.96	30.2	2.23	69.8	3.20	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 13. Predicted Entrance Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.00	0.1	0.00	0.1
Highway Segment	Collision with Fixed Object	0.15	7.1	0.18	8.2	0.33	15.3
Highway Segment	Collision with Other Object	0.01	0.7	0.05	2.3	0.06	3.0
Highway Segment	Other Single-vehicle Collision	0.05	2.5	0.02	1.0	0.07	3.5
Highway Segment	Collision with Parked Vehicle	0.00	0.1	0.00	0.2	0.01	0.3
Highway Segment	Total Single Vehicle Crashes	0.23	10.4	0.25	11.8	0.48	22.2
Highway Segment	Right-Angle Collision	0.01	0.7	0.02	1.0	0.04	1.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.1	0.01	0.2
Highway Segment	Other Multi-vehicle Collision	0.01	0.6	0.02	0.9	0.03	1.6
Highway Segment	Rear-end Collision	0.43	20.0	0.72	33.5	1.16	53.5
Highway Segment	Sideswipe, Same Direction Collision	0.11	4.9	0.34	15.9	0.45	20.8
Highway Segment	Total Multiple Vehicle Crashes	0.57	26.3	1.11	51.5	1.68	77.8
Highway Segment	Total Highway Segment Crashes	0.79	36.8	1.36	63.2	2.16	100.0
	Total Crashes	0.79	36.8	1.36	63.2	2.16	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 14. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1343+13.390	1343+39.350	Information: for segment #1 (1343+13.390 to 1343+39.350), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1343+13.390	1343+39.350	Information: for segment #1 (1343+13.390 to 1343+39.350), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1343+13.390	1343+39.350	Information: for segment #1 (1343+13.390 to 1343+39.350), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1343+13.390	1343+39.350	Information: for segment #1 (1343+13.390 to 1343+39.350), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1343+39.350	1344+71.390	Information: for segment #2 (1343+39.350 to 1344+71.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1343+39.350	1344+71.390	Information: for segment #2 (1343+39.350 to 1344+71.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1343+39.350	1344+71.390	Information: for segment #2 (1343+39.350 to 1344+71.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1343+39.350	1344+71.390	Information: for segment #2 (1343+39.350 to 1344+71.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1344+71.390	1346+07.390	Information: for segment #3 (1344+71.390 to 1346+07.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1344+71.390	1346+07.390	Information: for segment #3 (1344+71.390 to 1346+07.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1344+71.390	1346+07.390	Information: for segment #3 (1344+71.390 to 1346+07.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1344+71.390	1346+07.390	Warning: for segment #3 (1344+71.390 to 1346+07.390), Outside barrier offset (8.00 feet) is less than the left outside shoulder width (9.00 feet). This indicates there is problem with the input data.
1346+07.390	1346+47.920	Information: for segment #4 (1346+07.390 to 1346+47.920), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+07.390	1346+47.920	Information: for segment #4 (1346+07.390 to 1346+47.920), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+07.390	1346+47.920	Information: for segment #4 (1346+07.390 to 1346+47.920), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+07.390	1346+47.920	Information: for segment #4 (1346+07.390 to 1346+47.920), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+47.920	1352+90.390	Information: for segment #5 (1346+47.920 to 1352+90.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+47.920	1352+90.390	Information: for segment #5 (1346+47.920 to 1352+90.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+47.920	1352+90.390	Information: for segment #5 (1346+47.920 to 1352+90.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+47.920	1352+90.390	Information: for segment #5 (1346+47.920 to 1352+90.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1352+90.390	1360+45.180	Information: for segment #6 (1352+90.390 to 1360+45.180), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1352+90.390	1360+45.180	Information: for segment #6 (1352+90.390 to 1360+45.180), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1352+90.390	1360+45.180	Information: for segment #6 (1352+90.390 to 1360+45.180), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1352+90.390	1360+45.180	Information: for segment #6 (1352+90.390 to 1360+45.180), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1360+45.180	1361+05.390	Information: for segment #7 (1360+45.180 to 1361+05.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1360+45.180	1361+05.390	Information: for segment #7 (1360+45.180 to 1361+05.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1360+45.180	1361+05.390	Information: for segment #7 (1360+45.180 to 1361+05.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1360+45.180	1361+05.390	Warning: for segment #7 (1360+45.180 to 1361+05.390), Outside barrier offset (8.00 feet) is less than the left outside shoulder width (9.00 feet). This indicates there is problem with the input data.
1361+05.390	1375+07.630	Information: for segment #8 (1361+05.390 to 1375+07.630), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1361+05.390	1375+07.630	Information: for segment #8 (1361+05.390 to 1375+07.630), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1361+05.390	1375+07.630	Information: for segment #8 (1361+05.390 to 1375+07.630), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1361+05.390	1375+07.630	Information: for segment #8 (1361+05.390 to 1375+07.630), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1375+07.630	1377+39.570	Information: for segment #9 (1375+07.630 to 1377+39.570), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1375+07.630	1377+39.570	Information: for segment #9 (1375+07.630 to 1377+39.570), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1375+07.630	1377+39.570	Information: for segment #9 (1375+07.630 to 1377+39.570), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1375+07.630	1377+39.570	Information: for segment #9 (1375+07.630 to 1377+39.570), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+39.570	1386+00.390	Information: for segment #11 (1377+39.570 to 1386+00.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+39.570	1386+00.390	Information: for segment #11 (1377+39.570 to 1386+00.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+39.570	1386+00.390	Information: for segment #11 (1377+39.570 to 1386+00.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+39.570	1386+00.390	Information: for segment #11 (1377+39.570 to 1386+00.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1386+00.390	1393+33.520	Information: for segment #13 (1386+00.390 to 1393+33.520), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1386+00.390	1393+33.520	Information: for segment #13 (1386+00.390 to 1393+33.520), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1386+00.390	1393+33.520	Information: for segment #13 (1386+00.390 to 1393+33.520), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1386+00.390	1393+33.520	Information: for segment #13 (1386+00.390 to 1393+33.520), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1393+33.520	1395+79.430	Information: for segment #16 (1393+33.520 to 1395+79.430), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1393+33.520	1395+79.430	Information: for segment #16 (1393+33.520 to 1395+79.430), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1393+33.520	1395+79.430	Information: for segment #16 (1393+33.520 to 1395+79.430), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1393+33.520	1395+79.430	Information: for segment #16 (1393+33.520 to 1395+79.430), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1395+79.430	1408+12.390	Information: for segment #18 (1395+79.430 to 1408+12.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1395+79.430	1408+12.390	Information: for segment #18 (1395+79.430 to 1408+12.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1395+79.430	1408+12.390	Information: for segment #18 (1395+79.430 to 1408+12.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1395+79.430	1408+12.390	Information: for segment #18 (1395+79.430 to 1408+12.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+12.390	1408+39.350	Information: for segment #19 (1408+12.390 to 1408+39.350), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+12.390	1408+39.350	Information: for segment #19 (1408+12.390 to 1408+39.350), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+12.390	1408+39.350	Information: for segment #19 (1408+12.390 to 1408+39.350), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+12.390	1408+39.350	Information: for segment #19 (1408+12.390 to 1408+39.350), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+39.350	1418+67.223	Information: for segment #20 (1408+39.350 to 1418+67.223), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+39.350	1418+67.223	Information: for segment #20 (1408+39.350 to 1418+67.223), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+39.350	1418+67.223	Information: for segment #20 (1408+39.350 to 1418+67.223), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+39.350	1418+67.223	Information: for segment #20 (1408+39.350 to 1418+67.223), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1375+07.630	1377+39.570	Information: for segment #10 (1375+07.630 to 1377+39.570), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+39.570	1378+27.630	Information: for segment #12 (1377+39.570 to 1378+27.630), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1389+88.520	1393+33.520	Information: for segment #14 (1389+88.520 to 1393+33.520), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1392+24.430	1393+33.520	Information: for segment #15 (1392+24.430 to 1393+33.520), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1393+33.520	1395+79.430	Information: for segment #17 (1393+33.520 to 1395+79.430), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1343+13.390	1343+39.350	Warning: for segment #1 (1343+13.390 to 1343+39.350), Freeway Segment of type 8F is using unbalanced lane processing with 5 + 3 lanes. While results are provided, the HSM specifies that this approach only applies when the number of lanes varies by no more than one lane between the two travel directions.
1343+39.350	1344+71.390	Warning: for segment #2 (1343+39.350 to 1344+71.390), Freeway Segment of type 8F is using unbalanced lane processing with 5 + 3 lanes. While results are provided, the HSM specifies that this approach only applies when the number of lanes varies by no more than one lane between the two travel directions.
1344+71.390	1346+07.390	Warning: for segment #3 (1344+71.390 to 1346+07.390), Freeway Segment of type 8F is using unbalanced lane processing with 5 + 3 lanes. While results are provided, the HSM specifies that this approach only applies when the number of lanes varies by no more than one lane between the two travel directions.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1360+45.180	1361+05.390	Information: for segment #7 (1360+45.180 to 1361+05.390), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1377+39.570	1386+00.390	Information: for segment #11 (1377+39.570 to 1386+00.390), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1386+00.390	1393+33.520	Information: for segment #13 (1386+00.390 to 1393+33.520), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1395+79.430	1408+12.390	Information: for segment #18 (1395+79.430 to 1408+12.390), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1408+12.390	1408+39.350	Information: for segment #19 (1408+12.390 to 1408+39.350), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1377+39.570	1378+27.630	Information: for segment #12 (1377+39.570 to 1378+27.630), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
1389+88.520	1393+33.520	Information: for segment #14 (1389+88.520 to 1393+33.520), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
1392+24.430	1393+33.520	Information: for segment #15 (1392+24.430 to 1393+33.520), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

Report Generated: Aug 24, 2022 3:42 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 12:02:48 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP+ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL2
Highway Comment: Imported from CENTRAL2.xml
Highway Version: 1

Evaluation Title: Section 1
Evaluation Comment: Created Thu Jun 23 12:01:54 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1086+14.425

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1086+14.425
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_MV=1.0; FI_SV=1.0; PDO_MV=1.0; PDO_SV=1.0;

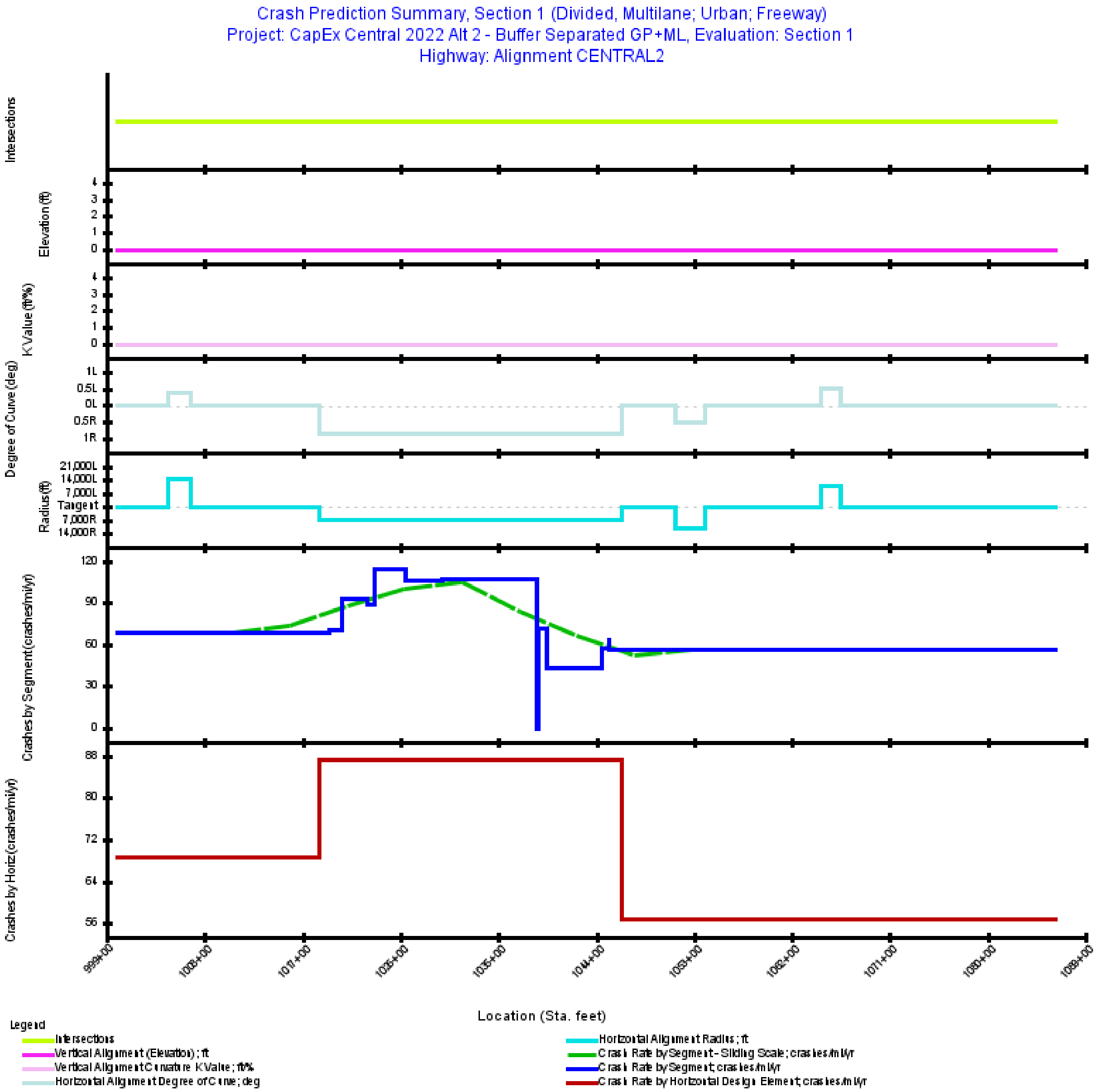

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Ten-lane Freeway	Urban	1000+00.000	1019+49.000	1,949.00	0.3691	2030: 203,650	16.00	Non-Traversable Median	30.50
2	Ten-lane Freeway	Urban	1019+49.000	1020+63.580	114.58	0.0217	2030: 203,650	26.66	Non-Traversable Median	34.66
3	Ten-lane Freeway	Urban	1020+63.580	1022+96.000	232.42	0.0440	2030: 210,700	31.67	Non-Traversable Median	39.67
4	Ten-lane Freeway	Urban	1022+96.000	1023+61.570	65.57	0.0124	2030: 210,700	35.97	Non-Traversable Median	43.97
5	Ten-lane Freeway	Urban	1023+61.570	1026+42.000	280.43	0.0531	2030: 224,050	40.96	Non-Traversable Median	48.96
6	Ten-lane Freeway	Urban	1026+42.000	1029+89.000	347.00	0.0657	2030: 224,050	50.02	Non-Traversable Median	58.02
7	Ten-lane Freeway	Urban	1029+89.000	1038+61.000	872.00	0.1652	2030: 224,050	62.66	Non-Traversable Median	36.51
8	Ten-lane Freeway	Urban	1038+61.000	1038+65.500	4.50	0.0009	2030: 224,050	2.00	Non-Traversable Median	10.00
9	Ten-lane Freeway	Urban	1038+65.500	1039+48.030	82.53	0.0156	2030: 179,650	2.00	Non-Traversable Median	10.00
10	Ten-lane Freeway	Urban	1039+48.030	1044+52.820	504.79	0.0956	2030: 142,550	2.00	Non-Traversable Median	11.35
11	Ten-lane Freeway	Urban	1044+52.820	1044+78.000	25.18	0.0048	2030: 148,350	4.86	Non-Traversable Median	12.86
12	Ten-lane Freeway	Urban	1044+78.000	1045+10.700	32.70	0.0062	2030: 148,350	5.19	Non-Traversable Median	13.19
13	Ten-lane Freeway	Urban	1045+10.700	1045+21.090	10.39	0.0020	2030: 148,350	5.44	Non-Traversable Median	13.44
14	Ten-lane Freeway	Urban	1045+21.090	1086+14.425	4,093.33	0.7753	2030: 153,000	5.00	Non-Traversable Median	13.25

Table 2. User Defined CMF Used in the Eval Segment CPM Evaluation (Section 1)

Name	Description	Start Loc. (Sta. ft)	End Loc. (Sta. ft)	Start CMF Year	End CMF Year	Severity	CMF Value
11	remove 20 left	1020+63.580	1023+61.570	2030	2050	Total	1.1000
12	remove 20 both	1023+61.570	1038+65.500	2030	2050	Total	1.2000
11	remove 20 right	1038+65.500	1039+48.030	2030	2050	Total	1.1000
11	remove 10 left	1044+52.820	1045+21.090	2030	2050	Total	1.1000
12	remove 10 both	1045+21.090	1086+14.425	2030	2050	Total	1.2000

Table 3. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**1.6307**
Average Future Road AADT (vpd)	**179,116**
Predicted Crashes	
Total Crashes	**112.74**
Fatal and Injury Crashes	**32.43**
Property-Damage-Only Crashes	**80.31**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**29**
Percent Property-Damage-Only Crashes (%)	**71**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**69.1351**
FI Crash Rate (crashes/mi/yr)	**19.8852**
PDO Crash Rate (crashes/mi/yr)	**49.2499**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**106.61**
Travel Crash Rate (crashes/million veh-mi)	**1.06**
Travel FI Crash Rate (crashes/million veh-mi)	**0.30**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.75**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 4. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1019+49.000	0.3691	25.313	25.3127	7.0852	18.2276	68.5743	0.92
2	1019+49.000	1020+63.580	0.0217	1.531	1.5314	0.4275	1.1039	70.5693	0.95
3	1020+63.580	1022+96.000	0.0440	4.086	4.0856	1.1334	2.9522	92.8143	1.21
4	1022+96.000	1023+61.570	0.0124	1.110	1.1096	0.3082	0.8014	89.3494	1.16
5	1023+61.570	1026+42.000	0.0531	6.095	6.0946	1.6689	4.4257	114.7507	1.40
6	1026+42.000	1029+89.000	0.0657	6.997	6.9968	1.9183	5.0785	106.4643	1.30
7	1029+89.000	1038+61.000	0.1652	17.711	17.7112	4.8532	12.8580	107.2419	1.31
8	1038+61.000	1038+65.500	0.0000	0.000	0.0000	0.0000	0.0000	0.0000	0.00
9	1038+65.500	1039+48.030	0.0156	1.118	1.1182	0.3236	0.7945	71.5358	1.09
10	1039+48.030	1044+52.820	0.0956	4.123	4.1233	1.2573	2.8660	43.1292	0.83
11	1044+52.820	1044+78.000	0.0048	0.274	0.2744	0.0832	0.1912	57.5371	1.06
12	1044+78.000	1045+10.700	0.0062	0.353	0.3531	0.1071	0.2460	57.0080	1.05
13	1045+10.700	1045+21.090	0.0020	0.124	0.1241	0.0377	0.0863	63.0547	1.16
14	1045+21.090	1086+14.425	0.7753	43.901	43.9015	13.2226	30.6789	56.6287	1.01
Total			1.6307	112.736	112.7364	32.4262	80.3102	69.1351	1.06

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 5. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1004+60.391	0.0872	5.979	5.9793	1.6736	4.3057	68.5743	0.92
Simple Curve 1	1004+60.391	1006+71.434	0.0400	2.741	2.7409	0.7672	1.9737	68.5743	0.92
Tangent	1006+71.434	1018+60.043	0.2251	15.437	15.4371	4.3209	11.1162	68.5743	0.92
Simple Curve 2	1018+60.043	1046+35.497	0.5257	45.904	45.9045	12.8114	33.0932	87.3284	1.17
Tangent	1046+35.497	1051+30.487	0.0937	5.309	5.3088	1.5990	3.7099	56.6287	1.01
Simple Curve 3	1051+30.487	1054+01.577	0.0513	2.908	2.9075	0.8757	2.0318	56.6287	1.01
Tangent	1054+01.577	1064+70.393	0.2024	11.463	11.4632	3.4526	8.0106	56.6287	1.01
Simple Curve 4	1064+70.393	1066+47.381	0.0335	1.898	1.8982	0.5717	1.3265	56.6287	1.01
Tangent	1066+47.381	1086+14.425	0.3725	21.097	21.0968	6.3541	14.7427	56.6287	1.01

Table 6. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	112.74	32.43	28.763	80.31	71.237
Total	112.74	32.43	28.763	80.31	71.237
Average	112.74	32.43	28.763	80.31	71.237

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 7. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.1467	0.3006	2.2513	4.3866	18.2276
2	0.0100	0.0212	0.1444	0.2519	1.1039
3	0.0266	0.0562	0.3828	0.6677	2.9522
4	0.0072	0.0153	0.1041	0.1816	0.8014
5	0.0392	0.0828	0.5638	0.9832	4.4257
6	0.0451	0.0951	0.6480	1.1301	5.0785
7	0.1140	0.2406	1.6394	2.8592	12.8580
8	0.0000	0.0000	0.0000	0.0000	0.0000
9	0.0076	0.0160	0.1093	0.1907	0.7945
10	0.0295	0.0623	0.4247	0.7407	2.8660
11	0.0020	0.0041	0.0281	0.0490	0.1912
12	0.0025	0.0053	0.0362	0.0631	0.2460
13	0.0009	0.0019	0.0128	0.0222	0.0863
14	0.2731	0.5592	4.1963	8.1940	30.6789
Total	0.7044	1.4607	10.5412	19.7199	80.3102

Table 8. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.05	0.0	0.68	0.6	0.73	0.7
Highway Segment	Collision with Fixed Object	9.02	8.0	22.25	19.7	31.27	27.7
Highway Segment	Collision with Other Object	0.64	0.6	4.32	3.8	4.96	4.4
Highway Segment	Other Single-vehicle Collision	2.60	2.3	3.33	2.9	5.92	5.3
Highway Segment	Collision with Parked Vehicle	0.19	0.2	0.50	0.4	0.69	0.6
Highway Segment	Total Single Vehicle Crashes	12.49	11.1	31.07	27.6	43.56	38.6
Highway Segment	Right-Angle Collision	0.62	0.5	0.89	0.8	1.50	1.3
Highway Segment	Head-on Collision	0.16	0.1	0.10	0.1	0.26	0.2
Highway Segment	Other Multi-vehicle Collision	0.62	0.5	1.18	1.0	1.80	1.6
Highway Segment	Rear-end Collision	14.95	13.3	33.98	30.1	48.92	43.4
Highway Segment	Sideswipe, Same Direction Collision	3.59	3.2	13.10	11.6	16.69	14.8
Highway Segment	Total Multiple Vehicle Crashes	19.93	17.7	49.24	43.7	69.17	61.4
Highway Segment	Total Highway Segment Crashes	32.43	28.8	80.31	71.2	112.74	100.0
	Total Crashes	32.43	28.8	80.31	71.2	112.74	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 9. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1019+49.000	Information: for segment #1 (1000+00.000 to 1019+49.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1000+00.000	1019+49.000	Information: for segment #1 (1000+00.000 to 1019+49.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1000+00.000	1019+49.000	Information: for segment #1 (1000+00.000 to 1019+49.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1000+00.000	1019+49.000	Information: for segment #1 (1000+00.000 to 1019+49.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1019+49.000	1020+63.580	Information: for segment #2 (1019+49.000 to 1020+63.580), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1019+49.000	1020+63.580	Information: for segment #2 (1019+49.000 to 1020+63.580), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1019+49.000	1020+63.580	Information: for segment #2 (1019+49.000 to 1020+63.580), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1019+49.000	1020+63.580	Information: for segment #2 (1019+49.000 to 1020+63.580), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1020+63.580	1022+96.000	Information: for segment #3 (1020+63.580 to 1022+96.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1020+63.580	1022+96.000	Information: for segment #3 (1020+63.580 to 1022+96.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1020+63.580	1022+96.000	Information: for segment #3 (1020+63.580 to 1022+96.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1020+63.580	1022+96.000	Information: for segment #3 (1020+63.580 to 1022+96.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1022+96.000	1023+61.570	Information: for segment #4 (1022+96.000 to 1023+61.570), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1022+96.000	1023+61.570	Information: for segment #4 (1022+96.000 to 1023+61.570), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1022+96.000	1023+61.570	Information: for segment #4 (1022+96.000 to 1023+61.570), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1022+96.000	1023+61.570	Information: for segment #4 (1022+96.000 to 1023+61.570), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1023+61.570	1026+42.000	Information: for segment #5 (1023+61.570 to 1026+42.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1023+61.570	1026+42.000	Information: for segment #5 (1023+61.570 to 1026+42.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1023+61.570	1026+42.000	Information: for segment #5 (1023+61.570 to 1026+42.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1023+61.570	1026+42.000	Information: for segment #5 (1023+61.570 to 1026+42.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1026+42.000	1029+89.000	Information: for segment #6 (1026+42.000 to 1029+89.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1026+42.000	1029+89.000	Information: for segment #6 (1026+42.000 to 1029+89.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1026+42.000	1029+89.000	Information: for segment #6 (1026+42.000 to 1029+89.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1026+42.000	1029+89.000	Information: for segment #6 (1026+42.000 to 1029+89.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1029+89.000	1038+61.000	Information: for segment #7 (1029+89.000 to 1038+61.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1029+89.000	1038+61.000	Information: for segment #7 (1029+89.000 to 1038+61.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1029+89.000	1038+61.000	Information: for segment #7 (1029+89.000 to 1038+61.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1029+89.000	1038+61.000	Information: for segment #7 (1029+89.000 to 1038+61.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+61.000	1038+65.500	Information: for segment #8 (1038+61.000 to 1038+65.500), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+61.000	1038+65.500	Information: for segment #8 (1038+61.000 to 1038+65.500), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+61.000	1038+65.500	Information: for segment #8 (1038+61.000 to 1038+65.500), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+61.000	1038+65.500	Information: for segment #8 (1038+61.000 to 1038+65.500), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+65.500	1039+48.030	Information: for segment #9 (1038+65.500 to 1039+48.030), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+65.500	1039+48.030	Information: for segment #9 (1038+65.500 to 1039+48.030), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+65.500	1039+48.030	Information: for segment #9 (1038+65.500 to 1039+48.030), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+65.500	1039+48.030	Information: for segment #9 (1038+65.500 to 1039+48.030), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1039+48.030	1044+52.820	Information: for segment #10 (1039+48.030 to 1044+52.820), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1039+48.030	1044+52.820	Information: for segment #10 (1039+48.030 to 1044+52.820), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1039+48.030	1044+52.820	Information: for segment #10 (1039+48.030 to 1044+52.820), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1039+48.030	1044+52.820	Information: for segment #10 (1039+48.030 to 1044+52.820), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1044+52.820	1044+78.000	Information: for segment #11 (1044+52.820 to 1044+78.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1044+52.820	1044+78.000	Information: for segment #11 (1044+52.820 to 1044+78.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1044+52.820	1044+78.000	Information: for segment #11 (1044+52.820 to 1044+78.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1044+52.820	1044+78.000	Information: for segment #11 (1044+52.820 to 1044+78.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1044+78.000	1045+10.700	Information: for segment #12 (1044+78.000 to 1045+10.700), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1044+78.000	1045+10.700	Information: for segment #12 (1044+78.000 to 1045+10.700), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1044+78.000	1045+10.700	Information: for segment #12 (1044+78.000 to 1045+10.700), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1044+78.000	1045+10.700	Information: for segment #12 (1044+78.000 to 1045+10.700), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1045+10.700	1045+21.090	Information: for segment #13 (1045+10.700 to 1045+21.090), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1045+10.700	1045+21.090	Information: for segment #13 (1045+10.700 to 1045+21.090), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1045+10.700	1045+21.090	Information: for segment #13 (1045+10.700 to 1045+21.090), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1045+10.700	1045+21.090	Information: for segment #13 (1045+10.700 to 1045+21.090), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1045+21.090	1086+14.425	Information: for segment #14 (1045+21.090 to 1086+14.425), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1045+21.090	1086+14.425	Information: for segment #14 (1045+21.090 to 1086+14.425), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1045+21.090	1086+14.425	Information: for segment #14 (1045+21.090 to 1086+14.425), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1045+21.090	1086+14.425	Information: for segment #14 (1045+21.090 to 1086+14.425), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

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Evaluation Date: Thu Jun 23 12:04:49 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP+ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL2
Highway Comment: Imported from CENTRAL2.xml
Highway Version: 1

Evaluation Title: Section 2
Evaluation Comment: Created Thu Jun 23 12:03:18 CDT 2022

Minimum Location: 1137+96.210
Maximum Location: 1160+88.270

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1137+96.210
Evaluation End Location: 1160+88.270
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_EX=1.0; FI_MV=1.0; FI_SV=1.0; PDO_EX=1.0; PDO_MV=1.0; PDO_SV=1.0;

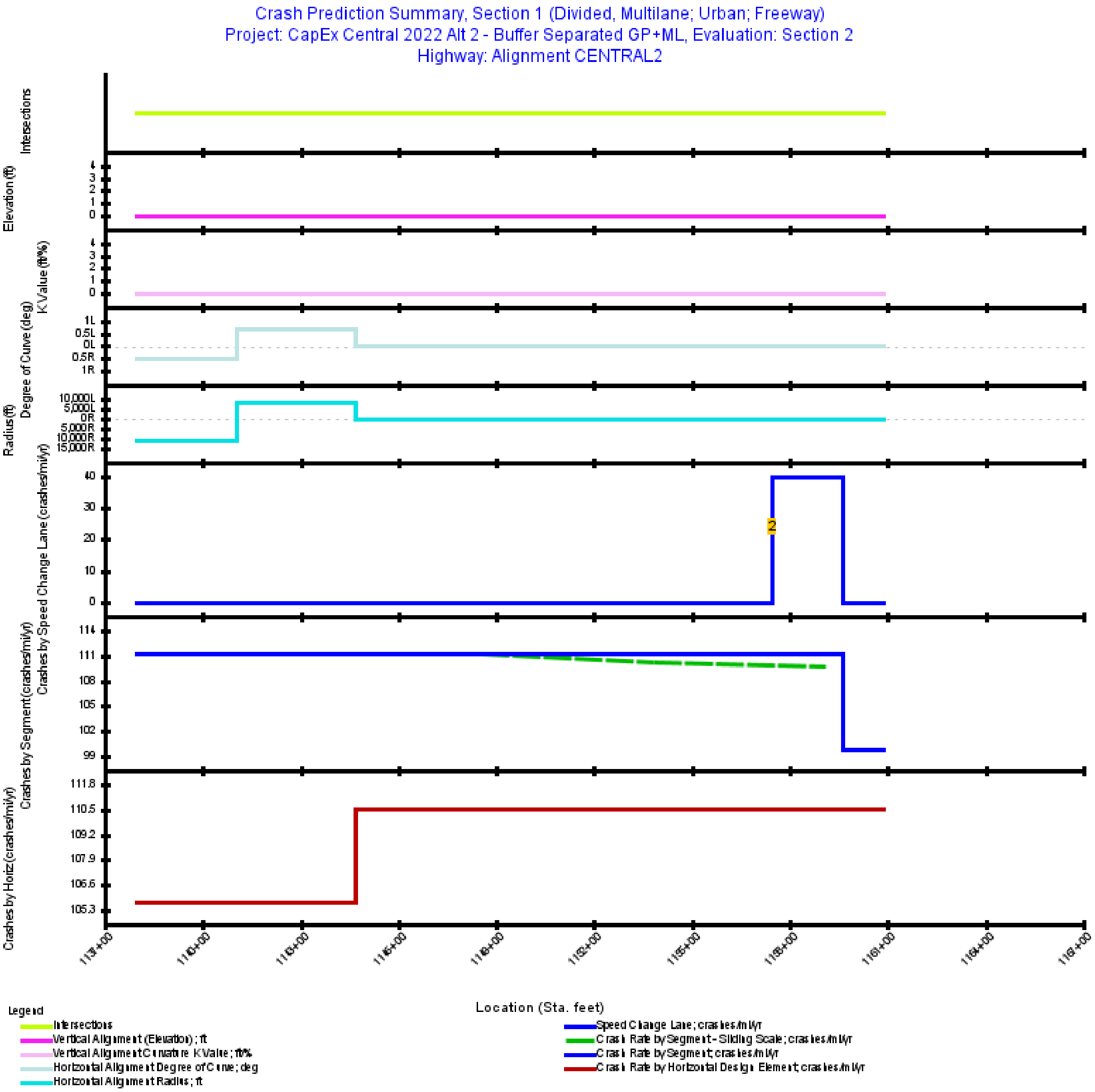

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Ten-lane Freeway	Urban	1137+96.210	1159+61.730	2,165.52	0.4101	2030: 216,900	14.00	Non-Traversable Median	19.00
3	Ten-lane Freeway	Urban	1159+61.730	1160+88.270	126.54	0.0240	2030: 200,650	14.00	Non-Traversable Median	22.00

Table 2. Evaluation Freeway - Speed Change Lanes (Speed Change)

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
2	Ten-lane Freeway Speed Change	Exit	1157+46.730	1159+61.730	215.00	0.0407	2030: 216,900	14.00	Non-Traversable Median	22.00

Table 3. User Defined CMF Used in the Eval Segment CPM Evaluation (Section 1)

Name	Description	Start Loc. (Sta. ft)	End Loc. (Sta. ft)	Start CMF Year	End CMF Year	Severity	CMF Value
14	remove 10 both, remove 20 both	1137+96.210	1159+61.730	2030	2050	Total	1.4000
13	remove 10 both, remove 20 left	1159+61.730	1160+88.270	2030	2050	Total	1.3000

Table 4. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**0.4137**
Average Future Road AADT (vpd)	**215,959**
Predicted Crashes	
Total Crashes	**45.74**
Fatal and Injury Crashes	**12.65**
Property-Damage-Only Crashes	**33.09**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**28**
Percent Property-Damage-Only Crashes (%)	**72**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**110.5604**
FI Crash Rate (crashes/mi/yr)	**30.5767**
PDO Crash Rate (crashes/mi/yr)	**79.9837**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**32.61**
Travel Crash Rate (crashes/million veh-mi)	**1.40**
Travel FI Crash Rate (crashes/million veh-mi)	**0.39**
Travel PDO Crash Rate (crashes/million veh-mi)	**1.01**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Table 5. Predicted Freeway Speed Change Lane Crash Rates and Frequencies Summary (Speed Change)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Length (mi)	**0.0407**
Average Future Road AADT (vpd)	**108,450**
Predicted Crashes	
Total Crashes	**1.63**
Fatal and Injury Crashes	**0.53**
Property-Damage-Only Crashes	**1.10**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**32**
Percent Property-Damage-Only Crashes (%)	**68**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**39.9915**
FI Crash Rate (crashes/mi/yr)	**12.9509**
PDO Crash Rate (crashes/mi/yr)	**27.0407**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.61**
Travel Crash Rate (crashes/million veh-mi)	**1.01**
Travel FI Crash Rate (crashes/million veh-mi)	**0.33**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.68**

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 6. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1137+96.210	1159+61.730	0.3898	43.351	43.3509	11.9764	31.3745	111.2198	1.41
3	1159+61.730	1160+88.270	0.0240	2.393	2.3927	0.6745	1.7182	99.8364	1.36
Total			0.4137	45.743	45.7435	12.6509	33.0926	110.5604	1.40

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 7. Predicted Crash Frequencies and Rates by Freeway Speed Change Lane (Speed Change)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
2	1157+46.730	1159+61.730	0.0407	1.628	1.6284	0.5274	1.1011	39.9915	1.01
Total			0.0407	1.628	1.6284	0.5274	1.1011	39.9915	1.01

Note: *Travel Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 8. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1137+96.210	1141+05.636	0.0586	6.194	6.1943	1.7113	4.4830	105.6987	1.41
Simple Curve 2	1141+05.636	1144+70.088	0.0690	7.296	7.2958	2.0156	5.2803	105.6987	1.41
Tangent	1144+70.088	1160+88.270	0.3065	33.882	33.8818	9.4514	24.4305	110.5537	1.54

Table 9. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	47.37	13.18	27.819	34.19	72.181
Total	47.37	13.18	27.819	34.19	72.181
Average	47.37	13.18	27.819	34.19	72.181

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 10. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.2546	0.5248	3.8549	7.3422	31.3745
3	0.0136	0.0278	0.2119	0.4212	1.7182
Total	0.2682	0.5526	4.0667	7.7634	33.0926

Table 11. Predicted Crash Severity by Speed Change Lane (Speed Change)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
2	0.0107	0.0217	0.1656	0.3293	1.1011

Table 12. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.02	0.0	0.25	0.5	0.27	0.6
Highway Segment	Collision with Fixed Object	3.16	6.9	8.14	17.8	11.30	24.7
Highway Segment	Collision with Other Object	0.22	0.5	1.58	3.5	1.80	3.9
Highway Segment	Other Single-vehicle Collision	0.91	2.0	1.22	2.7	2.13	4.6
Highway Segment	Collision with Parked Vehicle	0.07	0.1	0.18	0.4	0.25	0.5
Highway Segment	Total Single Vehicle Crashes	4.38	9.6	11.37	24.8	15.74	34.4
Highway Segment	Right-Angle Collision	0.26	0.6	0.39	0.9	0.65	1.4
Highway Segment	Head-on Collision	0.07	0.1	0.04	0.1	0.11	0.2
Highway Segment	Other Multi-vehicle Collision	0.26	0.6	0.52	1.1	0.78	1.7
Highway Segment	Rear-end Collision	6.21	13.6	14.99	32.8	21.20	46.3
Highway Segment	Sideswipe, Same Direction Collision	1.49	3.3	5.78	12.6	7.27	15.9
Highway Segment	Total Multiple Vehicle Crashes	8.27	18.1	21.73	47.5	30.00	65.6
Highway Segment	Total Highway Segment Crashes	12.65	27.7	33.09	72.3	45.74	100.0
	Total Crashes	12.65	27.7	33.09	72.3	45.74	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 13. Predicted Exit Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.01	0.5	0.01	0.5
Highway Segment	Collision with Fixed Object	0.10	6.3	0.23	14.0	0.33	20.3
Highway Segment	Collision with Other Object	0.01	0.5	0.03	2.0	0.04	2.5
Highway Segment	Other Single-vehicle Collision	0.03	1.6	0.03	1.6	0.05	3.1
Highway Segment	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Total Single Vehicle Crashes	0.14	8.5	0.29	18.1	0.43	26.5
Highway Segment	Right-Angle Collision	0.01	0.4	0.01	0.8	0.02	1.2
Highway Segment	Head-on Collision	0.00	0.2	0.00	0.1	0.01	0.3
Highway Segment	Other Multi-vehicle Collision	0.01	0.5	0.02	1.1	0.03	1.6
Highway Segment	Rear-end Collision	0.29	17.8	0.62	38.2	0.91	56.0
Highway Segment	Sideswipe, Same Direction Collision	0.08	5.1	0.15	9.3	0.23	14.4
Highway Segment	Total Multiple Vehicle Crashes	0.39	23.9	0.81	49.6	1.20	73.5
Highway Segment	Total Highway Segment Crashes	0.53	32.4	1.10	67.6	1.63	100.0
	Total Crashes	0.53	32.4	1.10	67.6	1.63	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 14. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1137+96.210	1159+61.730	Information: for segment #1 (1137+96.210 to 1159+61.730), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1137+96.210	1159+61.730	Information: for segment #1 (1137+96.210 to 1159+61.730), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1137+96.210	1159+61.730	Information: for segment #1 (1137+96.210 to 1159+61.730), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1137+96.210	1159+61.730	Information: for segment #1 (1137+96.210 to 1159+61.730), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1159+61.730	1160+88.270	Information: for segment #3 (1159+61.730 to 1160+88.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1159+61.730	1160+88.270	Information: for segment #3 (1159+61.730 to 1160+88.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1159+61.730	1160+88.270	Information: for segment #3 (1159+61.730 to 1160+88.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1159+61.730	1160+88.270	Information: for segment #3 (1159+61.730 to 1160+88.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1157+46.730	1159+61.730	Information: for segment #2 (1157+46.730 to 1159+61.730), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Evaluation Date: Thu Jun 23 12:06:00 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP+ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL2
Highway Comment: Imported from CENTRAL2.xml
Highway Version: 1

Evaluation Title: Section 3
Evaluation Comment: Created Thu Jun 23 12:05:04 CDT 2022

Minimum Location: 1181+39.215
Maximum Location: 1301+70.260

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1181+39.215
Evaluation End Location: 1301+70.260
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_MV=1.0; FI_SV=1.0; PDO_MV=1.0; PDO_SV=1.0;

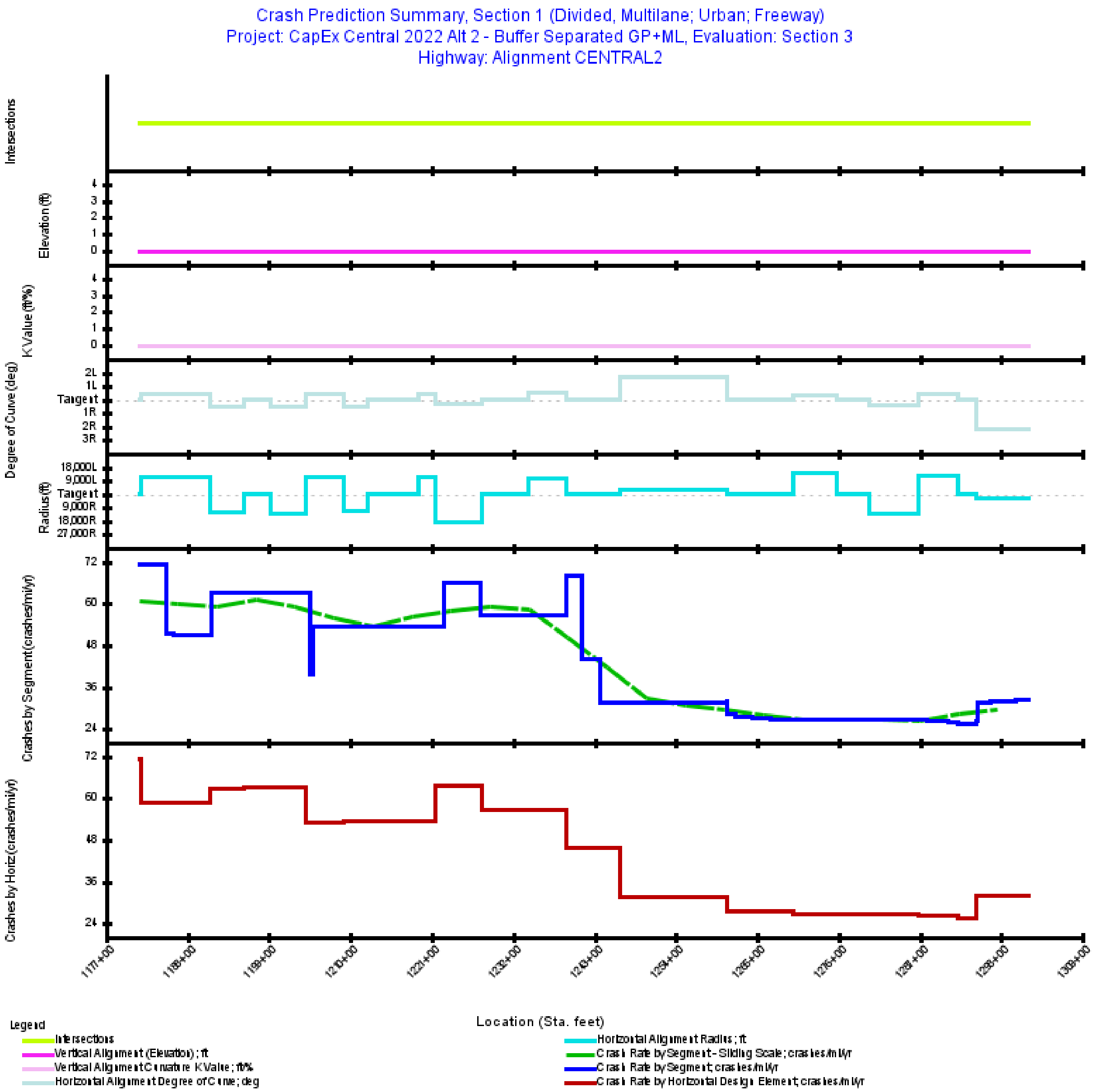

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Ten-lane Freeway	Urban	1181+39.215	1185+16.760	377.55	0.0715	2030: 181,000	4.40	Non-Traversable Median	12.40
2	Ten-lane Freeway	Urban	1185+16.760	1186+06.215	89.45	0.0169	2030: 163,350	4.90	Non-Traversable Median	12.90
3	Ten-lane Freeway	Urban	1186+06.215	1191+27.480	521.26	0.0987	2030: 163,350	5.56	Non-Traversable Median	13.50
4	Ten-lane Freeway	Urban	1191+27.480	1204+51.660	1,324.18	0.2508	2030: 168,950	6.00	Non-Traversable Median	14.00
5	Ten-lane Freeway	Urban	1204+51.660	1204+99.010	47.35	0.0090	2030: 135,350	6.00	Non-Traversable Median	14.00
6	Ten-lane Freeway	Urban	1204+99.010	1222+62.550	1,763.54	0.3340	2030: 155,300	6.00	Non-Traversable Median	14.29
7	Ten-lane Freeway	Urban	1222+62.550	1227+62.215	499.66	0.0946	2030: 163,000	8.29	Non-Traversable Median	11.29
8	Ten-lane Freeway	Urban	1227+62.215	1239+17.215	1,155.00	0.2188	2030: 163,000	0.00	None	0.00
9	Ten-lane Freeway	Urban	1239+17.215	1241+21.390	204.18	0.0387	2030: 163,000	9.69	Non-Traversable Median	17.63
10	Ten-lane Freeway	Urban	1241+21.390	1243+70.050	248.66	0.0471	2030: 130,600	8.75	Non-Traversable Median	16.75
11	Ten-lane Freeway	Urban	1243+70.050	1260+87.200	1,717.15	0.3252	2030: 105,100	5.00	Non-Traversable Median	14.62
12	Ten-lane Freeway	Urban	1260+87.200	1260+95.640	8.44	0.0016	2030: 105,100	5.00	Non-Traversable Median	13.02
13	Ten-lane Freeway	Urban	1260+95.640	1262+08.215	112.57	0.0213	2030: 105,100	5.00	Non-Traversable Median	13.52
14	Ten-lane Freeway	Urban	1262+08.215	1264+42.215	234.00	0.0443	2030: 105,100	5.00	Non-Traversable Median	15.00
15	Ten-lane Freeway	Urban	1264+42.215	1266+76.215	234.00	0.0443	2030: 105,100	5.00	Non-Traversable Median	17.01
16	Ten-lane Freeway	Urban	1266+76.215	1269+09.215	233.00	0.0441	2030: 105,100	5.00	Non-Traversable Median	19.00
17	Ten-lane Freeway	Urban	1269+09.215	1269+94.460	85.25	0.0161	2030: 105,100	5.00	Non-Traversable Median	20.37
18	Ten-lane Freeway	Urban	1269+94.460	1270+59.210	64.75	0.0123	2030: 105,100	5.00	Non-Traversable Median	20.87
19	Ten-lane Freeway	Urban	1270+59.210	1286+49.920	1,590.71	0.3013	2030: 105,100	5.00	Non-Traversable Median	21.00
20	Ten-lane Freeway	Urban	1286+49.920	1286+74.450	24.53	0.0046	2030: 105,100	5.00	Non-Traversable Median	21.04
21	Ten-lane Freeway	Urban	1286+74.450	1288+04.215	129.76	0.0246	2030: 105,100	5.00	Non-Traversable Median	21.54
22	Ten-lane Freeway	Urban	1288+04.215	1290+88.215	284.00	0.0538	2030: 105,100	5.00	Non-Traversable Median	23.00
23	Ten-lane Freeway	Urban	1290+88.215	1292+07.160	118.95	0.0225	2030: 105,100	5.00	Non-Traversable Median	24.42
24	Ten-lane Freeway	Urban	1292+07.160	1292+53.520	46.36	0.0088	2030: 105,100	5.00	Non-Traversable Median	24.92
25	Ten-lane Freeway	Urban	1292+53.520	1294+61.400	207.88	0.0394	2030: 105,100	5.00	Non-Traversable Median	25.00

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
26	Ten-lane Freeway	Urban	1294+61.400	1294+72.080	10.68	0.0020	2030: 105,100	5.00	Non-Traversable Median	24.98
27	Ten-lane Freeway	Urban	1294+72.080	1296+43.215	171.13	0.0324	2030: 105,100	4.87	Non-Traversable Median	24.36
28	Ten-lane Freeway	Urban	1296+43.215	1299+95.215	352.00	0.0667	2030: 105,100	4.50	Non-Traversable Median	22.50
29	Ten-lane Freeway	Urban	1299+95.215	1301+70.260	175.05	0.0332	2030: 105,100	4.12	Non-Traversable Median	20.62

Table 2. User Defined CMF Used in the Eval Segment CPM Evaluation (Section 1)

Name	Description	Start Loc. (Sta. ft)	End Loc. (Sta. ft)	Start CMF Year	End CMF Year	Severity	CMF Value
11	remove 10 right	1181+39.215	1185+16.760	2030	2050	Total	1.1000
11	remove 10 left	1191+27.480	1204+51.660	2030	2050	Total	1.1000
11	remove 10 right	1204+99.010	1222+62.550	2030	2050	Total	1.1000
12	remove 10 both	1222+62.550	1241+21.390	2030	2050	Total	1.2000
11	remove 10 left	1241+21.390	1243+70.050	2030	2050	Total	1.1000

Table 3. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**2.2786**
Average Future Road AADT (vpd)	**134,417**
Predicted Crashes	
Total Crashes	**99.93**
Fatal and Injury Crashes	**30.76**
Property-Damage-Only Crashes	**69.17**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**31**
Percent Property-Damage-Only Crashes (%)	**69**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**43.8571**
FI Crash Rate (crashes/mi/yr)	**13.4991**
PDO Crash Rate (crashes/mi/yr)	**30.3580**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**111.79**
Travel Crash Rate (crashes/million veh-mi)	**0.89**
Travel FI Crash Rate (crashes/million veh-mi)	**0.28**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.62**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 4. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1181+39.215	1185+16.760	0.0715	5.108	5.1080	1.4816	3.6264	71.4360	1.08
2	1185+16.760	1186+06.215	0.0169	0.871	0.8713	0.2581	0.6132	51.4266	0.86
3	1186+06.215	1191+27.480	0.0987	5.051	5.0513	1.4958	3.5555	51.1655	0.86
4	1191+27.480	1204+51.660	0.2508	15.905	15.9048	4.6940	11.2108	63.4184	1.03
5	1204+51.660	1204+99.010	0.0090	0.355	0.3548	0.1097	0.2451	39.5626	0.80
6	1204+99.010	1222+62.550	0.3340	17.809	17.8094	5.3455	12.4639	53.3211	0.94
7	1222+62.550	1227+62.215	0.0946	6.255	6.2554	1.8615	4.3939	66.1013	1.11
8	1227+62.215	1239+17.215	0.2188	12.383	12.3832	3.8815	8.5017	56.6088	0.95
9	1239+17.215	1241+21.390	0.0387	2.637	2.6371	0.7868	1.8502	68.1950	1.15
10	1241+21.390	1243+70.050	0.0471	2.076	2.0762	0.6504	1.4259	44.0861	0.93
11	1243+70.050	1260+87.200	0.3252	10.202	10.2021	3.3066	6.8955	31.3699	0.82
12	1260+87.200	1260+95.640	0.0016	0.051	0.0511	0.0165	0.0346	31.9796	0.83
13	1260+95.640	1262+08.215	0.0213	0.599	0.5992	0.1953	0.4039	28.1055	0.73
14	1262+08.215	1264+42.215	0.0443	1.225	1.2254	0.3991	0.8263	27.6506	0.72
15	1264+42.215	1266+76.215	0.0443	1.206	1.2060	0.3923	0.8137	27.2132	0.71
16	1266+76.215	1269+09.215	0.0441	1.182	1.1819	0.3840	0.7979	26.7837	0.70
17	1269+09.215	1269+94.460	0.0161	0.428	0.4278	0.1389	0.2889	26.4950	0.69
18	1269+94.460	1270+59.210	0.0123	0.326	0.3259	0.1057	0.2202	26.5764	0.69
19	1270+59.210	1286+49.920	0.3013	7.990	7.9905	2.5917	5.3988	26.5226	0.69
20	1286+49.920	1286+74.450	0.0046	0.124	0.1236	0.0401	0.0835	26.6028	0.69
21	1286+74.450	1288+04.215	0.0246	0.651	0.6515	0.2112	0.4403	26.5090	0.69
22	1288+04.215	1290+88.215	0.0538	1.409	1.4094	0.4565	0.9530	26.2034	0.68
23	1290+88.215	1292+07.160	0.0225	0.584	0.5837	0.1889	0.3948	25.9091	0.68
24	1292+07.160	1292+53.520	0.0088	0.224	0.2244	0.0726	0.1517	25.5520	0.67
25	1292+53.520	1294+61.400	0.0394	1.005	1.0054	0.3254	0.6800	25.5358	0.67
26	1294+61.400	1294+72.080	0.0020	0.053	0.0535	0.0173	0.0362	26.4335	0.69
27	1294+72.080	1296+43.215	0.0324	1.022	1.0221	0.3272	0.6950	31.5359	0.82
28	1296+43.215	1299+95.215	0.0667	2.127	2.1274	0.6816	1.4458	31.9112	0.83
29	1299+95.215	1301+70.260	0.0332	1.071	1.0706	0.3434	0.7273	32.2938	0.84
Total			2.2786	99.933	99.9330	30.7591	69.1738	43.8571	0.89

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 5. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1181+39.215	1181+65.772	0.0050	0.359	0.3593	0.1042	0.2551	71.4360	1.08
Simple Curve 1	1181+65.772	1191+08.412	0.1785	10.486	10.4865	3.0766	7.4099	58.7379	0.94
Simple Curve 2	1191+08.412	1195+55.770	0.0847	5.329	5.3290	1.5729	3.7561	62.8961	1.02
Tangent	1195+55.770	1199+27.159	0.0703	4.461	4.4608	1.3165	3.1443	63.4184	1.03
Simple Curve 3	1199+27.159	1203+92.707	0.0882	5.592	5.5917	1.6503	3.9414	63.4184	1.03
Simple Curve 4	1203+92.707	1209+17.267	0.0993	5.287	5.2867	1.5865	3.7002	53.2140	0.94
Simple Curve 5	1209+17.267	1212+36.361	0.0604	3.222	3.2224	0.9672	2.2552	53.3211	0.94
Tangent	1212+36.361	1219+22.461	0.1299	6.929	6.9287	2.0797	4.8490	53.3211	0.94
Simple Curve 6	1219+22.461	1221+54.111	0.0439	2.339	2.3394	0.7022	1.6372	53.3211	0.94
Simple Curve 7	1221+54.111	1227+72.169	0.1171	7.457	7.4572	2.2236	5.2336	63.7061	1.08
Tangent	1227+72.169	1234+11.553	0.1211	6.855	6.8551	2.1487	4.7064	56.6088	0.95
Simple Curve 8	1234+11.553	1239+25.969	0.0974	5.535	5.5345	1.7331	3.8014	56.8060	0.95
Tangent	1239+25.969	1246+43.446	0.1359	6.224	6.2245	1.9299	4.2946	45.8071	0.94
Simple Curve 9	1246+43.446	1260+99.318	0.2757	8.648	8.6484	2.8030	5.8454	31.3652	0.82
Tangent	1260+99.318	1269+94.455	0.1695	4.621	4.6208	1.5032	3.1175	27.2559	0.71
Simple Curve 10	1269+94.455	1275+78.714	0.1107	2.936	2.9355	0.9521	1.9834	26.5285	0.69
Tangent	1275+78.714	1280+14.318	0.0825	2.188	2.1881	0.7097	1.4784	26.5226	0.69
Simple Curve 11	1280+14.318	1286+74.447	0.1250	3.316	3.3163	1.0756	2.2407	26.5256	0.69
Simple Curve 12	1286+74.447	1292+07.157	0.1009	2.645	2.6446	0.8565	1.7881	26.2121	0.68
Tangent	1292+07.157	1294+70.453	0.0499	1.275	1.2751	0.4126	0.8624	25.5695	0.67
Simple Curve 13	1294+70.453	1301+70.260	0.1325	4.228	4.2283	1.3548	2.8735	31.9024	0.83

Table 6. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	99.93	30.76	30.780	69.17	69.220
Total	99.93	30.76	30.780	69.17	69.220
Average	99.93	30.76	30.780	69.17	69.220

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 7. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0344	0.0725	0.4980	0.8766	3.6264
2	0.0061	0.0128	0.0872	0.1521	0.6132
3	0.0351	0.0742	0.5053	0.8812	3.5555
4	0.1058	0.2211	1.5545	2.8126	11.2108
5	0.0026	0.0054	0.0371	0.0646	0.2451
6	0.1186	0.2468	1.7565	3.2236	12.4639
7	0.0437	0.0923	0.6288	1.0967	4.3939
8	0.0840	0.1739	1.2603	2.3633	8.5017
9	0.0160	0.0327	0.2479	0.4902	1.8502
10	0.0132	0.0268	0.2043	0.4061	1.4259
11	0.0759	0.1593	1.1045	1.9669	6.8955
12	0.0004	0.0008	0.0056	0.0097	0.0346
13	0.0040	0.0081	0.0615	0.1217	0.4039
14	0.0081	0.0165	0.1254	0.2493	0.8263
15	0.0079	0.0162	0.1232	0.2450	0.8137
16	0.0078	0.0158	0.1206	0.2398	0.7979
17	0.0028	0.0057	0.0436	0.0867	0.2889
18	0.0025	0.0052	0.0357	0.0623	0.2202
19	0.0585	0.1222	0.8587	1.5523	5.3988
20	0.0009	0.0020	0.0135	0.0236	0.0835
21	0.0050	0.0105	0.0713	0.1244	0.4403
22	0.0107	0.0226	0.1542	0.2689	0.9530
23	0.0044	0.0094	0.0638	0.1113	0.3948
24	0.0015	0.0030	0.0228	0.0453	0.1517
25	0.0066	0.0134	0.1022	0.2032	0.6800
26	0.0004	0.0007	0.0055	0.0107	0.0362
27	0.0077	0.0162	0.1105	0.1927	0.6950
28	0.0160	0.0338	0.2302	0.4016	1.4458
29	0.0081	0.0170	0.1160	0.2023	0.7273
Total	0.6885	1.4370	10.1489	18.4848	69.1738

Table 8. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.06	0.1	0.69	0.7	0.75	0.8
Highway Segment	Collision with Fixed Object	9.99	10.0	22.63	22.6	32.62	32.6
Highway Segment	Collision with Other Object	0.71	0.7	4.39	4.4	5.10	5.1
Highway Segment	Other Single-vehicle Collision	2.88	2.9	3.38	3.4	6.26	6.3
Highway Segment	Collision with Parked Vehicle	0.21	0.2	0.51	0.5	0.71	0.7
Highway Segment	Total Single Vehicle Crashes	13.84	13.8	31.61	31.6	45.45	45.5
Highway Segment	Right-Angle Collision	0.53	0.5	0.68	0.7	1.20	1.2
Highway Segment	Head-on Collision	0.14	0.1	0.07	0.1	0.21	0.2
Highway Segment	Other Multi-vehicle Collision	0.53	0.5	0.90	0.9	1.43	1.4
Highway Segment	Rear-end Collision	12.69	12.7	25.92	25.9	38.61	38.6
Highway Segment	Sideswipe, Same Direction Collision	3.05	3.0	9.99	10.0	13.04	13.0
Highway Segment	Total Multiple Vehicle Crashes	16.92	16.9	37.57	37.6	54.49	54.5
Highway Segment	Total Highway Segment Crashes	30.76	30.8	69.17	69.2	99.93	100.0
	Total Crashes	30.76	30.8	69.17	69.2	99.93	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 9. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1181+39.215	1185+16.760	Information: for segment #1 (1181+39.215 to 1185+16.760), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1181+39.215	1185+16.760	Information: for segment #1 (1181+39.215 to 1185+16.760), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1181+39.215	1185+16.760	Information: for segment #1 (1181+39.215 to 1185+16.760), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1181+39.215	1185+16.760	Information: for segment #1 (1181+39.215 to 1185+16.760), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1185+16.760	1186+06.215	Information: for segment #2 (1185+16.760 to 1186+06.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1185+16.760	1186+06.215	Information: for segment #2 (1185+16.760 to 1186+06.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1185+16.760	1186+06.215	Information: for segment #2 (1185+16.760 to 1186+06.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1185+16.760	1186+06.215	Information: for segment #2 (1185+16.760 to 1186+06.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1186+06.215	1191+27.480	Information: for segment #3 (1186+06.215 to 1191+27.480), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1186+06.215	1191+27.480	Information: for segment #3 (1186+06.215 to 1191+27.480), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1186+06.215	1191+27.480	Information: for segment #3 (1186+06.215 to 1191+27.480), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1186+06.215	1191+27.480	Information: for segment #3 (1186+06.215 to 1191+27.480), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1191+27.480	1204+51.660	Information: for segment #4 (1191+27.480 to 1204+51.660), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1191+27.480	1204+51.660	Information: for segment #4 (1191+27.480 to 1204+51.660), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1191+27.480	1204+51.660	Information: for segment #4 (1191+27.480 to 1204+51.660), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1191+27.480	1204+51.660	Information: for segment #4 (1191+27.480 to 1204+51.660), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1204+51.660	1204+99.010	Information: for segment #5 (1204+51.660 to 1204+99.010), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1204+51.660	1204+99.010	Information: for segment #5 (1204+51.660 to 1204+99.010), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1204+51.660	1204+99.010	Information: for segment #5 (1204+51.660 to 1204+99.010), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1204+51.660	1204+99.010	Information: for segment #5 (1204+51.660 to 1204+99.010), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1204+99.010	1222+62.550	Information: for segment #6 (1204+99.010 to 1222+62.550), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1204+99.010	1222+62.550	Information: for segment #6 (1204+99.010 to 1222+62.550), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1204+99.010	1222+62.550	Information: for segment #6 (1204+99.010 to 1222+62.550), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1204+99.010	1222+62.550	Information: for segment #6 (1204+99.010 to 1222+62.550), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1222+62.550	1227+62.215	Information: for segment #7 (1222+62.550 to 1227+62.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1222+62.550	1227+62.215	Information: for segment #7 (1222+62.550 to 1227+62.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1222+62.550	1227+62.215	Information: for segment #7 (1222+62.550 to 1227+62.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1222+62.550	1227+62.215	Information: for segment #7 (1222+62.550 to 1227+62.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1227+62.215	1239+17.215	Information: for segment #8 (1227+62.215 to 1239+17.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1227+62.215	1239+17.215	Information: for segment #8 (1227+62.215 to 1239+17.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1227+62.215	1239+17.215	Information: for segment #8 (1227+62.215 to 1239+17.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1227+62.215	1239+17.215	Information: for segment #8 (1227+62.215 to 1239+17.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1239+17.215	1241+21.390	Information: for segment #9 (1239+17.215 to 1241+21.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1239+17.215	1241+21.390	Information: for segment #9 (1239+17.215 to 1241+21.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1239+17.215	1241+21.390	Information: for segment #9 (1239+17.215 to 1241+21.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1239+17.215	1241+21.390	Information: for segment #9 (1239+17.215 to 1241+21.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1241+21.390	1243+70.050	Information: for segment #10 (1241+21.390 to 1243+70.050), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1241+21.390	1243+70.050	Information: for segment #10 (1241+21.390 to 1243+70.050), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1241+21.390	1243+70.050	Information: for segment #10 (1241+21.390 to 1243+70.050), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1241+21.390	1243+70.050	Information: for segment #10 (1241+21.390 to 1243+70.050), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1243+70.050	1260+87.200	Information: for segment #11 (1243+70.050 to 1260+87.200), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1243+70.050	1260+87.200	Information: for segment #11 (1243+70.050 to 1260+87.200), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1243+70.050	1260+87.200	Information: for segment #11 (1243+70.050 to 1260+87.200), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1243+70.050	1260+87.200	Information: for segment #11 (1243+70.050 to 1260+87.200), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1260+87.200	1260+95.640	Information: for segment #12 (1260+87.200 to 1260+95.640), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1260+87.200	1260+95.640	Information: for segment #12 (1260+87.200 to 1260+95.640), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1260+87.200	1260+95.640	Information: for segment #12 (1260+87.200 to 1260+95.640), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1260+87.200	1260+95.640	Information: for segment #12 (1260+87.200 to 1260+95.640), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1260+95.640	1262+08.215	Information: for segment #13 (1260+95.640 to 1262+08.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1260+95.640	1262+08.215	Information: for segment #13 (1260+95.640 to 1262+08.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1260+95.640	1262+08.215	Information: for segment #13 (1260+95.640 to 1262+08.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1260+95.640	1262+08.215	Information: for segment #13 (1260+95.640 to 1262+08.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1262+08.215	1264+42.215	Information: for segment #14 (1262+08.215 to 1264+42.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1262+08.215	1264+42.215	Information: for segment #14 (1262+08.215 to 1264+42.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1262+08.215	1264+42.215	Information: for segment #14 (1262+08.215 to 1264+42.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1262+08.215	1264+42.215	Information: for segment #14 (1262+08.215 to 1264+42.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1264+42.215	1266+76.215	Information: for segment #15 (1264+42.215 to 1266+76.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1264+42.215	1266+76.215	Information: for segment #15 (1264+42.215 to 1266+76.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1264+42.215	1266+76.215	Information: for segment #15 (1264+42.215 to 1266+76.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1264+42.215	1266+76.215	Information: for segment #15 (1264+42.215 to 1266+76.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1266+76.215	1269+09.215	Information: for segment #16 (1266+76.215 to 1269+09.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1266+76.215	1269+09.215	Information: for segment #16 (1266+76.215 to 1269+09.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1266+76.215	1269+09.215	Information: for segment #16 (1266+76.215 to 1269+09.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1266+76.215	1269+09.215	Information: for segment #16 (1266+76.215 to 1269+09.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1269+09.215	1269+94.460	Information: for segment #17 (1269+09.215 to 1269+94.460), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1269+09.215	1269+94.460	Information: for segment #17 (1269+09.215 to 1269+94.460), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1269+09.215	1269+94.460	Information: for segment #17 (1269+09.215 to 1269+94.460), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1269+09.215	1269+94.460	Information: for segment #17 (1269+09.215 to 1269+94.460), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1269+94.460	1270+59.210	Information: for segment #18 (1269+94.460 to 1270+59.210), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1269+94.460	1270+59.210	Information: for segment #18 (1269+94.460 to 1270+59.210), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1269+94.460	1270+59.210	Information: for segment #18 (1269+94.460 to 1270+59.210), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1269+94.460	1270+59.210	Information: for segment #18 (1269+94.460 to 1270+59.210), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1270+59.210	1286+49.920	Information: for segment #19 (1270+59.210 to 1286+49.920), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1270+59.210	1286+49.920	Information: for segment #19 (1270+59.210 to 1286+49.920), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1270+59.210	1286+49.920	Information: for segment #19 (1270+59.210 to 1286+49.920), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1270+59.210	1286+49.920	Information: for segment #19 (1270+59.210 to 1286+49.920), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1286+49.920	1286+74.450	Information: for segment #20 (1286+49.920 to 1286+74.450), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1286+49.920	1286+74.450	Information: for segment #20 (1286+49.920 to 1286+74.450), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1286+49.920	1286+74.450	Information: for segment #20 (1286+49.920 to 1286+74.450), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1286+49.920	1286+74.450	Information: for segment #20 (1286+49.920 to 1286+74.450), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1286+74.450	1288+04.215	Information: for segment #21 (1286+74.450 to 1288+04.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1286+74.450	1288+04.215	Information: for segment #21 (1286+74.450 to 1288+04.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1286+74.450	1288+04.215	Information: for segment #21 (1286+74.450 to 1288+04.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1286+74.450	1288+04.215	Information: for segment #21 (1286+74.450 to 1288+04.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1288+04.215	1290+88.215	Information: for segment #22 (1288+04.215 to 1290+88.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1288+04.215	1290+88.215	Information: for segment #22 (1288+04.215 to 1290+88.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1288+04.215	1290+88.215	Information: for segment #22 (1288+04.215 to 1290+88.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1288+04.215	1290+88.215	Information: for segment #22 (1288+04.215 to 1290+88.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1290+88.215	1292+07.160	Information: for segment #23 (1290+88.215 to 1292+07.160), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1290+88.215	1292+07.160	Information: for segment #23 (1290+88.215 to 1292+07.160), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1290+88.215	1292+07.160	Information: for segment #23 (1290+88.215 to 1292+07.160), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1290+88.215	1292+07.160	Information: for segment #23 (1290+88.215 to 1292+07.160), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1292+07.160	1292+53.520	Information: for segment #24 (1292+07.160 to 1292+53.520), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1292+07.160	1292+53.520	Information: for segment #24 (1292+07.160 to 1292+53.520), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1292+07.160	1292+53.520	Information: for segment #24 (1292+07.160 to 1292+53.520), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1292+07.160	1292+53.520	Information: for segment #24 (1292+07.160 to 1292+53.520), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1292+53.520	1294+61.400	Information: for segment #25 (1292+53.520 to 1294+61.400), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1292+53.520	1294+61.400	Information: for segment #25 (1292+53.520 to 1294+61.400), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1292+53.520	1294+61.400	Information: for segment #25 (1292+53.520 to 1294+61.400), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1292+53.520	1294+61.400	Information: for segment #25 (1292+53.520 to 1294+61.400), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+61.400	1294+72.080	Information: for segment #26 (1294+61.400 to 1294+72.080), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+61.400	1294+72.080	Information: for segment #26 (1294+61.400 to 1294+72.080), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+61.400	1294+72.080	Information: for segment #26 (1294+61.400 to 1294+72.080), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+61.400	1294+72.080	Information: for segment #26 (1294+61.400 to 1294+72.080), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+72.080	1296+43.215	Information: for segment #27 (1294+72.080 to 1296+43.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+72.080	1296+43.215	Information: for segment #27 (1294+72.080 to 1296+43.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+72.080	1296+43.215	Information: for segment #27 (1294+72.080 to 1296+43.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+72.080	1296+43.215	Information: for segment #27 (1294+72.080 to 1296+43.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+43.215	1299+95.215	Information: for segment #28 (1296+43.215 to 1299+95.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+43.215	1299+95.215	Information: for segment #28 (1296+43.215 to 1299+95.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+43.215	1299+95.215	Information: for segment #28 (1296+43.215 to 1299+95.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+43.215	1299+95.215	Information: for segment #28 (1296+43.215 to 1299+95.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1299+95.215	1301+70.260	Information: for segment #29 (1299+95.215 to 1301+70.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1299+95.215	1301+70.260	Information: for segment #29 (1299+95.215 to 1301+70.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1299+95.215	1301+70.260	Information: for segment #29 (1299+95.215 to 1301+70.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1299+95.215	1301+70.260	Information: for segment #29 (1299+95.215 to 1301+70.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

Report Generated: Aug 24, 2022 3:43 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 12:07:55 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP+ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL2
Highway Comment: Imported from CENTRAL2.xml
Highway Version: 1

Evaluation Title: Section 4
Evaluation Comment: Created Thu Jun 23 12:06:18 CDT 2022

Minimum Location: 1343+13.390
Maximum Location: 1418+67.223

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1343+13.390
Evaluation End Location: 1418+67.223
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_EN=1.0; FI_EX=1.0; FI_MV=1.0; FI_SV=1.0; PDO_EN=1.0; PDO_EX=1.0; PDO_MV=1.0; PDO_SV=1.0;

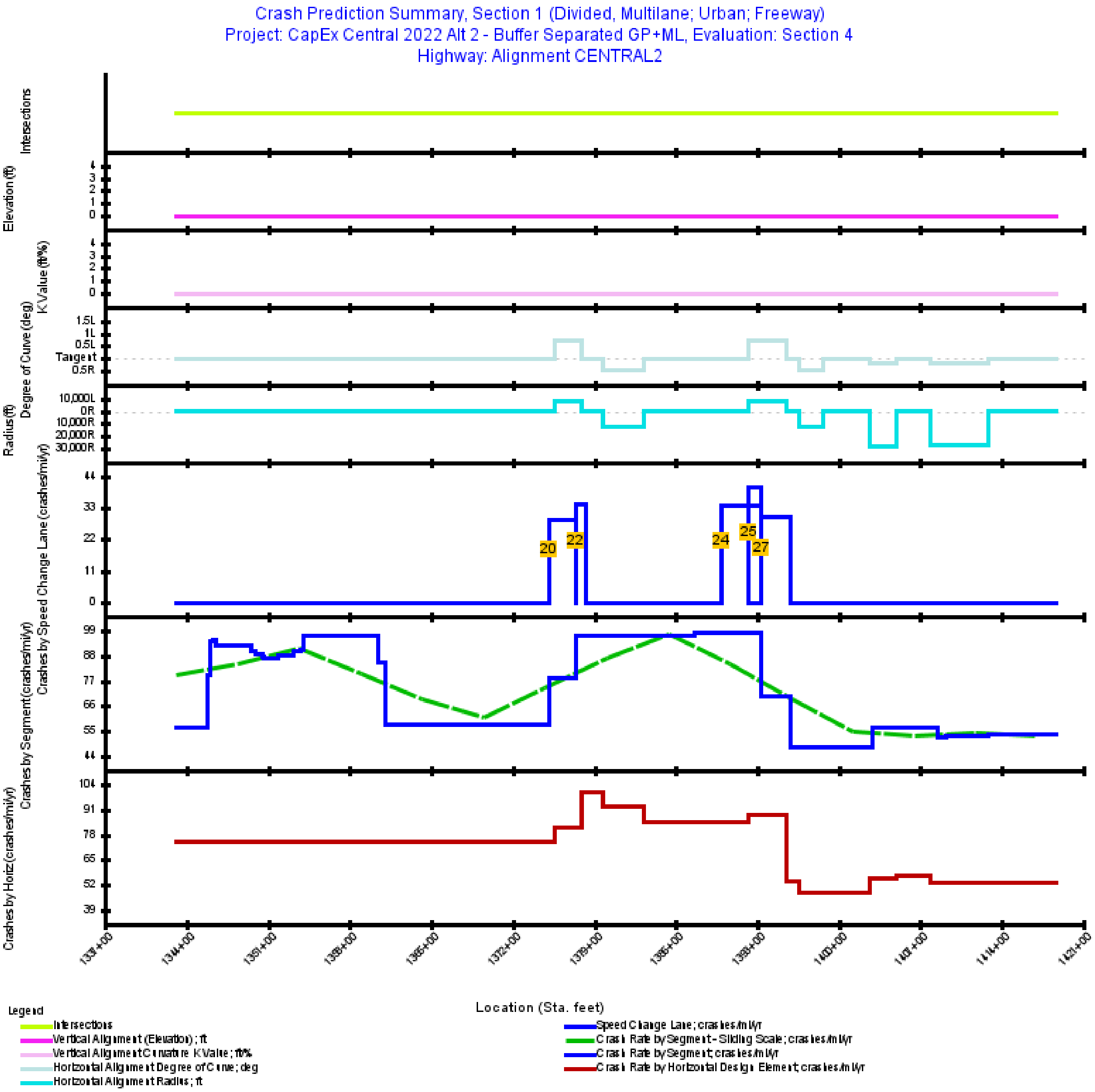

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Ten-lane Freeway	Urban	1343+13.390	1345+47.920	234.53	0.0444	2030: 158,050	2.00	Non-Traversable Median	14.00
2	Ten-lane Freeway	Urban	1345+47.920	1345+73.390	25.47	0.0048	2030: 158,050	2.51	Non-Traversable Median	14.00
3	Ten-lane Freeway	Urban	1345+73.390	1346+07.390	34.00	0.0064	2030: 158,050	3.70	Non-Traversable Median	14.00
4	Ten-lane Freeway	Urban	1346+07.390	1346+23.390	16.00	0.0030	2030: 185,350	4.70	Non-Traversable Median	14.00
5	Ten-lane Freeway	Urban	1346+23.390	1346+47.920	24.53	0.0046	2030: 185,350	5.51	Non-Traversable Median	14.00
6	Ten-lane Freeway	Urban	1346+47.920	1349+58.530	310.61	0.0588	2030: 185,350	6.00	Non-Traversable Median	13.99
7	Ten-lane Freeway	Urban	1349+58.530	1349+90.390	31.86	0.0060	2030: 185,350	5.54	Non-Traversable Median	14.06
8	Ten-lane Freeway	Urban	1349+90.390	1349+96.390	6.00	0.0011	2030: 185,350	5.06	Non-Traversable Median	14.17
9	Ten-lane Freeway	Urban	1349+96.390	1350+54.390	58.00	0.0110	2030: 185,350	4.24	Non-Traversable Median	14.34
10	Ten-lane Freeway	Urban	1350+54.390	1350+68.890	14.50	0.0027	2030: 185,350	3.32	Non-Traversable Median	14.55
11	Ten-lane Freeway	Urban	1350+68.890	1351+13.440	44.55	0.0084	2030: 185,350	2.57	Non-Traversable Median	14.29
12	Ten-lane Freeway	Urban	1351+13.440	1351+81.390	67.95	0.0129	2030: 185,350	2.00	Non-Traversable Median	13.49
13	Ten-lane Freeway	Urban	1351+81.390	1353+18.390	137.00	0.0259	2030: 185,350	2.00	Non-Traversable Median	11.99
14	Ten-lane Freeway	Urban	1353+18.390	1353+72.910	54.52	0.0103	2030: 185,350	2.00	Non-Traversable Median	10.59
15	Ten-lane Freeway	Urban	1353+72.910	1354+00.500	27.59	0.0052	2030: 185,350	2.00	Non-Traversable Median	10.10
16	Ten-lane Freeway	Urban	1354+00.500	1360+45.180	644.68	0.1221	2030: 185,350	2.00	Non-Traversable Median	10.00
17	Ten-lane Freeway	Urban	1360+45.180	1361+05.390	60.21	0.0114	2030: 172,950	2.00	Non-Traversable Median	10.00
18	Ten-lane Freeway	Urban	1361+05.390	1375+07.630	1,402.24	0.2656	2030: 158,850	2.00	Non-Traversable Median	10.00
19	Ten-lane Freeway	Urban	1375+07.630	1377+39.570	231.94	0.0439	2030: 182,900	2.00	Non-Traversable Median	10.00
21	Ten-lane Freeway	Urban	1377+39.570	1387+63.390	1,023.82	0.1939	2030: 203,000	2.00	Non-Traversable Median	11.50
23	Ten-lane Freeway	Urban	1387+63.390	1393+33.520	570.13	0.1080	2030: 203,000	6.00	Non-Traversable Median	13.50
26	Ten-lane Freeway	Urban	1393+33.520	1395+79.430	245.91	0.0466	2030: 168,550	6.00	Non-Traversable Median	14.00
28	Ten-lane Freeway	Urban	1395+79.430	1402+90.080	710.65	0.1346	2030: 147,550	6.00	Non-Traversable Median	14.17
29	Nine-lane Freeway	Urban	1402+90.080	1408+40.050	549.97	0.1042	2030: 147,550	10.14	Non-Traversable Median	18.14
30	Ten-lane Freeway	Urban	1408+40.050	1409+18.390	78.34	0.0148	2030: 147,550	14.47	Non-Traversable Median	22.29

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
31	Ten-lane Freeway	Urban	1409+18.390	1410+60.390	142.00	0.0269	2030: 147,550	15.99	Non-Traversable Median	23.31
32	Ten-lane Freeway	Urban	1410+60.390	1412+79.860	219.47	0.0416	2030: 147,550	18.49	Non-Traversable Median	24.98
33	Ten-lane Freeway	Urban	1412+79.860	1418+67.223	587.36	0.1112	2030: 147,550	20.00	Non-Traversable Median	26.00

Table 2. Evaluation Freeway - Speed Change Lanes (Speed Change)

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
20	Ten-lane Freeway Speed Change	Exit	1375+07.630	1377+39.570	231.94	0.0439	2030: 182,900	2.00	Non-Traversable Median	10.00
22	Ten-lane Freeway Speed Change	Exit	1377+39.570	1378+27.630	88.06	0.0167	2030: 203,000	2.00	Non-Traversable Median	10.00
24	Ten-lane Freeway Speed Change	Exit	1389+88.520	1393+33.520	345.00	0.0653	2030: 203,000	6.00	Non-Traversable Median	14.00
25	Ten-lane Freeway Speed Change	Entrance	1392+24.430	1393+33.520	109.09	0.0207	2030: 203,000	6.00	Non-Traversable Median	14.00
27	Ten-lane Freeway Speed Change	Entrance	1393+33.520	1395+79.430	245.91	0.0466	2030: 168,550	6.00	Non-Traversable Median	14.00

Table 3. User Defined CMF Used in the Eval Segment CPM Evaluation (Section 1)

Name	Description	Start Loc. (Sta. ft)	End Loc. (Sta. ft)	Start CMF Year	End CMF Year	Severity	CMF Value
12	remove 10 right, remove 20 right	1343+13.390	1346+07.370	2030	2050	Total	1.2000
14	remove 10 both, remove 20 both	1346+07.370	1360+45.180	2030	2050	Total	1.4000
13	remove 10 both, remove 20 left	1360+45.180	1361+05.340	2030	2050	Total	1.3000
12	remove 10 both	1361+05.340	1377+39.570	2030	2050	Total	1.2000
13	remove 10 both, remove 20 right	1377+39.570	1393+33.520	2030	2050	Total	1.3000
12	remove 10 both	1393+33.520	1395+79.430	2030	2050	Total	1.2000
11	remove 10 right	1395+79.430	1402+90.080	2030	2050	Total	1.1000
12	remove 10 both	1402+90.080	1418+67.223	2030	2050	Total	1.2000

Table 4. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**1.3341**
Average Future Road AADT (vpd)	**169,533**
Predicted Crashes	
Total Crashes	**95.53**
Fatal and Injury Crashes	**28.02**
Property-Damage-Only Crashes	**67.50**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**29**
Percent Property-Damage-Only Crashes (%)	**71**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**71.6074**
FI Crash Rate (crashes/mi/yr)	**21.0070**
PDO Crash Rate (crashes/mi/yr)	**50.6004**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**82.55**
Travel Crash Rate (crashes/million veh-mi)	**1.16**
Travel FI Crash Rate (crashes/million veh-mi)	**0.34**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.82**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Table 5. Predicted Freeway Speed Change Lane Crash Rates and Frequencies Summary (Speed Change)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Length (mi)	**0.1932**
Average Future Road AADT (vpd)	**95,062**
Predicted Crashes	
Total Crashes	**6.26**
Fatal and Injury Crashes	**2.01**
Property-Damage-Only Crashes	**4.25**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**32**
Percent Property-Damage-Only Crashes (%)	**68**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**32.4322**
FI Crash Rate (crashes/mi/yr)	**10.4116**
PDO Crash Rate (crashes/mi/yr)	**22.0206**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**6.70**
Travel Crash Rate (crashes/million veh-mi)	**0.94**
Travel FI Crash Rate (crashes/million veh-mi)	**0.30**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.64**

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 6. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1343+13.390	1345+47.920	0.0444	2.514	2.5144	0.7500	1.7644	56.6068	0.98
2	1345+47.920	1345+73.390	0.0048	0.274	0.2738	0.0817	0.1921	56.7626	0.98
3	1345+73.390	1346+07.390	0.0064	0.513	0.5128	0.1549	0.3579	79.6381	1.38
4	1346+07.390	1346+23.390	0.0030	0.286	0.2865	0.0840	0.2025	94.5464	1.40
5	1346+23.390	1346+47.920	0.0046	0.440	0.4399	0.1290	0.3109	94.6812	1.40
6	1346+47.920	1349+58.530	0.0588	5.425	5.4250	1.5933	3.8317	92.2194	1.36
7	1349+58.530	1349+90.390	0.0060	0.543	0.5428	0.1595	0.3833	89.9560	1.33
8	1349+90.390	1349+96.390	0.0011	0.102	0.1016	0.0298	0.0718	89.4186	1.32
9	1349+96.390	1350+54.390	0.0110	0.973	0.9727	0.2855	0.6872	88.5528	1.31
10	1350+54.390	1350+68.890	0.0027	0.241	0.2406	0.0706	0.1700	87.6130	1.29
11	1350+68.890	1351+13.440	0.0084	0.736	0.7356	0.2157	0.5199	87.1861	1.29
12	1351+13.440	1351+81.390	0.0129	1.123	1.1229	0.3294	0.7935	87.2559	1.29
13	1351+81.390	1353+18.390	0.0259	2.294	2.2938	0.6737	1.6201	88.4033	1.31
14	1353+18.390	1353+72.910	0.0103	0.927	0.9268	0.2725	0.6543	89.7580	1.33
15	1353+72.910	1354+00.500	0.0052	0.472	0.4722	0.1389	0.3333	90.3718	1.34
16	1354+00.500	1360+45.180	0.1221	11.794	11.7939	3.4668	8.3271	96.5932	1.43
17	1360+45.180	1361+05.390	0.0114	0.973	0.9730	0.2869	0.6862	85.3268	1.35
18	1361+05.390	1375+07.630	0.2656	15.413	15.4127	4.5934	10.8194	58.0351	1.00
19	1375+07.630	1377+39.570	0.0220	1.724	1.7241	0.4973	1.2267	78.4948	1.18
21	1377+39.570	1387+63.390	0.1856	18.020	18.0201	5.0848	12.9353	97.1086	1.31
23	1387+63.390	1393+33.520	0.0650	6.385	6.3846	1.8026	4.5821	98.2581	1.33
26	1393+33.520	1395+79.430	0.0233	1.634	1.6337	0.4810	1.1527	70.1543	1.14
28	1395+79.430	1402+90.080	0.1346	6.495	6.4950	1.9688	4.5262	48.2567	0.90
29	1402+90.080	1408+40.050	0.1042	5.892	5.8924	1.7381	4.1542	56.5697	1.05
30	1408+40.050	1409+18.390	0.0148	0.781	0.7806	0.2366	0.5440	52.6117	0.98
31	1409+18.390	1410+60.390	0.0269	1.421	1.4206	0.4307	0.9899	52.8213	0.98
32	1410+60.390	1412+79.860	0.0416	2.210	2.2100	0.6704	1.5395	53.1671	0.99
33	1412+79.860	1418+67.223	0.1112	5.926	5.9263	1.7987	4.1276	53.2737	0.99
Total			1.3341	95.528	95.5285	28.0246	67.5039	71.6074	1.16

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 7. Predicted Crash Frequencies and Rates by Freeway Speed Change Lane (Speed Change)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
20	1375+07.630	1377+39.570	0.0439	1.263	1.2632	0.3833	0.8799	28.7552	0.86
22	1377+39.570	1378+27.630	0.0167	0.571	0.5706	0.1729	0.3977	34.2138	0.92
24	1389+88.520	1393+33.520	0.0653	2.218	2.2180	0.6667	1.5512	33.9448	0.92
25	1392+24.430	1393+33.520	0.0207	0.832	0.8318	0.2952	0.5366	40.2608	1.09
27	1393+33.520	1395+79.430	0.0466	1.382	1.3817	0.4932	0.8885	29.6672	0.96
Total			0.1932	6.265	6.2653	2.0113	4.2540	32.4322	0.94

Note: *Travel Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 8. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1343+13.390	1375+66.020	0.6160	45.793	45.7933	13.5372	32.2560	74.3363	1.19
Simple Curve 1	1375+66.020	1377+90.504	0.0425	3.462	3.4617	1.0119	2.4498	81.4220	2.08
Tangent	1377+90.504	1379+73.892	0.0347	3.468	3.4683	0.9837	2.4846	99.8587	1.50
Simple Curve 2	1379+73.892	1383+26.747	0.0668	6.210	6.2105	1.7524	4.4581	92.9324	1.31
Tangent	1383+26.747	1392+20.762	0.1693	14.300	14.3003	4.0635	10.2368	84.4565	1.56
Simple Curve 3	1392+20.762	1395+42.746	0.0610	5.385	5.3850	1.6985	3.6865	88.3057	2.52
Tangent	1395+42.746	1396+53.147	0.0209	1.124	1.1236	0.3496	0.7740	53.7352	1.30
Simple Curve 4	1396+53.147	1398+62.242	0.0396	1.911	1.9110	0.5793	1.3318	48.2567	0.90
Tangent	1398+62.242	1402+65.418	0.0764	3.685	3.6848	1.1169	2.5679	48.2567	0.90
Simple Curve 5	1402+65.418	1404+94.572	0.0434	2.416	2.4163	0.7146	1.7017	55.6750	1.03
Tangent	1404+94.572	1407+89.943	0.0559	3.165	3.1646	0.9335	2.2311	56.5697	1.05
Simple Curve 6	1407+89.943	1412+79.861	0.0928	4.948	4.9480	1.4961	3.4519	53.3259	0.99
Tangent	1412+79.861	1418+67.223	0.1112	5.926	5.9263	1.7987	4.1276	53.2738	0.99

Table 9. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	101.79	30.04	29.507	71.76	70.493
Total	101.79	30.04	29.507	71.76	70.493
Average	101.79	30.04	29.507	71.76	70.493

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 10. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0152	0.0309	0.2356	0.4684	1.7644
2	0.0017	0.0034	0.0257	0.0510	0.1921
3	0.0031	0.0064	0.0487	0.0967	0.3579
4	0.0017	0.0035	0.0264	0.0524	0.2025
5	0.0026	0.0053	0.0405	0.0806	0.3109
6	0.0322	0.0657	0.5005	0.9950	3.8317
7	0.0032	0.0066	0.0501	0.0996	0.3833
8	0.0006	0.0012	0.0094	0.0186	0.0718
9	0.0058	0.0118	0.0897	0.1783	0.6872
10	0.0014	0.0029	0.0222	0.0441	0.1700
11	0.0044	0.0089	0.0678	0.1347	0.5199
12	0.0067	0.0136	0.1035	0.2057	0.7935
13	0.0136	0.0278	0.2116	0.4207	1.6201
14	0.0055	0.0112	0.0856	0.1702	0.6543
15	0.0028	0.0057	0.0436	0.0867	0.3333
16	0.0701	0.1429	1.0889	2.1649	8.3271
17	0.0058	0.0118	0.0901	0.1791	0.6862
18	0.0929	0.1893	1.4427	2.8684	10.8194
19	0.0113	0.0236	0.1650	0.2975	1.2267
21	0.1090	0.2252	1.6437	3.1068	12.9353
23	0.0365	0.0744	0.5664	1.1253	4.5821
26	0.0111	0.0232	0.1608	0.2860	1.1527
28	0.0419	0.0863	0.6338	1.2069	4.5262
29	0.0377	0.0781	0.5650	1.0573	4.1542
30	0.0056	0.0117	0.0799	0.1394	0.5440
31	0.0101	0.0214	0.1455	0.2537	0.9899
32	0.0157	0.0332	0.2265	0.3950	1.5395
33	0.0364	0.0741	0.5650	1.1232	4.1276
Total	0.5845	1.2001	8.9340	17.3061	67.5039

Table 11. Predicted Crash Severity by Speed Change Lane (Speed Change)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
20	0.0087	0.0181	0.1272	0.2293	0.8799
22	0.0038	0.0079	0.0567	0.1045	0.3977
24	0.0142	0.0292	0.2146	0.4088	1.5512
25	0.0069	0.0146	0.0997	0.1739	0.5366
27	0.0113	0.0238	0.1649	0.2932	0.8885
Total	0.0449	0.0937	0.6631	1.2096	4.2540

Table 12. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.04	0.0	0.59	0.6	0.63	0.7
Highway Segment	Collision with Fixed Object	7.92	8.3	19.11	20.0	27.04	28.3
Highway Segment	Collision with Other Object	0.56	0.6	3.71	3.9	4.27	4.5
Highway Segment	Other Single-vehicle Collision	2.28	2.4	2.86	3.0	5.14	5.4
Highway Segment	Collision with Parked Vehicle	0.17	0.2	0.43	0.4	0.59	0.6
Highway Segment	Total Single Vehicle Crashes	10.97	11.5	26.70	27.9	37.67	39.4
Highway Segment	Right-Angle Collision	0.53	0.6	0.73	0.8	1.26	1.3
Highway Segment	Head-on Collision	0.14	0.1	0.08	0.1	0.22	0.2
Highway Segment	Other Multi-vehicle Collision	0.53	0.6	0.98	1.0	1.51	1.6
Highway Segment	Rear-end Collision	12.79	13.4	28.16	29.5	40.95	42.9
Highway Segment	Sideswipe, Same Direction Collision	3.07	3.2	10.86	11.4	13.92	14.6
Highway Segment	Total Multiple Vehicle Crashes	17.05	17.8	40.81	42.7	57.86	60.6
Highway Segment	Total Highway Segment Crashes	28.02	29.3	67.50	70.7	95.53	100.0
	Total Crashes	28.02	29.3	67.50	70.7	95.53	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 13. Predicted Exit Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.02	0.5	0.02	0.5
Highway Segment	Collision with Fixed Object	0.24	5.9	0.59	14.5	0.82	20.4
Highway Segment	Collision with Other Object	0.02	0.5	0.09	2.1	0.10	2.6
Highway Segment	Other Single-vehicle Collision	0.06	1.5	0.07	1.6	0.12	3.1
Highway Segment	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Total Single Vehicle Crashes	0.32	7.9	0.76	18.6	1.07	26.5
Highway Segment	Right-Angle Collision	0.01	0.3	0.03	0.8	0.05	1.2
Highway Segment	Head-on Collision	0.01	0.2	0.01	0.1	0.01	0.3
Highway Segment	Other Multi-vehicle Collision	0.02	0.5	0.04	1.1	0.07	1.6
Highway Segment	Rear-end Collision	0.67	16.6	1.60	39.4	2.27	56.0
Highway Segment	Sideswipe, Same Direction Collision	0.19	4.8	0.39	9.6	0.58	14.4
Highway Segment	Total Multiple Vehicle Crashes	0.90	22.3	2.07	51.2	2.98	73.5
Highway Segment	Total Highway Segment Crashes	1.22	30.2	2.83	69.8	4.05	100.0
	Total Crashes	1.22	30.2	2.83	69.8	4.05	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 14. Predicted Entrance Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.00	0.1	0.00	0.1
Highway Segment	Collision with Fixed Object	0.15	6.9	0.18	8.3	0.34	15.2
Highway Segment	Collision with Other Object	0.01	0.7	0.05	2.3	0.07	3.0
Highway Segment	Other Single-vehicle Collision	0.05	2.4	0.02	1.0	0.08	3.4
Highway Segment	Collision with Parked Vehicle	0.00	0.1	0.00	0.2	0.01	0.3
Highway Segment	Total Single Vehicle Crashes	0.22	10.1	0.27	12.0	0.49	22.1
Highway Segment	Right-Angle Collision	0.01	0.7	0.02	1.0	0.04	1.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.1	0.01	0.2
Highway Segment	Other Multi-vehicle Collision	0.01	0.6	0.02	1.0	0.04	1.6
Highway Segment	Rear-end Collision	0.43	19.3	0.76	34.1	1.18	53.5
Highway Segment	Sideswipe, Same Direction Collision	0.10	4.7	0.36	16.2	0.46	21.0
Highway Segment	Total Multiple Vehicle Crashes	0.56	25.5	1.16	52.4	1.73	77.9
Highway Segment	Total Highway Segment Crashes	0.79	35.6	1.43	64.4	2.21	100.0
	Total Crashes	0.79	35.6	1.43	64.4	2.21	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 15. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1343+13.390	1345+47.920	Information: for segment #1 (1343+13.390 to 1345+47.920), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1343+13.390	1345+47.920	Information: for segment #1 (1343+13.390 to 1345+47.920), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1343+13.390	1345+47.920	Information: for segment #1 (1343+13.390 to 1345+47.920), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1343+13.390	1345+47.920	Information: for segment #1 (1343+13.390 to 1345+47.920), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1345+47.920	1345+73.390	Information: for segment #2 (1345+47.920 to 1345+73.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1345+47.920	1345+73.390	Information: for segment #2 (1345+47.920 to 1345+73.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1345+47.920	1345+73.390	Information: for segment #2 (1345+47.920 to 1345+73.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1345+47.920	1345+73.390	Information: for segment #2 (1345+47.920 to 1345+73.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1345+73.390	1346+07.390	Information: for segment #3 (1345+73.390 to 1346+07.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1345+73.390	1346+07.390	Information: for segment #3 (1345+73.390 to 1346+07.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1345+73.390	1346+07.390	Information: for segment #3 (1345+73.390 to 1346+07.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1345+73.390	1346+07.390	Warning: for segment #3 (1345+73.390 to 1346+07.390), Outside barrier offset (8.00 feet) is less than the left outside shoulder width (9.00 feet). This indicates there is problem with the input data.
1346+07.390	1346+23.390	Information: for segment #4 (1346+07.390 to 1346+23.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+07.390	1346+23.390	Information: for segment #4 (1346+07.390 to 1346+23.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+07.390	1346+23.390	Information: for segment #4 (1346+07.390 to 1346+23.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+07.390	1346+23.390	Information: for segment #4 (1346+07.390 to 1346+23.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+23.390	1346+47.920	Information: for segment #5 (1346+23.390 to 1346+47.920), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+23.390	1346+47.920	Information: for segment #5 (1346+23.390 to 1346+47.920), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+23.390	1346+47.920	Information: for segment #5 (1346+23.390 to 1346+47.920), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+23.390	1346+47.920	Information: for segment #5 (1346+23.390 to 1346+47.920), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+47.920	1349+58.530	Information: for segment #6 (1346+47.920 to 1349+58.530), Median barrier distance from edge of inside shoulder to barrier face (-0.01 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+47.920	1349+58.530	Information: for segment #6 (1346+47.920 to 1349+58.530), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1346+47.920	1349+58.530	Information: for segment #6 (1346+47.920 to 1349+58.530), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+47.920	1349+58.530	Information: for segment #6 (1346+47.920 to 1349+58.530), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+47.920	1349+58.530	Information: for segment #6 (1346+47.920 to 1349+58.530), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1349+58.530	1349+90.390	Information: for segment #7 (1349+58.530 to 1349+90.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1349+58.530	1349+90.390	Information: for segment #7 (1349+58.530 to 1349+90.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1349+58.530	1349+90.390	Information: for segment #7 (1349+58.530 to 1349+90.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1349+58.530	1349+90.390	Information: for segment #7 (1349+58.530 to 1349+90.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1349+90.390	1349+96.390	Information: for segment #8 (1349+90.390 to 1349+96.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1349+90.390	1349+96.390	Information: for segment #8 (1349+90.390 to 1349+96.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1349+90.390	1349+96.390	Information: for segment #8 (1349+90.390 to 1349+96.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1349+90.390	1349+96.390	Information: for segment #8 (1349+90.390 to 1349+96.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1349+96.390	1350+54.390	Information: for segment #9 (1349+96.390 to 1350+54.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1349+96.390	1350+54.390	Information: for segment #9 (1349+96.390 to 1350+54.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1349+96.390	1350+54.390	Information: for segment #9 (1349+96.390 to 1350+54.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1349+96.390	1350+54.390	Information: for segment #9 (1349+96.390 to 1350+54.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1350+54.390	1350+68.890	Information: for segment #10 (1350+54.390 to 1350+68.890), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1350+54.390	1350+68.890	Information: for segment #10 (1350+54.390 to 1350+68.890), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1350+54.390	1350+68.890	Information: for segment #10 (1350+54.390 to 1350+68.890), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1350+54.390	1350+68.890	Information: for segment #10 (1350+54.390 to 1350+68.890), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1350+68.890	1351+13.440	Information: for segment #11 (1350+68.890 to 1351+13.440), Median barrier distance from edge of inside shoulder to barrier face (0.01 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1350+68.890	1351+13.440	Information: for segment #11 (1350+68.890 to 1351+13.440), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1350+68.890	1351+13.440	Information: for segment #11 (1350+68.890 to 1351+13.440), Median barrier distance from edge of inside shoulder to barrier face (0.27 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1350+68.890	1351+13.440	Information: for segment #11 (1350+68.890 to 1351+13.440), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1350+68.890	1351+13.440	Information: for segment #11 (1350+68.890 to 1351+13.440), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1351+13.440	1351+81.390	Information: for segment #12 (1351+13.440 to 1351+81.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1351+13.440	1351+81.390	Information: for segment #12 (1351+13.440 to 1351+81.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1351+13.440	1351+81.390	Information: for segment #12 (1351+13.440 to 1351+81.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1351+13.440	1351+81.390	Information: for segment #12 (1351+13.440 to 1351+81.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1351+81.390	1353+18.390	Information: for segment #13 (1351+81.390 to 1353+18.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1351+81.390	1353+18.390	Information: for segment #13 (1351+81.390 to 1353+18.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1351+81.390	1353+18.390	Information: for segment #13 (1351+81.390 to 1353+18.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1351+81.390	1353+18.390	Information: for segment #13 (1351+81.390 to 1353+18.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1353+18.390	1353+72.910	Information: for segment #14 (1353+18.390 to 1353+72.910), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1353+18.390	1353+72.910	Information: for segment #14 (1353+18.390 to 1353+72.910), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1353+18.390	1353+72.910	Information: for segment #14 (1353+18.390 to 1353+72.910), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1353+18.390	1353+72.910	Information: for segment #14 (1353+18.390 to 1353+72.910), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1353+72.910	1354+00.500	Information: for segment #15 (1353+72.910 to 1354+00.500), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1353+72.910	1354+00.500	Information: for segment #15 (1353+72.910 to 1354+00.500), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1353+72.910	1354+00.500	Information: for segment #15 (1353+72.910 to 1354+00.500), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1353+72.910	1354+00.500	Information: for segment #15 (1353+72.910 to 1354+00.500), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1354+00.500	1360+45.180	Information: for segment #16 (1354+00.500 to 1360+45.180), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1354+00.500	1360+45.180	Information: for segment #16 (1354+00.500 to 1360+45.180), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1354+00.500	1360+45.180	Information: for segment #16 (1354+00.500 to 1360+45.180), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1354+00.500	1360+45.180	Information: for segment #16 (1354+00.500 to 1360+45.180), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1360+45.180	1361+05.390	Information: for segment #17 (1360+45.180 to 1361+05.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1360+45.180	1361+05.390	Information: for segment #17 (1360+45.180 to 1361+05.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1360+45.180	1361+05.390	Information: for segment #17 (1360+45.180 to 1361+05.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1360+45.180	1361+05.390	Warning: for segment #17 (1360+45.180 to 1361+05.390), Outside barrier offset (8.00 feet) is less than the left outside shoulder width (9.00 feet). This indicates there is problem with the input data.
1361+05.390	1375+07.630	Information: for segment #18 (1361+05.390 to 1375+07.630), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1361+05.390	1375+07.630	Information: for segment #18 (1361+05.390 to 1375+07.630), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1361+05.390	1375+07.630	Information: for segment #18 (1361+05.390 to 1375+07.630), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1361+05.390	1375+07.630	Information: for segment #18 (1361+05.390 to 1375+07.630), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1375+07.630	1377+39.570	Information: for segment #19 (1375+07.630 to 1377+39.570), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1375+07.630	1377+39.570	Information: for segment #19 (1375+07.630 to 1377+39.570), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1375+07.630	1377+39.570	Information: for segment #19 (1375+07.630 to 1377+39.570), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1375+07.630	1377+39.570	Information: for segment #19 (1375+07.630 to 1377+39.570), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+39.570	1387+63.390	Information: for segment #21 (1377+39.570 to 1387+63.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+39.570	1387+63.390	Information: for segment #21 (1377+39.570 to 1387+63.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+39.570	1387+63.390	Information: for segment #21 (1377+39.570 to 1387+63.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+39.570	1387+63.390	Information: for segment #21 (1377+39.570 to 1387+63.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1387+63.390	1393+33.520	Information: for segment #23 (1387+63.390 to 1393+33.520), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1387+63.390	1393+33.520	Information: for segment #23 (1387+63.390 to 1393+33.520), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1387+63.390	1393+33.520	Information: for segment #23 (1387+63.390 to 1393+33.520), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1387+63.390	1393+33.520	Information: for segment #23 (1387+63.390 to 1393+33.520), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1393+33.520	1395+79.430	Information: for segment #26 (1393+33.520 to 1395+79.430), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1393+33.520	1395+79.430	Information: for segment #26 (1393+33.520 to 1395+79.430), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1393+33.520	1395+79.430	Information: for segment #26 (1393+33.520 to 1395+79.430), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1393+33.520	1395+79.430	Information: for segment #26 (1393+33.520 to 1395+79.430), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1395+79.430	1402+90.080	Information: for segment #28 (1395+79.430 to 1402+90.080), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1395+79.430	1402+90.080	Information: for segment #28 (1395+79.430 to 1402+90.080), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1395+79.430	1402+90.080	Information: for segment #28 (1395+79.430 to 1402+90.080), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1395+79.430	1402+90.080	Information: for segment #28 (1395+79.430 to 1402+90.080), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1402+90.080	1408+40.050	Information: for segment #29 (1402+90.080 to 1408+40.050), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1402+90.080	1408+40.050	Information: for segment #29 (1402+90.080 to 1408+40.050), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1402+90.080	1408+40.050	Information: for segment #29 (1402+90.080 to 1408+40.050), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1402+90.080	1408+40.050	Information: for segment #29 (1402+90.080 to 1408+40.050), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+40.050	1409+18.390	Information: for segment #30 (1408+40.050 to 1409+18.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+40.050	1409+18.390	Information: for segment #30 (1408+40.050 to 1409+18.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+40.050	1409+18.390	Information: for segment #30 (1408+40.050 to 1409+18.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+40.050	1409+18.390	Information: for segment #30 (1408+40.050 to 1409+18.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1409+18.390	1410+60.390	Information: for segment #31 (1409+18.390 to 1410+60.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1409+18.390	1410+60.390	Information: for segment #31 (1409+18.390 to 1410+60.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1409+18.390	1410+60.390	Information: for segment #31 (1409+18.390 to 1410+60.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1409+18.390	1410+60.390	Information: for segment #31 (1409+18.390 to 1410+60.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1410+60.390	1412+79.860	Information: for segment #32 (1410+60.390 to 1412+79.860), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1410+60.390	1412+79.860	Information: for segment #32 (1410+60.390 to 1412+79.860), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1410+60.390	1412+79.860	Information: for segment #32 (1410+60.390 to 1412+79.860), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1410+60.390	1412+79.860	Information: for segment #32 (1410+60.390 to 1412+79.860), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1412+79.860	1418+67.223	Information: for segment #33 (1412+79.860 to 1418+67.223), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1412+79.860	1418+67.223	Information: for segment #33 (1412+79.860 to 1418+67.223), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1412+79.860	1418+67.223	Information: for segment #33 (1412+79.860 to 1418+67.223), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1412+79.860	1418+67.223	Information: for segment #33 (1412+79.860 to 1418+67.223), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1375+07.630	1377+39.570	Information: for segment #20 (1375+07.630 to 1377+39.570), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+39.570	1378+27.630	Information: for segment #22 (1377+39.570 to 1378+27.630), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1389+88.520	1393+33.520	Information: for segment #24 (1389+88.520 to 1393+33.520), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1392+24.430	1393+33.520	Information: for segment #25 (1392+24.430 to 1393+33.520), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1393+33.520	1395+79.430	Information: for segment #27 (1393+33.520 to 1395+79.430), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1402+90.080	1408+40.050	Information: for segment #29 (1402+90.080 to 1408+40.050), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway

I-35 Build Alternative 2 Model Barrier-Separated GP Lanes

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

Report Generated: Aug 24, 2022 3:40 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 12:09:16 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL2
Highway Comment: Imported from CENTRAL2.xml
Highway Version: 1

Evaluation Title: Section 1
Evaluation Comment: Created Thu Jun 23 12:08:21 CDT 2022

Minimum Location: 1086+14.425
Maximum Location: 1137+96.210

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1086+14.425
Evaluation End Location: 1137+96.210
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_EX=1.0; FI_MV=1.0; FI_SV=1.0; PDO_EX=1.0; PDO_MV=1.0; PDO_SV=1.0;

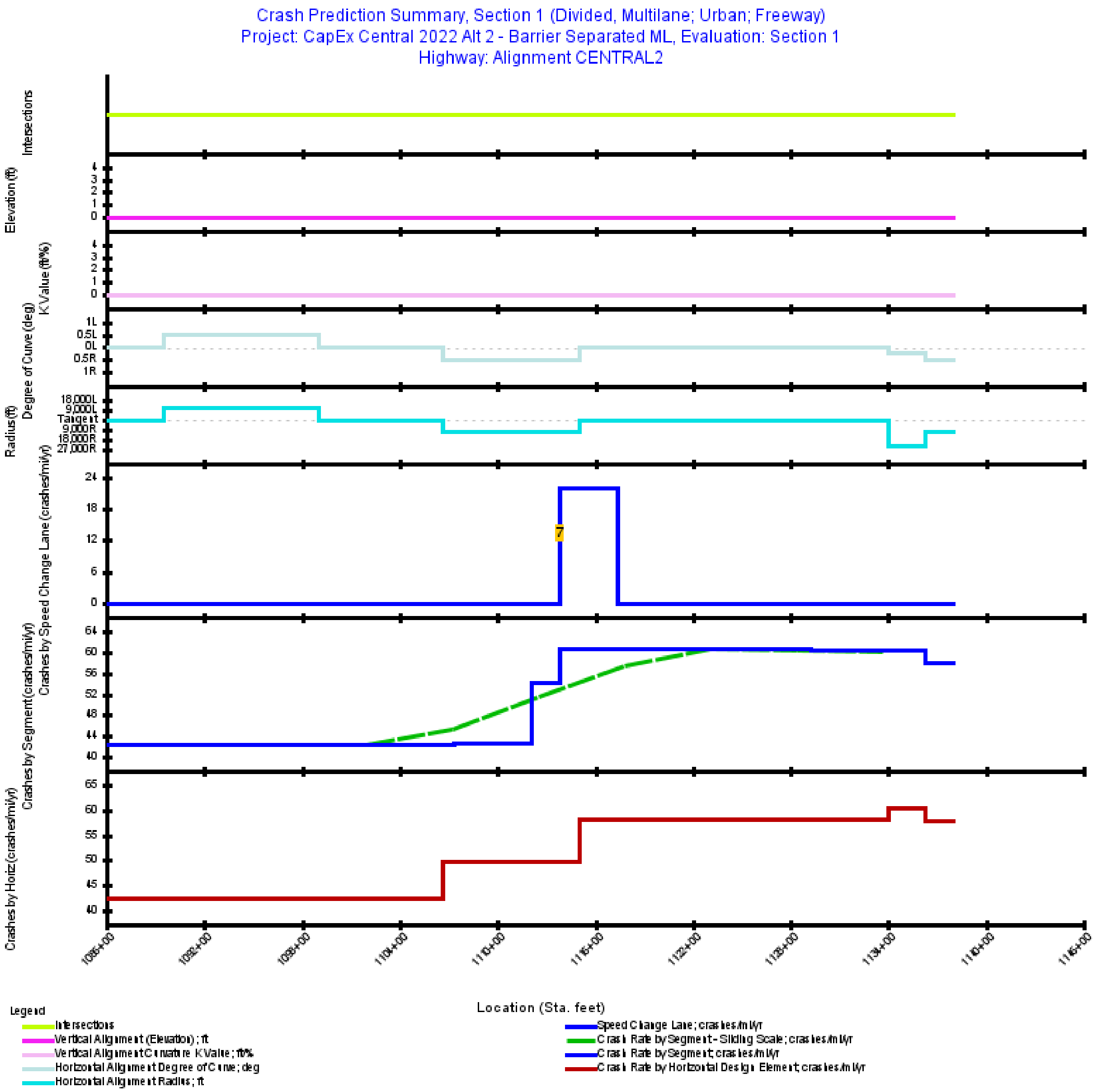

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Eight-lane Freeway	Urban	1086+14.425	1086+91.810	77.39	0.0147	2030: 129,550	86.53	Non-Traversable Median	94.42
2	Eight-lane Freeway	Urban	1086+91.810	1092+75.425	583.62	0.1105	2030: 129,550	91.03	Non-Traversable Median	99.03
3	Eight-lane Freeway	Urban	1092+75.425	1107+32.425	1,457.00	0.2759	2030: 129,550	96.00	Non-Traversable Median	103.00
4	Eight-lane Freeway	Urban	1107+32.425	1112+09.280	476.86	0.0903	2030: 129,550	92.98	Non-Traversable Median	100.98
5	Nine-lane Freeway	Urban	1112+09.280	1113+87.800	178.52	0.0338	2030: 151,450	90.22	Non-Traversable Median	98.22
6	Nine-lane Freeway	Urban	1113+87.800	1129+20.890	1,533.09	0.2904	2030: 169,950	88.00	Non-Traversable Median	96.73
8	Ten-lane Freeway	Urban	1129+20.890	1136+27.020	706.13	0.1337	2030: 175,750	88.00	Non-Traversable Median	96.00
9	Ten-lane Freeway	Urban	1136+27.020	1137+96.210	169.19	0.0320	2030: 175,750	88.00	Non-Traversable Median	95.68

Table 2. Evaluation Freeway - Speed Change Lanes (Speed Change)

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
7	Nine-lane Freeway Speed Change	Exit	1113+87.800	1117+37.800	350.00	0.0663	2030: 169,950	88.00	Non-Traversable Median	96.73

Table 3. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**0.9483**
Average Future Road AADT (vpd)	**149,366**
Predicted Crashes	
Total Crashes	**48.19**
Fatal and Injury Crashes	**14.08**
Property-Damage-Only Crashes	**34.11**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**29**
Percent Property-Damage-Only Crashes (%)	**71**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**50.8237**
FI Crash Rate (crashes/mi/yr)	**14.8516**
PDO Crash Rate (crashes/mi/yr)	**35.9721**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**51.70**
Travel Crash Rate (crashes/million veh-mi)	**0.93**
Travel FI Crash Rate (crashes/million veh-mi)	**0.27**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.66**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Table 4. Predicted Freeway Speed Change Lane Crash Rates and Frequencies Summary (Speed Change)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Length (mi)	**0.0663**
Average Future Road AADT (vpd)	**84,975**
Predicted Crashes	
Total Crashes	**1.47**
Fatal and Injury Crashes	**0.44**
Property-Damage-Only Crashes	**1.02**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**30**
Percent Property-Damage-Only Crashes (%)	**70**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**22.0946**
FI Crash Rate (crashes/mi/yr)	**6.6599**
PDO Crash Rate (crashes/mi/yr)	**15.4347**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.06**
Travel Crash Rate (crashes/million veh-mi)	**0.71**
Travel FI Crash Rate (crashes/million veh-mi)	**0.21**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.50**

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 5. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1086+14.425	1086+91.810	0.0147	0.618	0.6179	0.1834	0.4345	42.1588	0.89
2	1086+91.810	1092+75.425	0.1105	4.686	4.6865	1.3897	3.2968	42.3990	0.90
3	1092+75.425	1107+32.425	0.2759	11.690	11.6900	3.4668	8.2231	42.3631	0.90
4	1107+32.425	1112+09.280	0.0903	3.849	3.8493	1.1408	2.7085	42.6218	0.90
5	1112+09.280	1113+87.800	0.0338	1.835	1.8352	0.5401	1.2951	54.2776	0.98
6	1113+87.800	1129+20.890	0.2572	15.592	15.5918	4.4665	11.1253	60.6181	0.98
8	1129+20.890	1136+27.020	0.1337	8.070	8.0703	2.3561	5.7142	60.3447	0.94
9	1136+27.020	1137+96.210	0.0320	1.853	1.8529	0.5398	1.3131	57.8232	0.90
Total			0.9483	48.194	48.1938	14.0831	34.1107	50.8237	0.93

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 6. Predicted Crash Frequencies and Rates by Freeway Speed Change Lane (Speed Change)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
7	1113+87.800	1117+37.800	0.0663	1.465	1.4646	0.4415	1.0231	22.0946	0.71
Total			0.0663	1.465	1.4646	0.4415	1.0231	22.0946	0.71

Note: *Travel Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 7. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1086+14.425	1089+52.699	0.0641	2.713	2.7129	0.8046	1.9082	42.3441	0.89
Simple Curve 1	1089+52.699	1099+07.031	0.1807	7.659	7.6591	2.2713	5.3878	42.3752	0.90
Tangent	1099+07.031	1106+63.496	0.1433	6.069	6.0694	1.8000	4.2694	42.3631	0.90
Simple Curve 2	1106+63.496	1115+07.410	0.1598	7.955	7.9545	2.3442	5.6103	49.7678	1.03
Tangent	1115+07.410	1133+99.440	0.3583	20.809	20.8088	6.0054	14.8034	58.0700	1.05
Simple Curve 3	1133+99.440	1136+29.394	0.0436	2.627	2.6270	0.7669	1.8601	60.3187	0.94
Simple Curve 4	1136+29.394	1137+96.210	0.0316	1.827	1.8269	0.5322	1.2946	57.8232	0.90

Table 8. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	49.66	14.53	29.249	35.13	70.751
Total	49.66	14.53	29.249	35.13	70.751
Average	49.66	14.53	29.249	35.13	70.751

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 9. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0037	0.0076	0.0576	0.1145	0.4345
2	0.0306	0.0635	0.4547	0.8409	3.2968
3	0.0754	0.1563	1.1285	2.1066	8.2231
4	0.0268	0.0566	0.3854	0.6721	2.7085
5	0.0127	0.0268	0.1824	0.3182	1.2951
6	0.0909	0.1856	1.4076	2.7824	11.1253
8	0.0500	0.1031	0.7581	1.4448	5.7142
9	0.0127	0.0268	0.1823	0.3180	1.3131
Total	0.3028	0.6262	4.5566	8.5975	34.1107

Table 10. Predicted Crash Severity by Speed Change Lane (Speed Change)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
7	0.0094	0.0194	0.1422	0.2704	1.0231

Table 11. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.02	0.0	0.30	0.6	0.33	0.7
Highway Segment	Collision with Fixed Object	3.90	8.1	9.90	20.5	13.81	28.6
Highway Segment	Collision with Other Object	0.28	0.6	1.92	4.0	2.20	4.6
Highway Segment	Other Single-vehicle Collision	1.12	2.3	1.48	3.1	2.60	5.4
Highway Segment	Collision with Parked Vehicle	0.08	0.2	0.22	0.5	0.30	0.6
Highway Segment	Total Single Vehicle Crashes	5.41	11.2	13.83	28.7	19.24	39.9
Highway Segment	Right-Angle Collision	0.27	0.6	0.36	0.8	0.63	1.3
Highway Segment	Head-on Collision	0.07	0.1	0.04	0.1	0.11	0.2
Highway Segment	Other Multi-vehicle Collision	0.27	0.6	0.49	1.0	0.76	1.6
Highway Segment	Rear-end Collision	6.51	13.5	13.99	29.0	20.50	42.5
Highway Segment	Sideswipe, Same Direction Collision	1.56	3.2	5.39	11.2	6.96	14.4
Highway Segment	Total Multiple Vehicle Crashes	8.68	18.0	20.28	42.1	28.96	60.1
Highway Segment	Total Highway Segment Crashes	14.08	29.2	34.11	70.8	48.19	100.0
	Total Crashes	14.08	29.2	34.11	70.8	48.19	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 12. Predicted Exit Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.01	0.5	0.01	0.5
Highway Segment	Collision with Fixed Object	0.09	5.9	0.21	14.5	0.30	20.4
Highway Segment	Collision with Other Object	0.01	0.5	0.03	2.1	0.04	2.6
Highway Segment	Other Single-vehicle Collision	0.02	1.5	0.02	1.6	0.04	3.1
Highway Segment	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Total Single Vehicle Crashes	0.12	7.9	0.27	18.7	0.39	26.5
Highway Segment	Right-Angle Collision	0.01	0.3	0.01	0.8	0.02	1.2
Highway Segment	Head-on Collision	0.00	0.2	0.00	0.1	0.00	0.3
Highway Segment	Other Multi-vehicle Collision	0.01	0.5	0.02	1.1	0.02	1.6
Highway Segment	Rear-end Collision	0.24	16.5	0.58	39.5	0.82	56.0
Highway Segment	Sideswipe, Same Direction Collision	0.07	4.8	0.14	9.6	0.21	14.4
Highway Segment	Total Multiple Vehicle Crashes	0.33	22.3	0.75	51.2	1.08	73.5
Highway Segment	Total Highway Segment Crashes	0.44	30.1	1.02	69.9	1.47	100.0
	Total Crashes	0.44	30.1	1.02	69.9	1.47	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 13. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1086+14.425	1086+91.810	Information: for segment #1 (1086+14.425 to 1086+91.810), Effective median width (94.42 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1086+14.425	1086+91.810	Information: for segment #1 (1086+14.425 to 1086+91.810), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1086+14.425	1086+91.810	Information: for segment #1 (1086+14.425 to 1086+91.810), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1086+14.425	1086+91.810	Information: for segment #1 (1086+14.425 to 1086+91.810), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1086+14.425	1086+91.810	Information: for segment #1 (1086+14.425 to 1086+91.810), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1086+91.810	1092+75.425	Information: for segment #2 (1086+91.810 to 1092+75.425), Effective median width (99.03 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1086+91.810	1092+75.425	Information: for segment #2 (1086+91.810 to 1092+75.425), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1086+91.810	1092+75.425	Information: for segment #2 (1086+91.810 to 1092+75.425), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1086+91.810	1092+75.425	Information: for segment #2 (1086+91.810 to 1092+75.425), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1086+91.810	1092+75.425	Information: for segment #2 (1086+91.810 to 1092+75.425), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1092+75.425	1107+32.425	Information: for segment #3 (1092+75.425 to 1107+32.425), Effective median width (103.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1092+75.425	1107+32.425	Information: for segment #3 (1092+75.425 to 1107+32.425), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1092+75.425	1107+32.425	Information: for segment #3 (1092+75.425 to 1107+32.425), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1092+75.425	1107+32.425	Information: for segment #3 (1092+75.425 to 1107+32.425), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1092+75.425	1107+32.425	Information: for segment #3 (1092+75.425 to 1107+32.425), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1107+32.425	1112+09.280	Information: for segment #4 (1107+32.425 to 1112+09.280), Effective median width (100.98 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1107+32.425	1112+09.280	Information: for segment #4 (1107+32.425 to 1112+09.280), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1107+32.425	1112+09.280	Information: for segment #4 (1107+32.425 to 1112+09.280), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1107+32.425	1112+09.280	Information: for segment #4 (1107+32.425 to 1112+09.280), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1107+32.425	1112+09.280	Information: for segment #4 (1107+32.425 to 1112+09.280), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1112+09.280	1113+87.800	Information: for segment #5 (1112+09.280 to 1113+87.800), Effective median width (98.22 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1112+09.280	1113+87.800	Information: for segment #5 (1112+09.280 to 1113+87.800), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1112+09.280	1113+87.800	Information: for segment #5 (1112+09.280 to 1113+87.800), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1112+09.280	1113+87.800	Information: for segment #5 (1112+09.280 to 1113+87.800), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1112+09.280	1113+87.800	Information: for segment #5 (1112+09.280 to 1113+87.800), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1113+87.800	1129+20.890	Information: for segment #6 (1113+87.800 to 1129+20.890), Effective median width (96.73 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1113+87.800	1129+20.890	Information: for segment #6 (1113+87.800 to 1129+20.890), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1113+87.800	1129+20.890	Information: for segment #6 (1113+87.800 to 1129+20.890), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1113+87.800	1129+20.890	Information: for segment #6 (1113+87.800 to 1129+20.890), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1113+87.800	1129+20.890	Information: for segment #6 (1113+87.800 to 1129+20.890), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1129+20.890	1136+27.020	Information: for segment #8 (1129+20.890 to 1136+27.020), Effective median width (96.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1129+20.890	1136+27.020	Information: for segment #8 (1129+20.890 to 1136+27.020), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1129+20.890	1136+27.020	Information: for segment #8 (1129+20.890 to 1136+27.020), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1129+20.890	1136+27.020	Information: for segment #8 (1129+20.890 to 1136+27.020), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1129+20.890	1136+27.020	Information: for segment #8 (1129+20.890 to 1136+27.020), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1136+27.020	1137+96.210	Information: for segment #9 (1136+27.020 to 1137+96.210), Effective median width (95.68 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1136+27.020	1137+96.210	Information: for segment #9 (1136+27.020 to 1137+96.210), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1136+27.020	1137+96.210	Information: for segment #9 (1136+27.020 to 1137+96.210), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1136+27.020	1137+96.210	Information: for segment #9 (1136+27.020 to 1137+96.210), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1136+27.020	1137+96.210	Information: for segment #9 (1136+27.020 to 1137+96.210), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1113+87.800	1117+37.800	Information: for segment #7 (1113+87.800 to 1117+37.800), For Speed Change Lane the Effective median width (96.73 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1113+87.800	1117+37.800	Information: for segment #7 (1113+87.800 to 1117+37.800), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1112+09.280	1113+87.800	Information: for segment #5 (1112+09.280 to 1113+87.800), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1113+87.800	1129+20.890	Information: for segment #6 (1113+87.800 to 1129+20.890), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1113+87.800	1117+37.800	Information: for segment #7 (1113+87.800 to 1117+37.800), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

Report Generated: Aug 24, 2022 3:41 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 12:10:24 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL2
Highway Comment: Imported from CENTRAL2.xml
Highway Version: 1

Evaluation Title: Section 2
Evaluation Comment: Created Thu Jun 23 12:09:34 CDT 2022

Minimum Location: 1160+88.270
Maximum Location: 1181+39.215

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1160+88.270
Evaluation End Location: 1181+39.215
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_EX=1.0; FI_MV=1.0; FI_SV=1.0; PDO_EX=1.0; PDO_MV=1.0; PDO_SV=1.0;

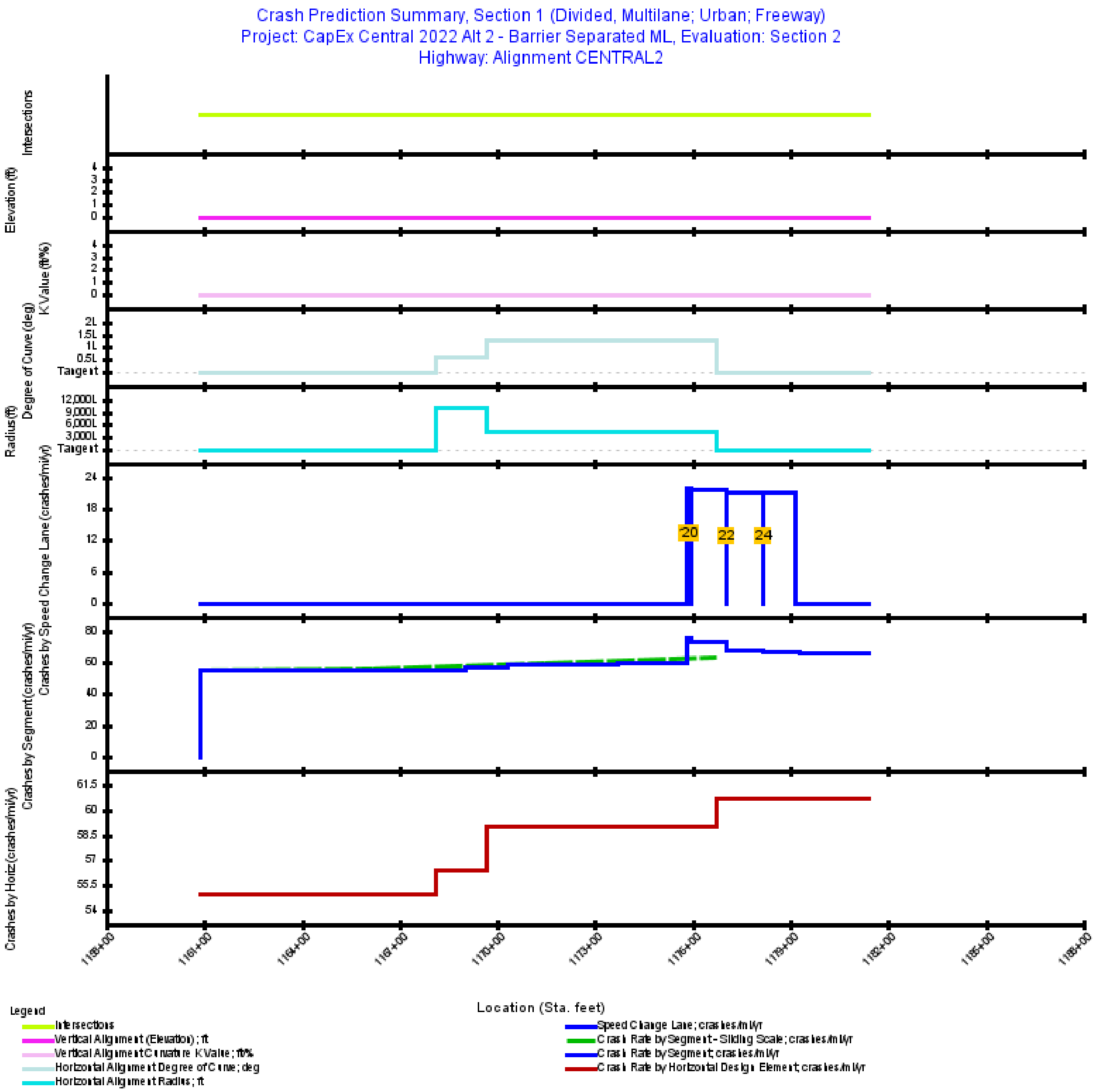

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Nine-lane Freeway	Urban	1160+88.270	1160+88.560	0.29	0.0001	2030: 159,500	88.01	Non-Traversable Median	95.92
2	Seven-lane Freeway	Urban	1160+88.560	1161+01.260	12.70	0.0024	2030: 151,150	88.63	Non-Traversable Median	96.58
3	Seven-lane Freeway	Urban	1161+01.260	1161+63.270	62.01	0.0117	2030: 151,150	92.16	Non-Traversable Median	100.16
4	Seven-lane Freeway	Urban	1161+63.270	1162+68.270	105.00	0.0199	2030: 151,150	100.05	Non-Traversable Median	108.05
5	Seven-lane Freeway	Urban	1162+68.270	1163+74.270	106.00	0.0201	2030: 151,150	110.03	Non-Traversable Median	118.03
6	Seven-lane Freeway	Urban	1163+74.270	1164+80.270	106.00	0.0201	2030: 151,150	120.05	Non-Traversable Median	128.05
7	Seven-lane Freeway	Urban	1164+80.270	1165+86.270	106.00	0.0201	2030: 151,150	130.07	Non-Traversable Median	138.07
8	Seven-lane Freeway	Urban	1165+86.270	1166+91.270	105.00	0.0199	2030: 151,150	140.04	Non-Traversable Median	148.04
9	Seven-lane Freeway	Urban	1166+91.270	1167+97.270	106.00	0.0201	2030: 151,150	150.02	Non-Traversable Median	158.02
10	Seven-lane Freeway	Urban	1167+97.270	1169+03.270	106.00	0.0201	2030: 151,150	160.04	Non-Traversable Median	168.04
11	Seven-lane Freeway	Urban	1169+03.270	1170+33.270	130.00	0.0246	2030: 151,150	170.82	Non-Traversable Median	173.02
12	Seven-lane Freeway	Urban	1170+33.270	1171+45.270	112.00	0.0212	2030: 151,150	159.99	Non-Traversable Median	167.99
13	Seven-lane Freeway	Urban	1171+45.270	1172+57.270	112.00	0.0212	2030: 151,150	149.96	Non-Traversable Median	157.96
14	Seven-lane Freeway	Urban	1172+57.270	1173+69.270	112.00	0.0212	2030: 151,150	139.93	Non-Traversable Median	147.93
15	Seven-lane Freeway	Urban	1173+69.270	1174+80.270	111.00	0.0210	2030: 151,150	129.95	Non-Traversable Median	137.95
16	Seven-lane Freeway	Urban	1174+80.270	1175+79.320	99.05	0.0188	2030: 151,150	120.55	Non-Traversable Median	128.55
17	Seven-lane Freeway	Urban	1175+79.320	1175+92.270	12.95	0.0025	2030: 161,600	115.54	Non-Traversable Median	123.54
19	Seven-lane Freeway	Urban	1175+92.270	1177+04.270	112.00	0.0212	2030: 161,600	109.95	Non-Traversable Median	117.95
21	Seven-lane Freeway	Urban	1177+04.270	1178+15.270	111.00	0.0210	2030: 161,600	99.97	Non-Traversable Median	107.97
23	Seven-lane Freeway	Urban	1178+15.270	1179+27.270	112.00	0.0212	2030: 161,600	89.98	Non-Traversable Median	97.99
25	Seven-lane Freeway	Urban	1179+27.270	1180+39.270	112.00	0.0212	2030: 161,600	79.96	Non-Traversable Median	87.96
26	Seven-lane Freeway	Urban	1180+39.270	1181+39.215	99.95	0.0189	2030: 161,600	70.47	Non-Traversable Median	78.47

Table 2. Evaluation Freeway - Speed Change Lanes (Speed Change)

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
18	Seven-lane Freeway Speed Change	Exit	1175+79.320	1175+92.270	12.95	0.0025	2030: 161,600	115.54	Non-Traversable Median	123.54
20	Seven-lane Freeway Speed Change	Exit	1175+92.270	1177+04.270	112.00	0.0212	2030: 161,600	109.95	Non-Traversable Median	117.95
22	Seven-lane Freeway Speed Change	Exit	1177+04.270	1178+15.270	111.00	0.0210	2030: 161,600	99.97	Non-Traversable Median	107.97
24	Seven-lane Freeway Speed Change	Exit	1178+15.270	1179+14.320	99.05	0.0188	2030: 161,600	90.56	Non-Traversable Median	98.56

Table 3. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**0.3567**
Average Future Road AADT (vpd)	**153,327**
Predicted Crashes	
Total Crashes	**21.08**
Fatal and Injury Crashes	**5.73**
Property-Damage-Only Crashes	**15.35**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**27**
Percent Property-Damage-Only Crashes (%)	**73**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**59.1085**
FI Crash Rate (crashes/mi/yr)	**16.0738**
PDO Crash Rate (crashes/mi/yr)	**43.0347**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**19.96**
Travel Crash Rate (crashes/million veh-mi)	**1.06**
Travel FI Crash Rate (crashes/million veh-mi)	**0.29**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.77**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Table 4. Predicted Freeway Speed Change Lane Crash Rates and Frequencies Summary (Speed Change)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Length (mi)	**0.0634**
Average Future Road AADT (vpd)	**80,800**
Predicted Crashes	
Total Crashes	**1.36**
Fatal and Injury Crashes	**0.41**
Property-Damage-Only Crashes	**0.95**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**30**
Percent Property-Damage-Only Crashes (%)	**70**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**21.3700**
FI Crash Rate (crashes/mi/yr)	**6.4553**
PDO Crash Rate (crashes/mi/yr)	**14.9147**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.87**
Travel Crash Rate (crashes/million veh-mi)	**0.72**
Travel FI Crash Rate (crashes/million veh-mi)	**0.22**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.51**

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 5. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	**Start Location (Sta. ft)**	**End Location (Sta. ft)**	**Effective Length (mi)**	**Total Predicted Crashes for Evaluation Period**	**Predicted Total Crash Frequency (crashes/yr)**	**Predicted FI Crash Frequency (crashes/yr)**	**Predicted PDO Crash Frequency (crashes/yr)**	**Predicted Crash Rate (crashes/mi/yr)**	**Predicted Travel Crash Rate (crashes/million veh-mi)**
1	1160+88.270	1160+88.560	0.0000	0.000	0.0000	0.0000	0.0000	0.0000	0.00
2	1160+88.560	1161+01.260	0.0024	0.132	0.1321	0.0361	0.0960	54.9314	1.00
3	1161+01.260	1161+63.270	0.0117	0.645	0.6449	0.1763	0.4687	54.9139	0.99
4	1161+63.270	1162+68.270	0.0199	1.092	1.0921	0.2985	0.7936	54.9186	0.99
5	1162+68.270	1163+74.270	0.0201	1.103	1.1027	0.3014	0.8013	54.9260	1.00
6	1163+74.270	1164+80.270	0.0201	1.103	1.1029	0.3015	0.8014	54.9358	1.00
7	1164+80.270	1165+86.270	0.0201	1.103	1.1031	0.3015	0.8016	54.9485	1.00
8	1165+86.270	1166+91.270	0.0199	1.093	1.0931	0.2988	0.7942	54.9649	1.00
9	1166+91.270	1167+97.270	0.0201	1.104	1.1039	0.3018	0.8021	54.9863	1.00
10	1167+97.270	1169+03.270	0.0201	1.118	1.1179	0.3052	0.8127	55.6844	1.01
11	1169+03.270	1170+33.270	0.0246	1.415	1.4150	0.3847	1.0303	57.4697	1.04
12	1170+33.270	1171+45.270	0.0212	1.253	1.2526	0.3395	0.9131	59.0516	1.07
13	1171+45.270	1172+57.270	0.0212	1.254	1.2542	0.3400	0.9142	59.1254	1.07
14	1172+57.270	1173+69.270	0.0212	1.256	1.2562	0.3406	0.9156	59.2230	1.07
15	1173+69.270	1174+80.270	0.0210	1.248	1.2477	0.3384	0.9093	59.3514	1.08
16	1174+80.270	1175+79.320	0.0188	1.116	1.1164	0.3029	0.8135	59.5094	1.08
17	1175+79.320	1175+92.270	0.0012	0.093	0.0932	0.0250	0.0683	76.0136	1.29
19	1175+92.270	1177+04.270	0.0106	0.778	0.7781	0.2090	0.5690	73.3596	1.24
21	1177+04.270	1178+15.270	0.0105	0.717	0.7171	0.1943	0.5227	68.2172	1.16
23	1178+15.270	1179+27.270	0.0118	0.794	0.7937	0.2152	0.5786	67.0799	1.14
25	1179+27.270	1180+39.270	0.0212	1.410	1.4097	0.3822	1.0275	66.4571	1.13
26	1180+39.270	1181+39.215	0.0189	1.255	1.2550	0.3402	0.9147	66.2991	1.12
Total			0.3567	21.081	21.0815	5.7329	15.3487	59.1085	1.06

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 6. Predicted Crash Frequencies and Rates by Freeway Speed Change Lane (Speed Change)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
18	1175+79.320	1175+92.270	0.0025	0.054	0.0542	0.0162	0.0381	22.1069	0.75
20	1175+92.270	1177+04.270	0.0212	0.463	0.4628	0.1387	0.3242	21.8193	0.74
22	1177+04.270	1178+15.270	0.0210	0.443	0.4433	0.1346	0.3086	21.0850	0.71
24	1178+15.270	1179+14.320	0.0188	0.396	0.3955	0.1201	0.2754	21.0850	0.71
Total			0.0634	1.356	1.3559	0.4096	0.9463	21.3700	0.72

Note: *Travel Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 7. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1160+88.270	1168+11.980	0.1371	7.530	7.5300	2.0582	5.4718	54.9366	1.00
Simple Curve 1	1168+11.980	1169+65.943	0.0292	1.645	1.6449	0.4483	1.1966	56.4111	1.02
Simple Curve 2	1169+65.943	1176+72.754	0.1339	7.899	7.8991	2.1515	5.7476	59.0075	1.19
Tangent	1176+72.754	1181+39.215	0.0883	5.363	5.3634	1.4845	3.8790	60.7101	1.52

Table 8. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	22.44	6.14	27.376	16.30	72.624
Total	22.44	6.14	27.376	16.30	72.624
Average	22.44	6.14	27.376	16.30	72.624

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 9. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0007	0.0015	0.0113	0.0226	0.0960
3	0.0036	0.0073	0.0554	0.1101	0.4687
4	0.0060	0.0123	0.0938	0.1864	0.7936
5	0.0061	0.0124	0.0947	0.1882	0.8013
6	0.0061	0.0124	0.0947	0.1882	0.8014
7	0.0061	0.0124	0.0947	0.1883	0.8016
8	0.0060	0.0123	0.0939	0.1866	0.7942
9	0.0061	0.0124	0.0948	0.1885	0.8021
10	0.0070	0.0148	0.1021	0.1813	0.8127
11	0.0090	0.0191	0.1300	0.2266	1.0303
12	0.0080	0.0168	0.1147	0.2000	0.9131
13	0.0080	0.0169	0.1148	0.2003	0.9142
14	0.0080	0.0169	0.1151	0.2007	0.9156
15	0.0079	0.0168	0.1143	0.1994	0.9093
16	0.0071	0.0150	0.1023	0.1784	0.8135
17	0.0006	0.0012	0.0084	0.0147	0.0683
19	0.0047	0.0098	0.0692	0.1253	0.5690
21	0.0039	0.0080	0.0610	0.1213	0.5227
23	0.0044	0.0089	0.0676	0.1344	0.5786
25	0.0077	0.0158	0.1200	0.2387	1.0275
26	0.0069	0.0140	0.1069	0.2125	0.9147
Total	0.1240	0.2570	1.8595	3.4922	15.3487

Table 10. Predicted Crash Severity by Speed Change Lane (Speed Change)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
18	0.0004	0.0008	0.0055	0.0095	0.0381
20	0.0031	0.0065	0.0459	0.0831	0.3242
22	0.0027	0.0055	0.0423	0.0841	0.3086
24	0.0024	0.0050	0.0377	0.0750	0.2754
Total	0.0087	0.0178	0.1314	0.2517	0.9463

Table 11. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.0	0.12	0.6	0.13	0.6
Highway Segment	Collision with Fixed Object	1.46	6.9	4.07	19.3	5.53	26.2
Highway Segment	Collision with Other Object	0.10	0.5	0.79	3.7	0.89	4.2
Highway Segment	Other Single-vehicle Collision	0.42	2.0	0.61	2.9	1.03	4.9
Highway Segment	Collision with Parked Vehicle	0.03	0.1	0.09	0.4	0.12	0.6
Highway Segment	Total Single Vehicle Crashes	2.02	9.6	5.68	27.0	7.71	36.6
Highway Segment	Right-Angle Collision	0.12	0.5	0.17	0.8	0.29	1.4
Highway Segment	Head-on Collision	0.03	0.1	0.02	0.1	0.05	0.2
Highway Segment	Other Multi-vehicle Collision	0.12	0.5	0.23	1.1	0.35	1.6
Highway Segment	Rear-end Collision	2.78	13.2	6.67	31.6	9.45	44.8
Highway Segment	Sideswipe, Same Direction Collision	0.67	3.2	2.57	12.2	3.24	15.4
Highway Segment	Total Multiple Vehicle Crashes	3.71	17.6	9.66	45.8	13.37	63.4
Highway Segment	Total Highway Segment Crashes	5.73	27.2	15.35	72.8	21.08	100.0
	Total Crashes	5.73	27.2	15.35	72.8	21.08	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 12. Predicted Exit Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.01	0.5	0.01	0.5
Highway Segment	Collision with Fixed Object	0.08	5.9	0.20	14.4	0.28	20.4
Highway Segment	Collision with Other Object	0.01	0.5	0.03	2.1	0.04	2.6
Highway Segment	Other Single-vehicle Collision	0.02	1.5	0.02	1.6	0.04	3.1
Highway Segment	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Total Single Vehicle Crashes	0.11	7.9	0.25	18.6	0.36	26.5
Highway Segment	Right-Angle Collision	0.01	0.3	0.01	0.8	0.02	1.2
Highway Segment	Head-on Collision	0.00	0.2	0.00	0.1	0.00	0.3
Highway Segment	Other Multi-vehicle Collision	0.01	0.5	0.01	1.1	0.02	1.6
Highway Segment	Rear-end Collision	0.23	16.6	0.54	39.4	0.76	56.0
Highway Segment	Sideswipe, Same Direction Collision	0.07	4.8	0.13	9.6	0.20	14.4
Highway Segment	Total Multiple Vehicle Crashes	0.30	22.3	0.69	51.2	1.00	73.5
Highway Segment	Total Highway Segment Crashes	0.41	30.2	0.95	69.8	1.36	100.0
	Total Crashes	0.41	30.2	0.95	69.8	1.36	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 13. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1160+88.270	1160+88.560	Information: for segment #1 (1160+88.270 to 1160+88.560), Effective median width (95.92 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1160+88.270	1160+88.560	Information: for segment #1 (1160+88.270 to 1160+88.560), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+88.270	1160+88.560	Information: for segment #1 (1160+88.270 to 1160+88.560), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+88.270	1160+88.560	Information: for segment #1 (1160+88.270 to 1160+88.560), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+88.270	1160+88.560	Information: for segment #1 (1160+88.270 to 1160+88.560), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+88.560	1161+01.260	Information: for segment #2 (1160+88.560 to 1161+01.260), Effective median width (96.58 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1160+88.560	1161+01.260	Information: for segment #2 (1160+88.560 to 1161+01.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+88.560	1161+01.260	Information: for segment #2 (1160+88.560 to 1161+01.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+88.560	1161+01.260	Information: for segment #2 (1160+88.560 to 1161+01.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+88.560	1161+01.260	Information: for segment #2 (1160+88.560 to 1161+01.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+01.260	1161+63.270	Information: for segment #3 (1161+01.260 to 1161+63.270), Effective median width (100.16 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1161+01.260	1161+63.270	Information: for segment #3 (1161+01.260 to 1161+63.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+01.260	1161+63.270	Information: for segment #3 (1161+01.260 to 1161+63.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+01.260	1161+63.270	Information: for segment #3 (1161+01.260 to 1161+63.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+01.260	1161+63.270	Information: for segment #3 (1161+01.260 to 1161+63.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+63.270	1162+68.270	Information: for segment #4 (1161+63.270 to 1162+68.270), Effective median width (108.05 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1161+63.270	1162+68.270	Information: for segment #4 (1161+63.270 to 1162+68.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+63.270	1162+68.270	Information: for segment #4 (1161+63.270 to 1162+68.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+63.270	1162+68.270	Information: for segment #4 (1161+63.270 to 1162+68.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+63.270	1162+68.270	Information: for segment #4 (1161+63.270 to 1162+68.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1162+68.270	1163+74.270	Information: for segment #5 (1162+68.270 to 1163+74.270), Effective median width (118.03 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1162+68.270	1163+74.270	Information: for segment #5 (1162+68.270 to 1163+74.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1162+68.270	1163+74.270	Information: for segment #5 (1162+68.270 to 1163+74.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1162+68.270	1163+74.270	Information: for segment #5 (1162+68.270 to 1163+74.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1162+68.270	1163+74.270	Information: for segment #5 (1162+68.270 to 1163+74.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1163+74.270	1164+80.270	Information: for segment #6 (1163+74.270 to 1164+80.270), Effective median width (128.05 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1163+74.270	1164+80.270	Information: for segment #6 (1163+74.270 to 1164+80.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1163+74.270	1164+80.270	Information: for segment #6 (1163+74.270 to 1164+80.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1163+74.270	1164+80.270	Information: for segment #6 (1163+74.270 to 1164+80.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1163+74.270	1164+80.270	Information: for segment #6 (1163+74.270 to 1164+80.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1164+80.270	1165+86.270	Information: for segment #7 (1164+80.270 to 1165+86.270), Effective median width (138.07 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1164+80.270	1165+86.270	Information: for segment #7 (1164+80.270 to 1165+86.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1164+80.270	1165+86.270	Information: for segment #7 (1164+80.270 to 1165+86.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1164+80.270	1165+86.270	Information: for segment #7 (1164+80.270 to 1165+86.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1164+80.270	1165+86.270	Information: for segment #7 (1164+80.270 to 1165+86.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1165+86.270	1166+91.270	Information: for segment #8 (1165+86.270 to 1166+91.270), Effective median width (148.04 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1165+86.270	1166+91.270	Information: for segment #8 (1165+86.270 to 1166+91.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1165+86.270	1166+91.270	Information: for segment #8 (1165+86.270 to 1166+91.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1165+86.270	1166+91.270	Information: for segment #8 (1165+86.270 to 1166+91.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1165+86.270	1166+91.270	Information: for segment #8 (1165+86.270 to 1166+91.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1166+91.270	1167+97.270	Information: for segment #9 (1166+91.270 to 1167+97.270), Effective median width (158.02 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1166+91.270	1167+97.270	Information: for segment #9 (1166+91.270 to 1167+97.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1166+91.270	1167+97.270	Information: for segment #9 (1166+91.270 to 1167+97.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1166+91.270	1167+97.270	Information: for segment #9 (1166+91.270 to 1167+97.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1166+91.270	1167+97.270	Information: for segment #9 (1166+91.270 to 1167+97.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1167+97.270	1169+03.270	Information: for segment #10 (1167+97.270 to 1169+03.270), Effective median width (168.04 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1167+97.270	1169+03.270	Information: for segment #10 (1167+97.270 to 1169+03.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1167+97.270	1169+03.270	Information: for segment #10 (1167+97.270 to 1169+03.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1167+97.270	1169+03.270	Information: for segment #10 (1167+97.270 to 1169+03.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1167+97.270	1169+03.270	Information: for segment #10 (1167+97.270 to 1169+03.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1169+03.270	1170+33.270	Information: for segment #11 (1169+03.270 to 1170+33.270), Effective median width (173.02 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1169+03.270	1170+33.270	Information: for segment #11 (1169+03.270 to 1170+33.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1169+03.270	1170+33.270	Information: for segment #11 (1169+03.270 to 1170+33.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1169+03.270	1170+33.270	Information: for segment #11 (1169+03.270 to 1170+33.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1169+03.270	1170+33.270	Information: for segment #11 (1169+03.270 to 1170+33.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1170+33.270	1171+45.270	Information: for segment #12 (1170+33.270 to 1171+45.270), Effective median width (167.99 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1170+33.270	1171+45.270	Information: for segment #12 (1170+33.270 to 1171+45.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1170+33.270	1171+45.270	Information: for segment #12 (1170+33.270 to 1171+45.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1170+33.270	1171+45.270	Information: for segment #12 (1170+33.270 to 1171+45.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1170+33.270	1171+45.270	Information: for segment #12 (1170+33.270 to 1171+45.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1171+45.270	1172+57.270	Information: for segment #13 (1171+45.270 to 1172+57.270), Effective median width (157.96 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1171+45.270	1172+57.270	Information: for segment #13 (1171+45.270 to 1172+57.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1171+45.270	1172+57.270	Information: for segment #13 (1171+45.270 to 1172+57.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1171+45.270	1172+57.270	Information: for segment #13 (1171+45.270 to 1172+57.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1171+45.270	1172+57.270	Information: for segment #13 (1171+45.270 to 1172+57.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1172+57.270	1173+69.270	Information: for segment #14 (1172+57.270 to 1173+69.270), Effective median width (147.93 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1172+57.270	1173+69.270	Information: for segment #14 (1172+57.270 to 1173+69.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1172+57.270	1173+69.270	Information: for segment #14 (1172+57.270 to 1173+69.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1172+57.270	1173+69.270	Information: for segment #14 (1172+57.270 to 1173+69.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1172+57.270	1173+69.270	Information: for segment #14 (1172+57.270 to 1173+69.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1173+69.270	1174+80.270	Information: for segment #15 (1173+69.270 to 1174+80.270), Effective median width (137.95 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1173+69.270	1174+80.270	Information: for segment #15 (1173+69.270 to 1174+80.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1173+69.270	1174+80.270	Information: for segment #15 (1173+69.270 to 1174+80.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1173+69.270	1174+80.270	Information: for segment #15 (1173+69.270 to 1174+80.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1173+69.270	1174+80.270	Information: for segment #15 (1173+69.270 to 1174+80.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1174+80.270	1175+79.320	Information: for segment #16 (1174+80.270 to 1175+79.320), Effective median width (128.55 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1174+80.270	1175+79.320	Information: for segment #16 (1174+80.270 to 1175+79.320), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1174+80.270	1175+79.320	Information: for segment #16 (1174+80.270 to 1175+79.320), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1174+80.270	1175+79.320	Information: for segment #16 (1174+80.270 to 1175+79.320), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1174+80.270	1175+79.320	Information: for segment #16 (1174+80.270 to 1175+79.320), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1175+79.320	1175+92.270	Information: for segment #17 (1175+79.320 to 1175+92.270), Effective median width (123.54 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1175+79.320	1175+92.270	Information: for segment #17 (1175+79.320 to 1175+92.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1175+79.320	1175+92.270	Information: for segment #17 (1175+79.320 to 1175+92.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1175+79.320	1175+92.270	Information: for segment #17 (1175+79.320 to 1175+92.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1175+79.320	1175+92.270	Information: for segment #17 (1175+79.320 to 1175+92.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1175+92.270	1177+04.270	Information: for segment #19 (1175+92.270 to 1177+04.270), Effective median width (117.95 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1175+92.270	1177+04.270	Information: for segment #19 (1175+92.270 to 1177+04.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1175+92.270	1177+04.270	Information: for segment #19 (1175+92.270 to 1177+04.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1175+92.270	1177+04.270	Information: for segment #19 (1175+92.270 to 1177+04.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1175+92.270	1177+04.270	Information: for segment #19 (1175+92.270 to 1177+04.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1177+04.270	1178+15.270	Information: for segment #21 (1177+04.270 to 1178+15.270), Effective median width (107.97 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1177+04.270	1178+15.270	Information: for segment #21 (1177+04.270 to 1178+15.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1177+04.270	1178+15.270	Information: for segment #21 (1177+04.270 to 1178+15.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1177+04.270	1178+15.270	Information: for segment #21 (1177+04.270 to 1178+15.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1177+04.270	1178+15.270	Information: for segment #21 (1177+04.270 to 1178+15.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1178+15.270	1179+27.270	Information: for segment #23 (1178+15.270 to 1179+27.270), Effective median width (97.99 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1178+15.270	1179+27.270	Information: for segment #23 (1178+15.270 to 1179+27.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1178+15.270	1179+27.270	Information: for segment #23 (1178+15.270 to 1179+27.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1178+15.270	1179+27.270	Information: for segment #23 (1178+15.270 to 1179+27.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1178+15.270	1179+27.270	Information: for segment #23 (1178+15.270 to 1179+27.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1179+27.270	1180+39.270	Information: for segment #25 (1179+27.270 to 1180+39.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1179+27.270	1180+39.270	Information: for segment #25 (1179+27.270 to 1180+39.270), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1179+27.270	1180+39.270	Information: for segment #25 (1179+27.270 to 1180+39.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1179+27.270	1180+39.270	Information: for segment #25 (1179+27.270 to 1180+39.270), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1180+39.270	1181+39.215	Information: for segment #26 (1180+39.270 to 1181+39.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1180+39.270	1181+39.215	Information: for segment #26 (1180+39.270 to 1181+39.215), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1180+39.270	1181+39.215	Information: for segment #26 (1180+39.270 to 1181+39.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1180+39.270	1181+39.215	Information: for segment #26 (1180+39.270 to 1181+39.215), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1175+79.320	1175+92.270	Information: for segment #18 (1175+79.320 to 1175+92.270), For Speed Change Lane the Effective median width (123.54 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1175+79.320	1175+92.270	Information: for segment #18 (1175+79.320 to 1175+92.270), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1175+92.270	1177+04.270	Information: for segment #20 (1175+92.270 to 1177+04.270), For Speed Change Lane the Effective median width (117.95 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1175+92.270	1177+04.270	Information: for segment #20 (1175+92.270 to 1177+04.270), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1177+04.270	1178+15.270	Information: for segment #22 (1177+04.270 to 1178+15.270), For Speed Change Lane the Effective median width (107.97 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1177+04.270	1178+15.270	Information: for segment #22 (1177+04.270 to 1178+15.270), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1178+15.270	1179+14.320	Information: for segment #24 (1178+15.270 to 1179+14.320), For Speed Change Lane the Effective median width (98.56 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1178+15.270	1179+14.320	Information: for segment #24 (1178+15.270 to 1179+14.320), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+88.270	1160+88.560	Information: for segment #1 (1160+88.270 to 1160+88.560), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1160+88.560	1161+01.260	Information: for segment #2 (1160+88.560 to 1161+01.260), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1161+01.260	1161+63.270	Information: for segment #3 (1161+01.260 to 1161+63.270), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1161+63.270	1162+68.270	Information: for segment #4 (1161+63.270 to 1162+68.270), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1162+68.270	1163+74.270	Information: for segment #5 (1162+68.270 to 1163+74.270), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1163+74.270	1164+80.270	Information: for segment #6 (1163+74.270 to 1164+80.270), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1164+80.270	1165+86.270	Information: for segment #7 (1164+80.270 to 1165+86.270), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1165+86.270	1166+91.270	Information: for segment #8 (1165+86.270 to 1166+91.270), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1166+91.270	1167+97.270	Information: for segment #9 (1166+91.270 to 1167+97.270), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1167+97.270	1169+03.270	Information: for segment #10 (1167+97.270 to 1169+03.270), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1169+03.270	1170+33.270	Information: for segment #11 (1169+03.270 to 1170+33.270), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1170+33.270	1171+45.270	Information: for segment #12 (1170+33.270 to 1171+45.270), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1171+45.270	1172+57.270	Information: for segment #13 (1171+45.270 to 1172+57.270), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1172+57.270	1173+69.270	Information: for segment #14 (1172+57.270 to 1173+69.270), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1173+69.270	1174+80.270	Information: for segment #15 (1173+69.270 to 1174+80.270), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1174+80.270	1175+79.320	Information: for segment #16 (1174+80.270 to 1175+79.320), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1175+79.320	1175+92.270	Information: for segment #17 (1175+79.320 to 1175+92.270), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1175+92.270	1177+04.270	Information: for segment #19 (1175+92.270 to 1177+04.270), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1177+04.270	1178+15.270	Information: for segment #21 (1177+04.270 to 1178+15.270), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1178+15.270	1179+27.270	Information: for segment #23 (1178+15.270 to 1179+27.270), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1179+27.270	1180+39.270	Information: for segment #25 (1179+27.270 to 1180+39.270), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1180+39.270	1181+39.215	Information: for segment #26 (1180+39.270 to 1181+39.215), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1175+79.320	1175+92.270	Information: for segment #18 (1175+79.320 to 1175+92.270), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
1175+92.270	1177+04.270	Information: for segment #20 (1175+92.270 to 1177+04.270), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
1177+04.270	1178+15.270	Information: for segment #22 (1177+04.270 to 1178+15.270), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
1178+15.270	1179+14.320	Information: for segment #24 (1178+15.270 to 1179+14.320), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

Report Generated: Aug 24, 2022 3:41 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 12:11:58 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL2
Highway Comment: Imported from CENTRAL2.xml
Highway Version: 1

Evaluation Title: Section 3
Evaluation Comment: Created Thu Jun 23 12:10:44 CDT 2022

Minimum Location: 1301+70.260
Maximum Location: 1343+13.390

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1301+70.260
Evaluation End Location: 1343+13.390
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_MV=1.0; FI_SV=1.0; PDO_MV=1.0; PDO_SV=1.0;

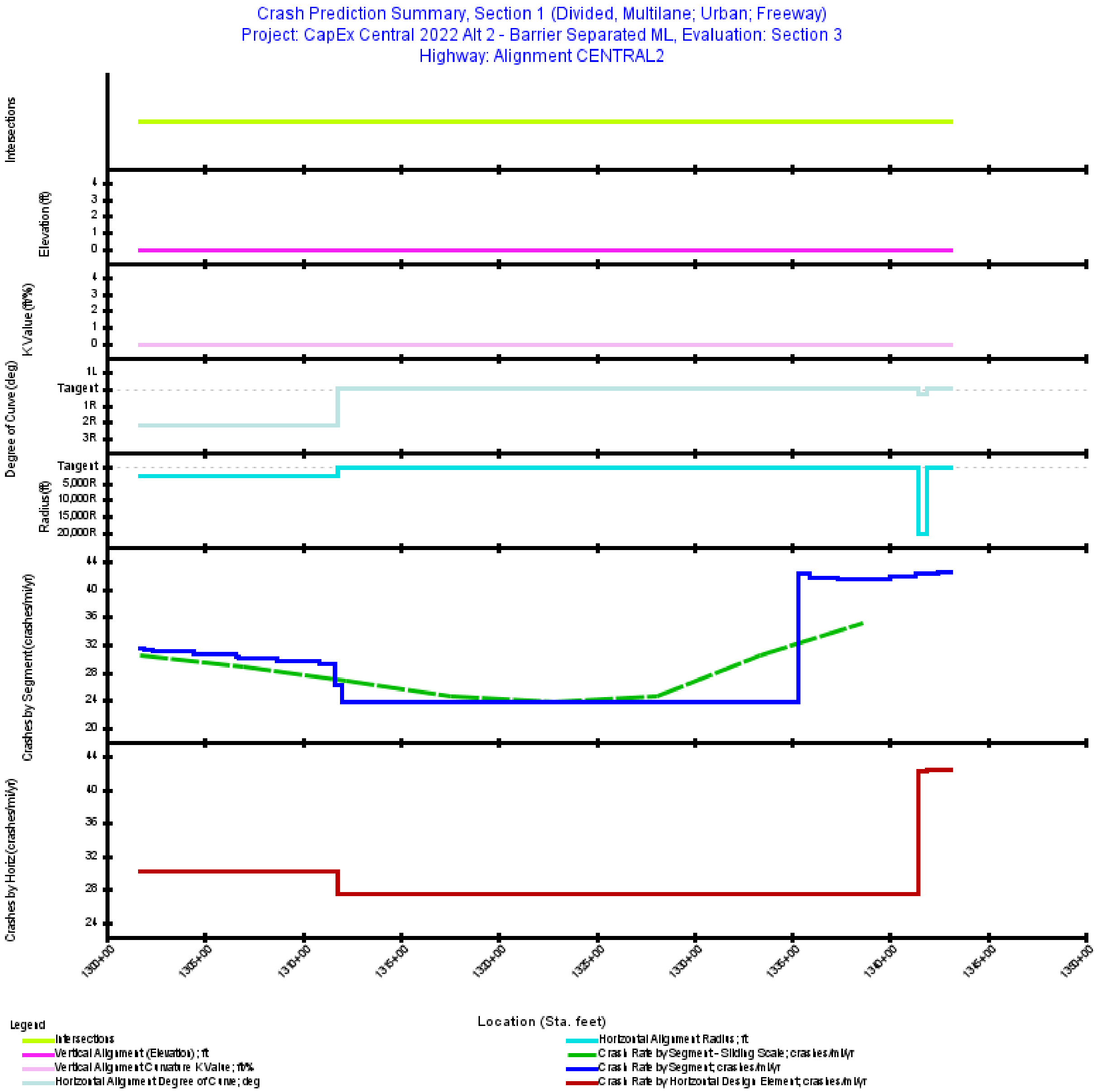

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Six-lane Freeway	Urban	1301+70.260	1301+89.180	18.92	0.0036	2030: 85,700	80.09	Non-Traversable Median	90.67
2	Six-lane Freeway	Urban	1301+89.180	1302+31.260	42.08	0.0080	2030: 85,700	80.40	Non-Traversable Median	91.20
3	Six-lane Freeway	Urban	1302+31.260	1304+44.260	213.00	0.0403	2030: 85,700	81.66	Non-Traversable Median	93.67
4	Six-lane Freeway	Urban	1304+44.260	1306+57.260	213.00	0.0403	2030: 85,700	83.78	Non-Traversable Median	97.78
5	Six-lane Freeway	Urban	1306+57.260	1306+74.260	17.00	0.0032	2030: 85,700	84.92	Non-Traversable Median	100.00
6	Six-lane Freeway	Urban	1306+74.260	1308+70.260	196.00	0.0371	2030: 85,700	85.98	Non-Traversable Median	102.06
7	Six-lane Freeway	Urban	1308+70.260	1310+83.260	213.00	0.0403	2030: 85,700	88.01	Non-Traversable Median	106.01
8	Six-lane Freeway	Urban	1310+83.260	1311+65.810	82.55	0.0156	2030: 85,700	89.47	Non-Traversable Median	108.86
9	Six-lane Freeway	Urban	1311+65.810	1312+03.280	37.47	0.0071	2030: 85,700	90.00	Non-Traversable Median	109.83
10	Six-lane Freeway	Urban	1312+03.280	1335+34.220	2,330.94	0.4415	2030: 85,700	90.00	Non-Traversable Median	110.00
11	Eight-lane Freeway	Urban	1335+34.220	1335+87.780	53.56	0.0101	2030: 132,350	90.00	Non-Traversable Median	110.00
12	Eight-lane Freeway	Urban	1335+87.780	1337+34.190	146.41	0.0277	2030: 132,350	90.00	Non-Traversable Median	109.59
13	Eight-lane Freeway	Urban	1337+34.190	1337+45.260	11.07	0.0021	2030: 132,350	89.84	Non-Traversable Median	108.92
14	Eight-lane Freeway	Urban	1337+45.260	1338+74.260	129.00	0.0244	2030: 132,350	87.78	Non-Traversable Median	105.78
15	Eight-lane Freeway	Urban	1338+74.260	1339+05.260	31.00	0.0059	2030: 132,350	85.43	Non-Traversable Median	102.18
16	Eight-lane Freeway	Urban	1339+05.260	1340+02.260	97.00	0.0184	2030: 132,350	83.56	Non-Traversable Median	99.31
17	Eight-lane Freeway	Urban	1340+02.260	1341+31.260	129.00	0.0244	2030: 132,350	80.24	Non-Traversable Median	94.23
18	Eight-lane Freeway	Urban	1341+31.260	1342+45.260	114.00	0.0216	2030: 132,350	76.67	Non-Traversable Median	88.77
19	Eight-lane Freeway	Urban	1342+45.260	1342+59.260	14.00	0.0027	2030: 132,350	74.79	Non-Traversable Median	85.90
20	Eight-lane Freeway	Urban	1342+59.260	1343+13.390	54.13	0.0103	2030: 132,350	73.79	Non-Traversable Median	84.37

Table 2. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**0.7847**
Average Future Road AADT (vpd)	**94,473**
Predicted Crashes	
Total Crashes	**22.61**
Fatal and Injury Crashes	**6.62**
Property-Damage-Only Crashes	**15.99**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**29**
Percent Property-Damage-Only Crashes (%)	**71**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**28.8142**
FI Crash Rate (crashes/mi/yr)	**8.4304**
PDO Crash Rate (crashes/mi/yr)	**20.3837**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**27.06**
Travel Crash Rate (crashes/million veh-mi)	**0.84**
Travel FI Crash Rate (crashes/million veh-mi)	**0.24**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.59**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 3. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1301+70.260	1301+89.180	0.0036	0.113	0.1126	0.0329	0.0797	31.4267	1.00
2	1301+89.180	1302+31.260	0.0080	0.250	0.2500	0.0731	0.1769	31.3693	1.00
3	1302+31.260	1304+44.260	0.0403	1.254	1.2535	0.3664	0.8871	31.0729	0.99
4	1304+44.260	1306+57.260	0.0403	1.234	1.2338	0.3602	0.8736	30.5841	0.98
5	1306+57.260	1306+74.260	0.0032	0.098	0.0976	0.0285	0.0692	30.3235	0.97
6	1306+74.260	1308+70.260	0.0371	1.117	1.1168	0.3256	0.7912	30.0840	0.96
7	1308+70.260	1310+83.260	0.0403	1.195	1.1953	0.3480	0.8473	29.6296	0.95
8	1310+83.260	1311+65.810	0.0156	0.458	0.4582	0.1333	0.3249	29.3055	0.94
9	1311+65.810	1312+03.280	0.0071	0.186	0.1861	0.0546	0.1315	26.2176	0.84
10	1312+03.280	1335+34.220	0.4415	10.533	10.5331	3.1157	7.4173	23.8593	0.76
11	1335+34.220	1335+87.780	0.0101	0.429	0.4295	0.1234	0.3061	42.3406	0.88
12	1335+87.780	1337+34.190	0.0277	1.157	1.1568	0.3324	0.8243	41.7171	0.86
13	1337+34.190	1337+45.260	0.0021	0.087	0.0868	0.0249	0.0618	41.3793	0.86
14	1337+45.260	1338+74.260	0.0244	1.011	1.0111	0.2908	0.7204	41.3854	0.86
15	1338+74.260	1339+05.260	0.0059	0.243	0.2433	0.0700	0.1733	41.4446	0.86
16	1339+05.260	1340+02.260	0.0184	0.763	0.7633	0.2197	0.5436	41.5478	0.86
17	1340+02.260	1341+31.260	0.0244	1.022	1.0215	0.2943	0.7272	41.8104	0.87
18	1341+31.260	1342+45.260	0.0216	0.912	0.9121	0.2630	0.6491	42.2437	0.87
19	1342+45.260	1342+59.260	0.0027	0.113	0.1125	0.0325	0.0800	42.4225	0.88
20	1342+59.260	1343+13.390	0.0103	0.436	0.4363	0.1259	0.3104	42.5576	0.88
Total			0.7847	22.610	22.6100	6.6152	15.9948	28.8142	0.84

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1301+70.260	1311+82.312	0.1917	5.800	5.7997	1.6920	4.1077	30.2578	0.97
Tangent	1311+82.312	1341+45.042	0.5611	15.460	15.4597	4.5337	10.9261	27.5514	0.78
Simple Curve 2	1341+45.042	1341+85.312	0.0076	0.322	0.3222	0.0929	0.2293	42.2437	0.87
Tangent	1341+85.312	1343+13.390	0.0243	1.028	1.0284	0.2967	0.7317	42.3959	0.88

Table 5. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	22.61	6.62	29.258	15.99	70.742
Total	22.61	6.62	29.258	15.99	70.742
Average	22.61	6.62	29.258	15.99	70.742

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0008	0.0016	0.0111	0.0194	0.0797
2	0.0017	0.0036	0.0247	0.0431	0.1769
3	0.0086	0.0182	0.1238	0.2159	0.8871
4	0.0085	0.0179	0.1217	0.2122	0.8736
5	0.0007	0.0014	0.0096	0.0168	0.0692
6	0.0076	0.0161	0.1100	0.1918	0.7912
7	0.0082	0.0173	0.1176	0.2050	0.8473
8	0.0031	0.0066	0.0450	0.0785	0.3249
9	0.0012	0.0024	0.0177	0.0332	0.1315
10	0.0630	0.1284	0.9786	1.9457	7.4173
11	0.0025	0.0051	0.0388	0.0771	0.3061
12	0.0067	0.0137	0.1044	0.2076	0.8243
13	0.0005	0.0010	0.0078	0.0156	0.0618
14	0.0059	0.0120	0.0913	0.1816	0.7204
15	0.0014	0.0029	0.0220	0.0437	0.1733
16	0.0044	0.0091	0.0690	0.1372	0.5436
17	0.0060	0.0121	0.0924	0.1838	0.7272
18	0.0056	0.0116	0.0848	0.1610	0.6491
19	0.0007	0.0013	0.0102	0.0203	0.0800
20	0.0025	0.0052	0.0396	0.0786	0.3104
Total	0.1396	0.2876	2.1201	4.0679	15.9948

Table 7. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.1	0.17	0.8	0.18	0.8
Highway Segment	Collision with Fixed Object	2.18	9.7	5.64	24.9	7.82	34.6
Highway Segment	Collision with Other Object	0.15	0.7	1.09	4.8	1.25	5.5
Highway Segment	Other Single-vehicle Collision	0.63	2.8	0.84	3.7	1.47	6.5
Highway Segment	Collision with Parked Vehicle	0.04	0.2	0.13	0.6	0.17	0.8
Highway Segment	Total Single Vehicle Crashes	3.02	13.4	7.87	34.8	10.90	48.2
Highway Segment	Right-Angle Collision	0.11	0.5	0.15	0.6	0.26	1.1
Highway Segment	Head-on Collision	0.03	0.1	0.02	0.1	0.04	0.2
Highway Segment	Other Multi-vehicle Collision	0.11	0.5	0.20	0.9	0.31	1.4
Highway Segment	Rear-end Collision	2.69	11.9	5.60	24.8	8.30	36.7
Highway Segment	Sideswipe, Same Direction Collision	0.65	2.9	2.16	9.6	2.81	12.4
Highway Segment	Total Multiple Vehicle Crashes	3.59	15.9	8.12	35.9	11.71	51.8
Highway Segment	Total Highway Segment Crashes	6.62	29.3	15.99	70.7	22.61	100.0
	Total Crashes	6.62	29.3	15.99	70.7	22.61	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1301+70.260	1301+89.180	Information: for segment #1 (1301+70.260 to 1301+89.180), Effective median width (90.67 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1301+70.260	1301+89.180	Information: for segment #1 (1301+70.260 to 1301+89.180), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1301+70.260	1301+89.180	Information: for segment #1 (1301+70.260 to 1301+89.180), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1301+70.260	1301+89.180	Information: for segment #1 (1301+70.260 to 1301+89.180), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1301+70.260	1301+89.180	Information: for segment #1 (1301+70.260 to 1301+89.180), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1301+89.180	1302+31.260	Information: for segment #2 (1301+89.180 to 1302+31.260), Effective median width (91.20 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1301+89.180	1302+31.260	Information: for segment #2 (1301+89.180 to 1302+31.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1301+89.180	1302+31.260	Information: for segment #2 (1301+89.180 to 1302+31.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1301+89.180	1302+31.260	Information: for segment #2 (1301+89.180 to 1302+31.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1301+89.180	1302+31.260	Information: for segment #2 (1301+89.180 to 1302+31.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1302+31.260	1304+44.260	Information: for segment #3 (1302+31.260 to 1304+44.260), Effective median width (93.67 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1302+31.260	1304+44.260	Information: for segment #3 (1302+31.260 to 1304+44.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1302+31.260	1304+44.260	Information: for segment #3 (1302+31.260 to 1304+44.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1302+31.260	1304+44.260	Information: for segment #3 (1302+31.260 to 1304+44.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1302+31.260	1304+44.260	Information: for segment #3 (1302+31.260 to 1304+44.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1304+44.260	1306+57.260	Information: for segment #4 (1304+44.260 to 1306+57.260), Effective median width (97.78 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1304+44.260	1306+57.260	Information: for segment #4 (1304+44.260 to 1306+57.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1304+44.260	1306+57.260	Information: for segment #4 (1304+44.260 to 1306+57.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1304+44.260	1306+57.260	Information: for segment #4 (1304+44.260 to 1306+57.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1304+44.260	1306+57.260	Information: for segment #4 (1304+44.260 to 1306+57.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1306+57.260	1306+74.260	Information: for segment #5 (1306+57.260 to 1306+74.260), Effective median width (100.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1306+57.260	1306+74.260	Information: for segment #5 (1306+57.260 to 1306+74.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1306+57.260	1306+74.260	Information: for segment #5 (1306+57.260 to 1306+74.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1306+57.260	1306+74.260	Information: for segment #5 (1306+57.260 to 1306+74.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1306+57.260	1306+74.260	Information: for segment #5 (1306+57.260 to 1306+74.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1306+74.260	1308+70.260	Information: for segment #6 (1306+74.260 to 1308+70.260), Effective median width (102.06 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1306+74.260	1308+70.260	Information: for segment #6 (1306+74.260 to 1308+70.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1306+74.260	1308+70.260	Information: for segment #6 (1306+74.260 to 1308+70.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1306+74.260	1308+70.260	Information: for segment #6 (1306+74.260 to 1308+70.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1306+74.260	1308+70.260	Information: for segment #6 (1306+74.260 to 1308+70.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+70.260	1310+83.260	Information: for segment #7 (1308+70.260 to 1310+83.260), Effective median width (106.01 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1308+70.260	1310+83.260	Information: for segment #7 (1308+70.260 to 1310+83.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+70.260	1310+83.260	Information: for segment #7 (1308+70.260 to 1310+83.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+70.260	1310+83.260	Information: for segment #7 (1308+70.260 to 1310+83.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+70.260	1310+83.260	Information: for segment #7 (1308+70.260 to 1310+83.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1310+83.260	1311+65.810	Information: for segment #8 (1310+83.260 to 1311+65.810), Effective median width (108.86 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1310+83.260	1311+65.810	Information: for segment #8 (1310+83.260 to 1311+65.810), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1310+83.260	1311+65.810	Information: for segment #8 (1310+83.260 to 1311+65.810), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1310+83.260	1311+65.810	Information: for segment #8 (1310+83.260 to 1311+65.810), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1310+83.260	1311+65.810	Information: for segment #8 (1310+83.260 to 1311+65.810), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1311+65.810	1312+03.280	Information: for segment #9 (1311+65.810 to 1312+03.280), Effective median width (109.83 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1311+65.810	1312+03.280	Information: for segment #9 (1311+65.810 to 1312+03.280), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1311+65.810	1312+03.280	Information: for segment #9 (1311+65.810 to 1312+03.280), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1311+65.810	1312+03.280	Information: for segment #9 (1311+65.810 to 1312+03.280), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1311+65.810	1312+03.280	Information: for segment #9 (1311+65.810 to 1312+03.280), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1312+03.280	1335+34.220	Information: for segment #10 (1312+03.280 to 1335+34.220), Effective median width (110.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1312+03.280	1335+34.220	Information: for segment #10 (1312+03.280 to 1335+34.220), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1312+03.280	1335+34.220	Information: for segment #10 (1312+03.280 to 1335+34.220), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1312+03.280	1335+34.220	Information: for segment #10 (1312+03.280 to 1335+34.220), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1312+03.280	1335+34.220	Information: for segment #10 (1312+03.280 to 1335+34.220), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1335+34.220	1335+87.780	Information: for segment #11 (1335+34.220 to 1335+87.780), Effective median width (110.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1335+34.220	1335+87.780	Information: for segment #11 (1335+34.220 to 1335+87.780), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1335+34.220	1335+87.780	Information: for segment #11 (1335+34.220 to 1335+87.780), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1335+34.220	1335+87.780	Information: for segment #11 (1335+34.220 to 1335+87.780), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1335+34.220	1335+87.780	Information: for segment #11 (1335+34.220 to 1335+87.780), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1335+87.780	1337+34.190	Information: for segment #12 (1335+87.780 to 1337+34.190), Effective median width (109.59 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1335+87.780	1337+34.190	Information: for segment #12 (1335+87.780 to 1337+34.190), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1335+87.780	1337+34.190	Information: for segment #12 (1335+87.780 to 1337+34.190), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1335+87.780	1337+34.190	Information: for segment #12 (1335+87.780 to 1337+34.190), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1335+87.780	1337+34.190	Information: for segment #12 (1335+87.780 to 1337+34.190), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1337+34.190	1337+45.260	Information: for segment #13 (1337+34.190 to 1337+45.260), Effective median width (108.92 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1337+34.190	1337+45.260	Information: for segment #13 (1337+34.190 to 1337+45.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1337+34.190	1337+45.260	Information: for segment #13 (1337+34.190 to 1337+45.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1337+34.190	1337+45.260	Information: for segment #13 (1337+34.190 to 1337+45.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1337+34.190	1337+45.260	Information: for segment #13 (1337+34.190 to 1337+45.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1337+45.260	1338+74.260	Information: for segment #14 (1337+45.260 to 1338+74.260), Effective median width (105.78 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1337+45.260	1338+74.260	Information: for segment #14 (1337+45.260 to 1338+74.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1337+45.260	1338+74.260	Information: for segment #14 (1337+45.260 to 1338+74.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1337+45.260	1338+74.260	Information: for segment #14 (1337+45.260 to 1338+74.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1337+45.260	1338+74.260	Information: for segment #14 (1337+45.260 to 1338+74.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1338+74.260	1339+05.260	Information: for segment #15 (1338+74.260 to 1339+05.260), Effective median width (102.18 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1338+74.260	1339+05.260	Information: for segment #15 (1338+74.260 to 1339+05.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1338+74.260	1339+05.260	Information: for segment #15 (1338+74.260 to 1339+05.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1338+74.260	1339+05.260	Information: for segment #15 (1338+74.260 to 1339+05.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1338+74.260	1339+05.260	Information: for segment #15 (1338+74.260 to 1339+05.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1339+05.260	1340+02.260	Information: for segment #16 (1339+05.260 to 1340+02.260), Effective median width (99.31 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1339+05.260	1340+02.260	Information: for segment #16 (1339+05.260 to 1340+02.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1339+05.260	1340+02.260	Information: for segment #16 (1339+05.260 to 1340+02.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1339+05.260	1340+02.260	Information: for segment #16 (1339+05.260 to 1340+02.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1339+05.260	1340+02.260	Information: for segment #16 (1339+05.260 to 1340+02.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1340+02.260	1341+31.260	Information: for segment #17 (1340+02.260 to 1341+31.260), Effective median width (94.23 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1340+02.260	1341+31.260	Information: for segment #17 (1340+02.260 to 1341+31.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1340+02.260	1341+31.260	Information: for segment #17 (1340+02.260 to 1341+31.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1340+02.260	1341+31.260	Information: for segment #17 (1340+02.260 to 1341+31.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1340+02.260	1341+31.260	Information: for segment #17 (1340+02.260 to 1341+31.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1341+31.260	1342+45.260	Information: for segment #18 (1341+31.260 to 1342+45.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1341+31.260	1342+45.260	Information: for segment #18 (1341+31.260 to 1342+45.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1341+31.260	1342+45.260	Information: for segment #18 (1341+31.260 to 1342+45.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1341+31.260	1342+45.260	Information: for segment #18 (1341+31.260 to 1342+45.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+45.260	1342+59.260	Information: for segment #19 (1342+45.260 to 1342+59.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+45.260	1342+59.260	Information: for segment #19 (1342+45.260 to 1342+59.260), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+45.260	1342+59.260	Information: for segment #19 (1342+45.260 to 1342+59.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+45.260	1342+59.260	Information: for segment #19 (1342+45.260 to 1342+59.260), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+59.260	1343+13.390	Information: for segment #20 (1342+59.260 to 1343+13.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+59.260	1343+13.390	Information: for segment #20 (1342+59.260 to 1343+13.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+59.260	1343+13.390	Information: for segment #20 (1342+59.260 to 1343+13.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+59.260	1343+13.390	Information: for segment #20 (1342+59.260 to 1343+13.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1335+34.220	1335+87.780	Warning: for segment #11 (1335+34.220 to 1335+87.780), Freeway Segment of type 8F is using unbalanced lane processing with 5 + 3 lanes. While results are provided, the HSM specifies that this approach only applies when the number of lanes varies by no more than one lane between the two travel directions.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1335+87.780	1337+34.190	Warning: for segment #12 (1335+87.780 to 1337+34.190), Freeway Segment of type 8F is using unbalanced lane processing with 5 + 3 lanes. While results are provided, the HSM specifies that this approach only applies when the number of lanes varies by no more than one lane between the two travel directions.
1337+34.190	1337+45.260	Warning: for segment #13 (1337+34.190 to 1337+45.260), Freeway Segment of type 8F is using unbalanced lane processing with 5 + 3 lanes. While results are provided, the HSM specifies that this approach only applies when the number of lanes varies by no more than one lane between the two travel directions.
1337+45.260	1338+74.260	Warning: for segment #14 (1337+45.260 to 1338+74.260), Freeway Segment of type 8F is using unbalanced lane processing with 5 + 3 lanes. While results are provided, the HSM specifies that this approach only applies when the number of lanes varies by no more than one lane between the two travel directions.
1338+74.260	1339+05.260	Warning: for segment #15 (1338+74.260 to 1339+05.260), Freeway Segment of type 8F is using unbalanced lane processing with 5 + 3 lanes. While results are provided, the HSM specifies that this approach only applies when the number of lanes varies by no more than one lane between the two travel directions.
1339+05.260	1340+02.260	Warning: for segment #16 (1339+05.260 to 1340+02.260), Freeway Segment of type 8F is using unbalanced lane processing with 5 + 3 lanes. While results are provided, the HSM specifies that this approach only applies when the number of lanes varies by no more than one lane between the two travel directions.
1340+02.260	1341+31.260	Warning: for segment #17 (1340+02.260 to 1341+31.260), Freeway Segment of type 8F is using unbalanced lane processing with 5 + 3 lanes. While results are provided, the HSM specifies that this approach only applies when the number of lanes varies by no more than one lane between the two travel directions.
1341+31.260	1342+45.260	Warning: for segment #18 (1341+31.260 to 1342+45.260), Freeway Segment of type 8F is using unbalanced lane processing with 5 + 3 lanes. While results are provided, the HSM specifies that this approach only applies when the number of lanes varies by no more than one lane between the two travel directions.
1342+45.260	1342+59.260	Warning: for segment #19 (1342+45.260 to 1342+59.260), Freeway Segment of type 8F is using unbalanced lane processing with 5 + 3 lanes. While results are provided, the HSM specifies that this approach only applies when the number of lanes varies by no more than one lane between the two travel directions.
1342+59.260	1343+13.390	Warning: for segment #20 (1342+59.260 to 1343+13.390), Freeway Segment of type 8F is using unbalanced lane processing with 5 + 3 lanes. While results are provided, the HSM specifies that this approach only applies when the number of lanes varies by no more than one lane between the two travel directions.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 8:46 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:45:38 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment MLNB12
Highway Comment: Imported from MLNB12.xml
Highway Version: 1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jun 23 10:45:26 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1049+35.160

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1049+35.160
Functional Class: Freeway C-D Road & System Ramp
Type of Alignment: One Direction
Model Category: C-D Road & System Ramp
Calibration Factor: CD_MV_FI=1.0; CD_MV_PDO=1.0; CD_SV_FI=1.0; CD_SV_PDO=1.0;

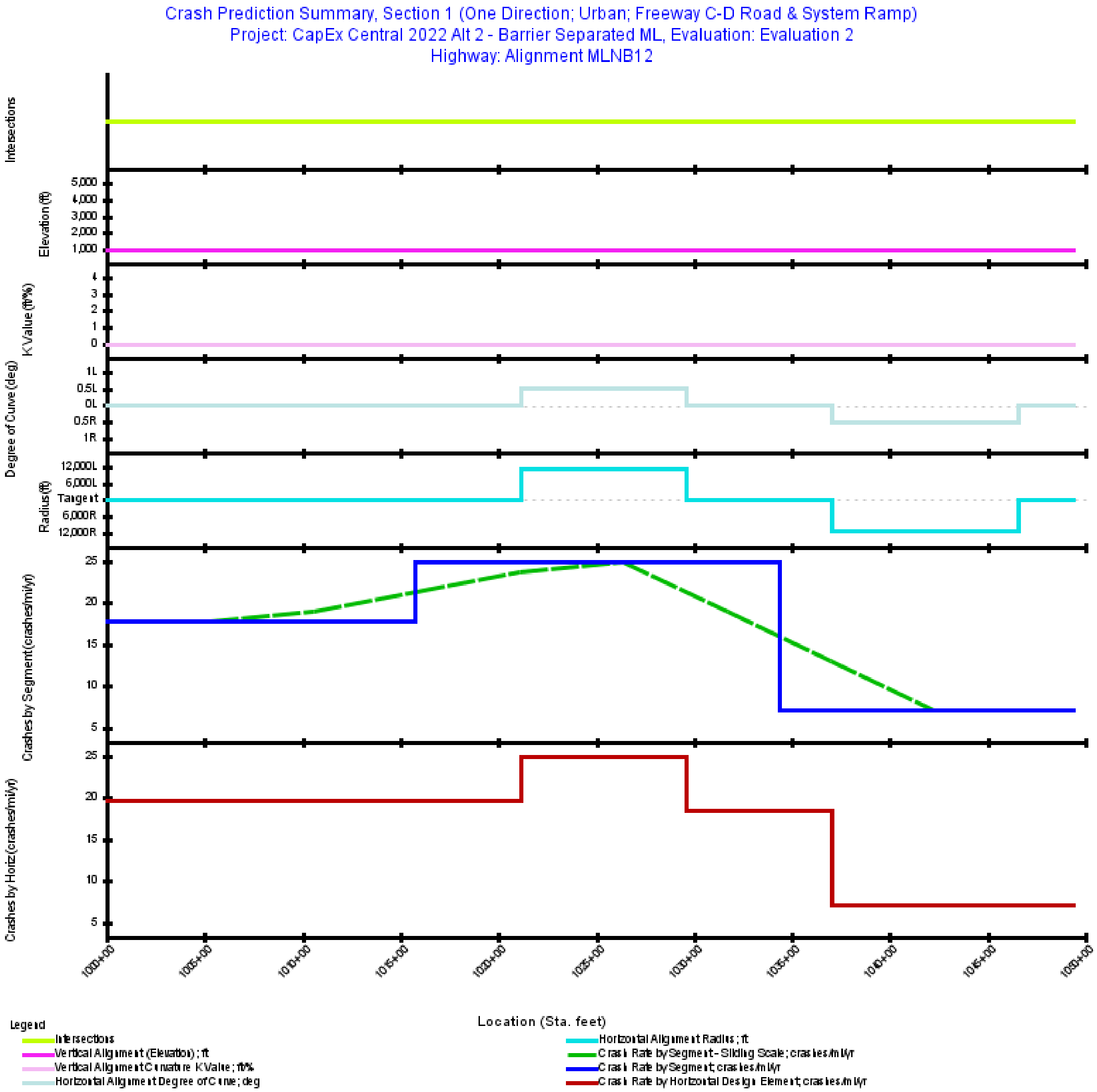

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1000+00.000	1015+73.000	1,573.00	0.2979	2030: 23,100
2	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1015+73.000	1034+35.000	1,862.00	0.3527	2030: 25,350
3	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1034+35.000	1049+35.160	1,500.16	0.2841	2030: 14,500

Table 2. User Defined CMF Used in the Eval Segment CPM Evaluation (Freeway Ramp Sections)

Name	Description	Start Loc. (Sta. ft)	End Loc. (Sta. ft)	Start CMF Year	End CMF Year	Severity	CMF Value
3 lanes	3/2	1015+72.450	1034+34.630	2030	2050	Total	1.5000

Table 3. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.9347**
Average Future Road AADT (vpd)	**21,335**
Predicted Crashes	
Total Crashes	**16.12**
Fatal and Injury Crashes	**6.23**
Property-Damage-Only Crashes	**9.89**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**39**
Percent Property-Damage-Only Crashes (%)	**61**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**17.2463**
FI Crash Rate (crashes/mi/yr)	**6.6684**
PDO Crash Rate (crashes/mi/yr)	**10.5779**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**7.28**
Travel Crash Rate (crashes/million veh-mi)	**2.21**
Travel FI Crash Rate (crashes/million veh-mi)	**0.86**
Travel PDO Crash Rate (crashes/million veh-mi)	**1.36**

Table 4. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1015+73.000	0.2979	5.304	5.3037	2.0278	3.2758	17.8026	2.11
2	1015+73.000	1034+35.000	0.3527	8.789	8.7892	3.5449	5.2443	24.9232	2.69
3	1034+35.000	1049+35.160	0.2841	2.027	2.0271	0.6602	1.3669	7.1345	1.35

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Total			0.9347	16.120	16.1199	6.2329	9.8870	17.2463	

Table 5. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1021+19.670	0.4015	7.884	7.8841	3.0686	4.8155	19.6390	2.26
Simple Curve 1	1021+19.670	1029+63.965	0.1599	3.985	3.9853	1.6074	2.3780	24.9232	2.69
Tangent	1029+63.965	1037+02.746	0.1399	2.585	2.5852	1.0146	1.5706	18.4763	2.21
Simple Curve 2	1037+02.746	1046+57.079	0.1807	1.290	1.2895	0.4200	0.8695	7.1345	1.35
Tangent	1046+57.079	1049+35.160	0.0527	0.376	0.3758	0.1224	0.2534	7.1345	1.35

Table 6. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	16.12	6.23	38.666	9.89	61.334
Total	16.12	6.23	38.666	9.89	61.334
Average	16.12	6.23	38.666	9.89	61.334

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 7. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0296	0.0899	0.4892	1.4191	3.2758
2	0.0518	0.1572	0.8552	2.4807	5.2443
3	0.0097	0.0293	0.1593	0.4620	1.3669
Total	0.0911	0.2763	1.5036	4.3618	9.8870

Table 8. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.0	0.04	0.2	0.04	0.3
Highway Segment	Collision with Fixed Object	0.90	5.6	1.15	7.2	2.06	12.8
Highway Segment	Collision with Other Object	0.06	0.4	0.22	1.4	0.29	1.8
Highway Segment	Other Single-vehicle Collision	0.26	1.6	0.17	1.1	0.43	2.7
Highway Segment	Collision with Parked Vehicle	0.02	0.1	0.03	0.2	0.04	0.3
Highway Segment	Total Single Vehicle Crashes	1.25	7.7	1.61	10.0	2.86	17.7
Highway Segment	Right-Angle Collision	0.15	1.0	0.15	0.9	0.30	1.9
Highway Segment	Head-on Collision	0.04	0.2	0.02	0.1	0.06	0.3
Highway Segment	Other Multi-vehicle Collision	0.15	1.0	0.20	1.2	0.35	2.2
Highway Segment	Rear-end Collision	3.74	23.2	5.71	35.4	9.45	58.6
Highway Segment	Sideswipe, Same Direction Collision	0.90	5.6	2.20	13.7	3.10	19.2
Highway Segment	Total Multiple Vehicle Crashes	4.99	30.9	8.28	51.3	13.26	82.3
Highway Segment	Total Highway Segment Crashes	6.23	38.7	9.89	61.3	16.12	100.0
	Total Crashes	6.23	38.7	9.89	61.3	16.12	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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This software product is provided "as-is," without warranty of any kind-either expressed or implied (but not limited to the implied warranties of merchantability and fitness for a particular purpose). The FHWA do not warrant that the functions contained in the software will meet the end-user's requirements or that the operation of the software will be uninterrupted and error-free.

Under no circumstances will the FHWA be liable to the end-user for any damages or claimed lost profits, lost savings, or other incidental or consequential damages rising out of the use or inability to use the software (even if these organizations have been advised of the possibility of such damages), or for any claim by any other party.

Notice

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Report Overview

Report Generated: Aug 25, 2022 8:46 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:47:14 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment MLNB22
Highway Comment: Imported from MLNB22.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:47:04 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1019+75.163

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1019+75.163
Functional Class: Freeway C-D Road & System Ramp
Type of Alignment: One Direction
Model Category: C-D Road & System Ramp
Calibration Factor: CD_MV_FI=1.0; CD_MV_PDO=1.0; CD_SV_FI=1.0; CD_SV_PDO=1.0;

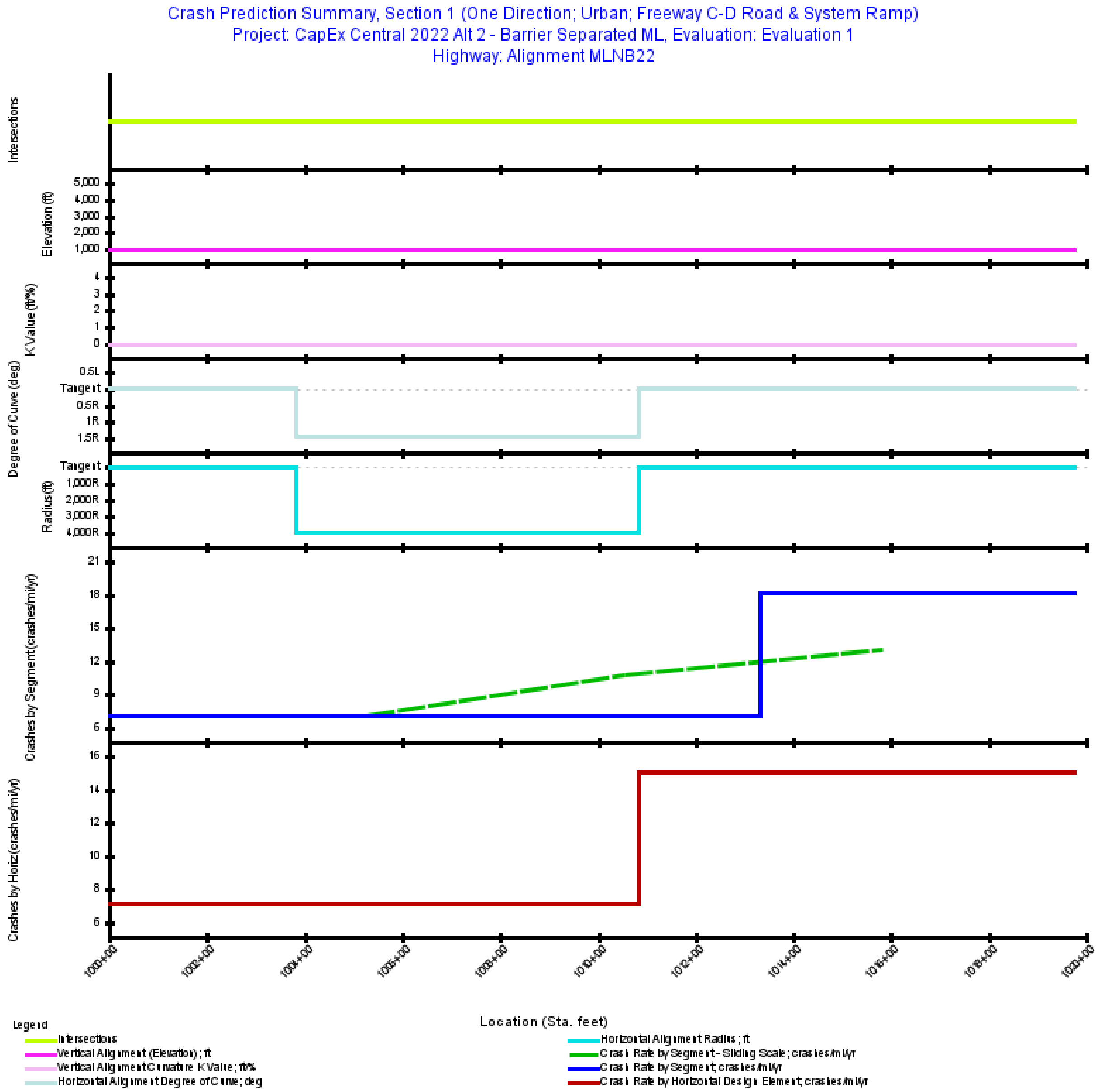

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1000+00.000	1013+30.750	1,330.75	0.2520	2030: 12,000
2	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1013+30.750	1019+75.163	644.41	0.1220	2030: 23,100

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.3741**
Average Future Road AADT (vpd)	**15,621**
Predicted Crashes	
Total Crashes	**4.00**
Fatal and Injury Crashes	**1.68**
Property-Damage-Only Crashes	**2.32**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**42**
Percent Property-Damage-Only Crashes (%)	**58**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**10.7011**
FI Crash Rate (crashes/mi/yr)	**4.4972**
PDO Crash Rate (crashes/mi/yr)	**6.2039**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.13**
Travel Crash Rate (crashes/million veh-mi)	**1.88**
Travel FI Crash Rate (crashes/million veh-mi)	**0.79**
Travel PDO Crash Rate (crashes/million veh-mi)	**1.09**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1013+30.750	0.2520	1.794	1.7945	0.6464	1.1480	7.1199	1.63
2	1013+30.750	1019+75.163	0.1220	2.209	2.2086	1.0359	1.1727	18.0966	2.15
Total			0.3741	4.003	4.0031	1.6823	2.3208	10.7011	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1003+81.193	0.0722	0.514	0.5140	0.1852	0.3289	7.1199	1.63
Simple Curve 1	1003+81.193	1010+84.650	0.1332	0.949	0.9486	0.3417	0.6069	7.1199	1.63
Tangent	1010+84.650	1019+75.163	0.1687	2.541	2.5405	1.1555	1.3851	15.0631	2.00

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.00	1.68	42.025	2.32	57.975
Total	4.00	1.68	42.025	2.32	57.975
Average	4.00	1.68	42.025	2.32	57.975

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0095	0.0287	0.1559	0.4524	1.1480
2	0.0151	0.0459	0.2499	0.7249	1.1727
Total	0.0246	0.0746	0.4058	1.1773	2.3208

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.01	0.2	0.01	0.3
Highway Segment	Collision with Fixed Object	0.27	6.8	0.32	7.9	0.59	14.7
Highway Segment	Collision with Other Object	0.02	0.5	0.06	1.5	0.08	2.0
Highway Segment	Other Single-vehicle Collision	0.08	1.9	0.05	1.2	0.12	3.1
Highway Segment	Collision with Parked Vehicle	0.01	0.1	0.01	0.2	0.01	0.3
Highway Segment	Total Single Vehicle Crashes	0.38	9.4	0.44	11.0	0.82	20.4
Highway Segment	Right-Angle Collision	0.04	1.0	0.03	0.8	0.07	1.9
Highway Segment	Head-on Collision	0.01	0.3	0.00	0.1	0.01	0.4
Highway Segment	Other Multi-vehicle Collision	0.04	1.0	0.04	1.1	0.09	2.1
Highway Segment	Rear-end Collision	0.98	24.5	1.30	32.4	2.28	56.9
Highway Segment	Sideswipe, Same Direction Collision	0.23	5.9	0.50	12.5	0.73	18.4
Highway Segment	Total Multiple Vehicle Crashes	1.31	32.7	1.88	46.9	3.19	79.6
Highway Segment	Total Highway Segment Crashes	1.68	42.0	2.32	58.0	4.00	100.0
	Total Crashes	1.68	42.0	2.32	58.0	4.00	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 8:47 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:48:05 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment MLNB32
Highway Comment: Imported from MLNB32.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:47:46 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1041+53.287

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1041+53.287
Functional Class: Freeway C-D Road & System Ramp
Type of Alignment: One Direction
Model Category: C-D Road & System Ramp
Calibration Factor: CD_MV_FI=1.0; CD_MV_PDO=1.0; CD_SV_FI=1.0; CD_SV_PDO=1.0;

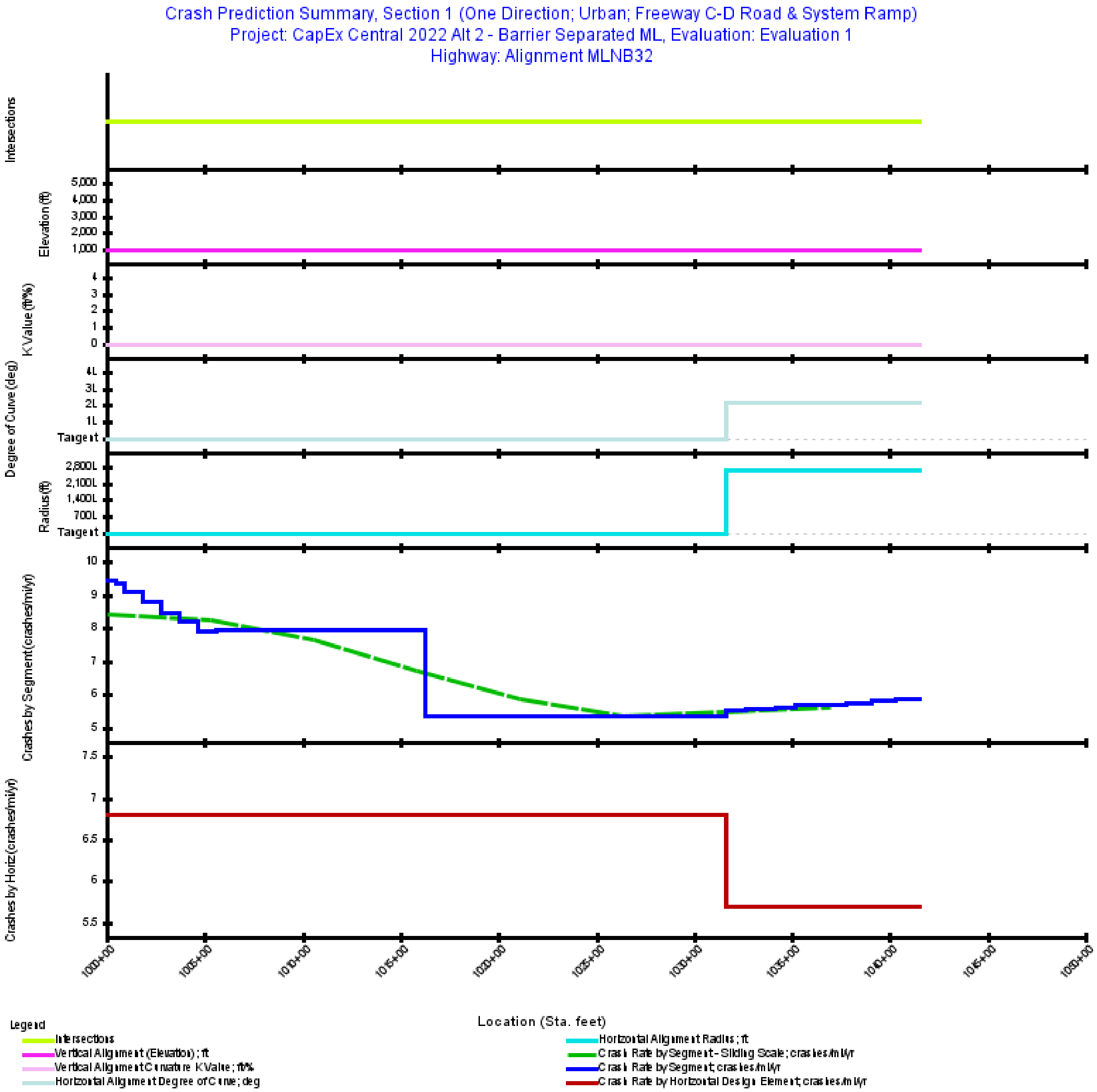

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1000+00.000	1000+44.860	44.86	0.0085	2030: 16,250
2	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1000+44.860	1000+92.000	47.14	0.0089	2030: 16,250
3	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1000+92.000	1001+85.000	93.00	0.0176	2030: 16,250
4	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1001+85.000	1002+79.000	94.00	0.0178	2030: 16,250
5	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1002+79.000	1003+72.000	93.00	0.0176	2030: 16,250
6	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1003+72.000	1004+66.000	94.00	0.0178	2030: 16,250
7	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1004+66.000	1005+59.000	93.00	0.0176	2030: 16,250
8	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1005+59.000	1016+28.380	1,069.38	0.2025	2030: 16,250
9	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1016+28.380	1031+65.760	1,537.38	0.2912	2030: 12,000
10	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1031+65.760	1032+67.000	101.24	0.0192	2030: 12,000
11	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1032+67.000	1034+13.000	146.00	0.0277	2030: 12,000
12	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1034+13.000	1035+20.000	107.00	0.0203	2030: 12,000
13	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1035+20.000	1037+74.000	254.00	0.0481	2030: 12,000
14	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1037+74.000	1039+07.000	133.00	0.0252	2030: 12,000
15	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1039+07.000	1040+27.000	120.00	0.0227	2030: 12,000
16	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1040+27.000	1041+53.287	126.29	0.0239	2030: 12,000

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.7866**
Average Future Road AADT (vpd)	**13,666**
Predicted Crashes	
Total Crashes	**5.14**
Fatal and Injury Crashes	**1.68**
Property-Damage-Only Crashes	**3.46**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**33**
Percent Property-Damage-Only Crashes (%)	**67**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**6.5366**
FI Crash Rate (crashes/mi/yr)	**2.1356**
PDO Crash Rate (crashes/mi/yr)	**4.4010**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**3.92**
Travel Crash Rate (crashes/million veh-mi)	**1.31**
Travel FI Crash Rate (crashes/million veh-mi)	**0.43**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.88**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+44.860	0.0085	0.080	0.0801	0.0285	0.0516	9.4309	1.59
2	1000+44.860	1000+92.000	0.0089	0.083	0.0834	0.0296	0.0539	9.3460	1.58
3	1000+92.000	1001+85.000	0.0176	0.160	0.1603	0.0560	0.1042	9.0986	1.53
4	1001+85.000	1002+79.000	0.0178	0.156	0.1563	0.0536	0.1027	8.7800	1.48
5	1002+79.000	1003+72.000	0.0176	0.149	0.1493	0.0503	0.0990	8.4741	1.43
6	1003+72.000	1004+66.000	0.0178	0.146	0.1456	0.0482	0.0975	8.1803	1.38
7	1004+66.000	1005+59.000	0.0176	0.139	0.1391	0.0451	0.0940	7.8980	1.33
8	1005+59.000	1016+28.380	0.2025	1.608	1.6076	0.5476	1.0599	7.9372	1.34
9	1016+28.380	1031+65.760	0.2912	1.556	1.5560	0.4830	1.0729	5.3438	1.22
10	1031+65.760	1032+67.000	0.0192	0.106	0.1059	0.0331	0.0728	5.5227	1.26
11	1032+67.000	1034+13.000	0.0277	0.154	0.1540	0.0483	0.1057	5.5683	1.27
12	1034+13.000	1035+20.000	0.0203	0.114	0.1138	0.0359	0.0779	5.6155	1.28
13	1035+20.000	1037+74.000	0.0481	0.273	0.2734	0.0868	0.1866	5.6835	1.30
14	1037+74.000	1039+07.000	0.0252	0.145	0.1450	0.0464	0.0987	5.7575	1.31
15	1039+07.000	1040+27.000	0.0227	0.132	0.1320	0.0424	0.0896	5.8065	1.33
16	1040+27.000	1041+53.287	0.0239	0.140	0.1400	0.0452	0.0949	5.8546	1.34
Total			0.7866	5.142	5.1418	1.6799	3.4619	6.5366	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1031+65.764	0.5996	4.078	4.0777	1.3420	2.7357	6.8009	1.30
Simple Curve 1	1031+65.764	1041+53.287	0.1870	1.064	1.0641	0.3379	0.7262	5.6894	1.30

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.14	1.68	32.671	3.46	67.329
Total	5.14	1.68	32.671	3.46	67.329
Average	5.14	1.68	32.671	3.46	67.329

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0004	0.0013	0.0069	0.0200	0.0516
2	0.0004	0.0013	0.0071	0.0207	0.0539
3	0.0008	0.0025	0.0135	0.0392	0.1042
4	0.0008	0.0024	0.0129	0.0375	0.1027
5	0.0007	0.0022	0.0121	0.0352	0.0990
6	0.0007	0.0021	0.0116	0.0337	0.0975
7	0.0007	0.0020	0.0109	0.0316	0.0940
8	0.0080	0.0243	0.1321	0.3832	1.0599
9	0.0071	0.0214	0.1165	0.3380	1.0729
10	0.0005	0.0015	0.0080	0.0231	0.0728
11	0.0007	0.0021	0.0117	0.0338	0.1057
12	0.0005	0.0016	0.0087	0.0251	0.0779
13	0.0013	0.0038	0.0209	0.0607	0.1866
14	0.0007	0.0021	0.0112	0.0324	0.0987
15	0.0006	0.0019	0.0102	0.0297	0.0896
16	0.0007	0.0020	0.0109	0.0316	0.0949
Total	0.0246	0.0745	0.4053	1.1756	3.4619

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.02	0.3	0.02	0.3
Highway Segment	Collision with Fixed Object	0.36	7.0	0.51	10.0	0.87	16.9
Highway Segment	Collision with Other Object	0.03	0.5	0.10	1.9	0.12	2.4
Highway Segment	Other Single-vehicle Collision	0.10	2.0	0.08	1.5	0.18	3.5
Highway Segment	Collision with Parked Vehicle	0.01	0.1	0.01	0.2	0.02	0.4
Highway Segment	Total Single Vehicle Crashes	0.49	9.6	0.71	13.9	1.21	23.5
Highway Segment	Right-Angle Collision	0.04	0.7	0.05	1.0	0.09	1.7
Highway Segment	Head-on Collision	0.01	0.2	0.01	0.1	0.01	0.3
Highway Segment	Other Multi-vehicle Collision	0.04	0.7	0.07	1.3	0.10	2.0
Highway Segment	Rear-end Collision	0.89	17.3	1.90	36.9	2.78	54.1
Highway Segment	Sideswipe, Same Direction Collision	0.21	4.1	0.73	14.2	0.94	18.4
Highway Segment	Total Multiple Vehicle Crashes	1.19	23.0	2.75	53.4	3.93	76.5
Highway Segment	Total Highway Segment Crashes	1.68	32.7	3.46	67.3	5.14	100.0
	Total Crashes	1.68	32.7	3.46	67.3	5.14	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 8:50 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:49:22 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment MLSB12
Highway Comment: Imported from MLSB12.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:49:08 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1054+28.200

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1054+28.200
Functional Class: Freeway C-D Road & System Ramp
Type of Alignment: One Direction
Model Category: C-D Road & System Ramp
Calibration Factor: CD_MV_FI=1.0; CD_MV_PDO=1.0; CD_SV_FI=1.0; CD_SV_PDO=1.0;

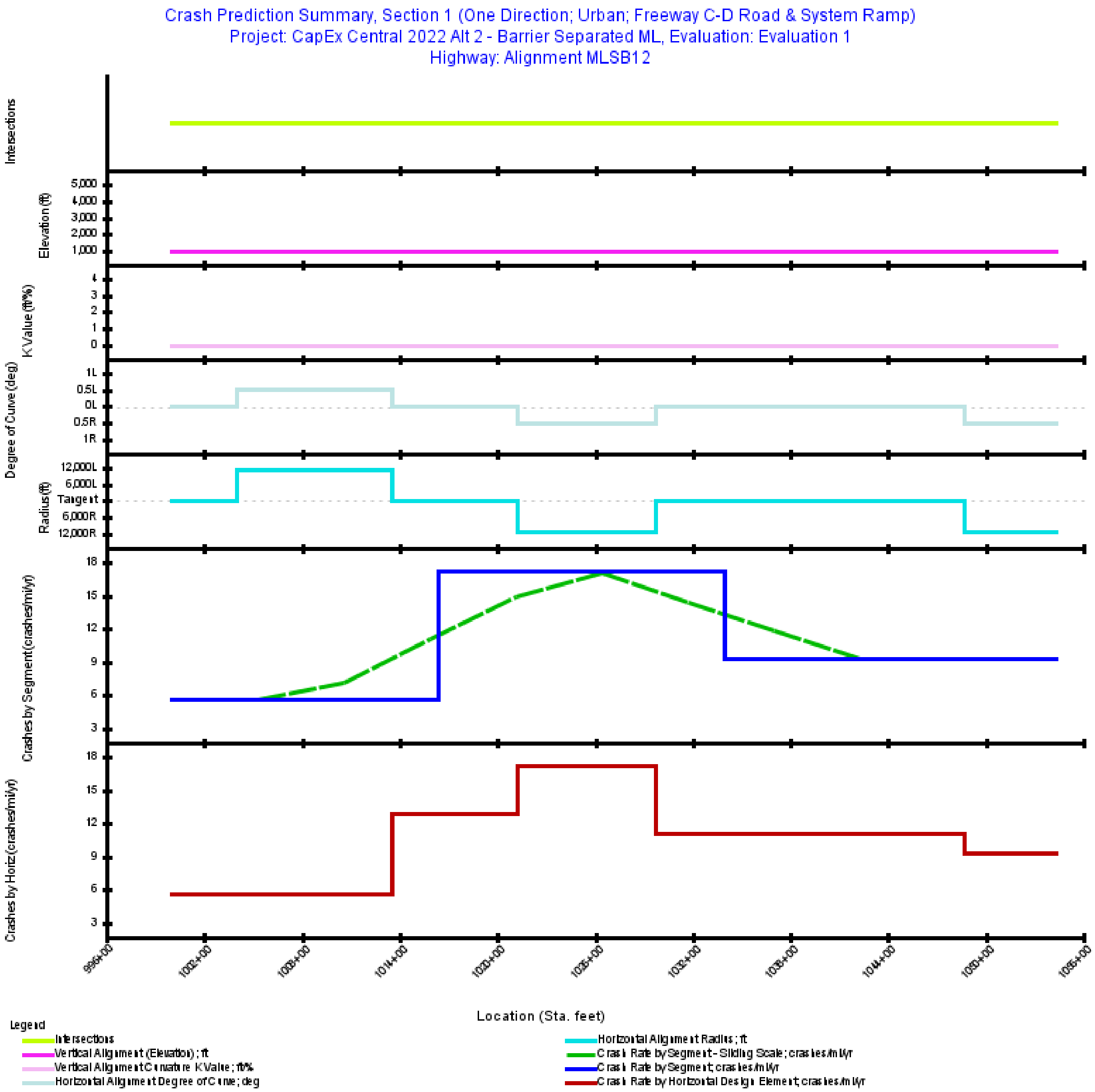

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1000+00.000	1016+42.000	1,642.00	0.3110	2030: 8,950
2	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1016+42.000	1033+98.000	1,756.00	0.3326	2030: 19,500
3	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1033+98.000	1054+28.200	2,030.20	0.3845	2030: 18,050

Table 2. User Defined CMF Used in the Eval Segment CPM Evaluation (Freeway Ramp Sections)

Name	Description	Start Loc. (Sta. ft)	End Loc. (Sta. ft)	Start CMF Year	End CMF Year	Severity	CMF Value
3 lanes	3/2	1016+41.650	1033+97.210	2030	2050	Total	1.5000

Table 3. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**1.0281**
Average Future Road AADT (vpd)	**15,766**
Predicted Crashes	
Total Crashes	**11.08**
Fatal and Injury Crashes	**3.90**
Property-Damage-Only Crashes	**7.18**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**35**
Percent Property-Damage-Only Crashes (%)	**65**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**10.7785**
FI Crash Rate (crashes/mi/yr)	**3.7923**
PDO Crash Rate (crashes/mi/yr)	**6.9862**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**5.92**
Travel Crash Rate (crashes/million veh-mi)	**1.87**
Travel FI Crash Rate (crashes/million veh-mi)	**0.66**
Travel PDO Crash Rate (crashes/million veh-mi)	**1.21**

Table 4. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1016+42.000	0.3110	1.759	1.7592	0.5995	1.1597	5.6570	1.73
2	1016+42.000	1033+98.000	0.3326	5.732	5.7319	2.0865	3.6454	17.2349	2.42
3	1033+98.000	1054+28.200	0.3845	3.590	3.5899	1.2126	2.3773	9.3363	1.42

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Total			1.0281	11.081	11.0810	3.8987	7.1823	10.7785	

Table 5. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1003+98.468	0.0755	0.427	0.4269	0.1455	0.2814	5.6570	1.73
Simple Curve 1	1003+98.468	1013+52.800	0.1807	1.022	1.0225	0.3485	0.6740	5.6570	1.73
Tangent	1013+52.800	1021+26.948	0.1466	1.893	1.8928	0.6818	1.2110	12.9097	2.16
Simple Curve 2	1021+26.948	1029+70.482	0.1598	2.753	2.7535	1.0023	1.7511	17.2349	2.42
Tangent	1029+70.482	1048+68.963	0.3596	3.997	3.9965	1.3866	2.6099	11.1150	1.64
Simple Curve 3	1048+68.963	1054+28.200	0.1059	0.989	0.9889	0.3340	0.6548	9.3363	1.42

Table 6. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	11.08	3.90	35.184	7.18	64.816
Total	11.08	3.90	35.184	7.18	64.816
Average	11.08	3.90	35.184	7.18	64.816

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 7. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0088	0.0266	0.1446	0.4196	1.1597
2	0.0305	0.0925	0.5034	1.4602	3.6454
3	0.0177	0.0538	0.2925	0.8486	2.3773
Total	0.0570	0.1728	0.9405	2.7283	7.1823

Table 8. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.03	0.3	0.03	0.3
Highway Segment	Collision with Fixed Object	0.74	6.7	0.97	8.8	1.71	15.5
Highway Segment	Collision with Other Object	0.05	0.5	0.19	1.7	0.24	2.2
Highway Segment	Other Single-vehicle Collision	0.21	1.9	0.14	1.3	0.36	3.2
Highway Segment	Collision with Parked Vehicle	0.01	0.1	0.02	0.2	0.04	0.3
Highway Segment	Total Single Vehicle Crashes	1.03	9.3	1.36	12.2	2.38	21.5
Highway Segment	Right-Angle Collision	0.09	0.8	0.10	0.9	0.19	1.7
Highway Segment	Head-on Collision	0.02	0.2	0.01	0.1	0.04	0.3
Highway Segment	Other Multi-vehicle Collision	0.09	0.8	0.14	1.3	0.23	2.1
Highway Segment	Rear-end Collision	2.15	19.4	4.02	36.3	6.17	55.7
Highway Segment	Sideswipe, Same Direction Collision	0.52	4.7	1.55	14.0	2.07	18.6
Highway Segment	Total Multiple Vehicle Crashes	2.87	25.9	5.83	52.6	8.70	78.5
Highway Segment	Total Highway Segment Crashes	3.90	35.2	7.18	64.8	11.08	100.0
	Total Crashes	3.90	35.2	7.18	64.8	11.08	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 8:51 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:49:53 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment MLSB22
Highway Comment: Imported from MLSB22.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:49:43 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1021+26.829

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1021+26.829
Functional Class: Freeway C-D Road & System Ramp
Type of Alignment: One Direction
Model Category: C-D Road & System Ramp
Calibration Factor: CD_MV_FI=1.0; CD_MV_PDO=1.0; CD_SV_FI=1.0; CD_SV_PDO=1.0;

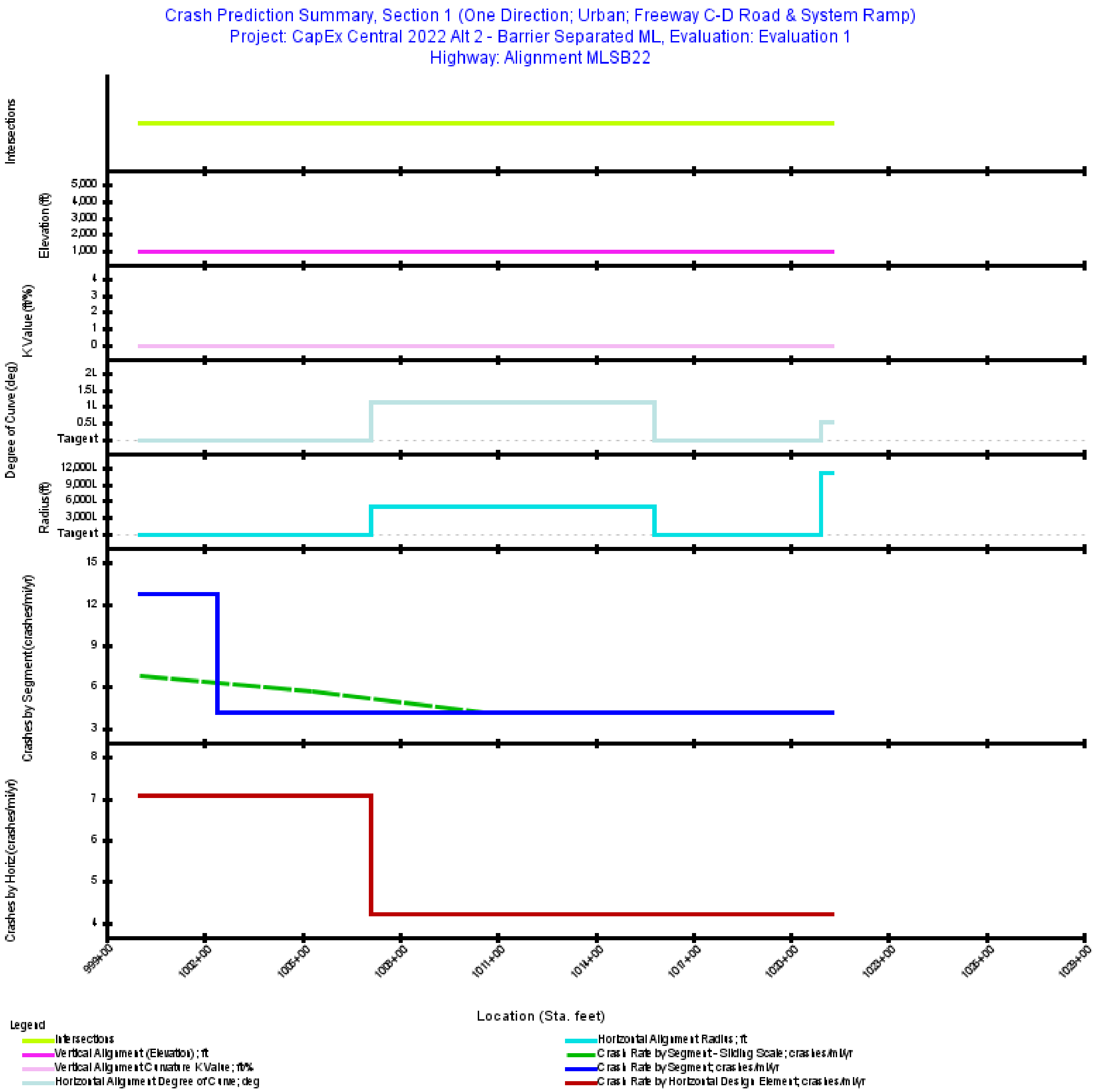

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1000+00.000	1002+37.680	237.68	0.0450	2030: 18,050
2	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1002+37.680	1021+26.829	1,889.15	0.3578	2030: 7,400

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.4028**
Average Future Road AADT (vpd)	**8,590**
Predicted Crashes	
Total Crashes	**2.08**
Fatal and Injury Crashes	**0.81**
Property-Damage-Only Crashes	**1.27**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**39**
Percent Property-Damage-Only Crashes (%)	**61**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.1611**
FI Crash Rate (crashes/mi/yr)	**2.0036**
PDO Crash Rate (crashes/mi/yr)	**3.1575**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.26**
Travel Crash Rate (crashes/million veh-mi)	**1.65**
Travel FI Crash Rate (crashes/million veh-mi)	**0.64**
Travel PDO Crash Rate (crashes/million veh-mi)	**1.01**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1002+37.680	0.0450	0.574	0.5741	0.2491	0.3250	12.7529	1.94
2	1002+37.680	1021+26.829	0.3578	1.505	1.5048	0.5580	0.9469	4.2059	1.56
Total			0.4028	2.079	2.0789	0.8071	1.2719	5.1611	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1007+10.718	0.1346	0.951	0.9509	0.3888	0.5621	7.0642	1.68
Simple Curve 1	1007+10.718	1015+81.127	0.1649	0.693	0.6933	0.2571	0.4363	4.2059	1.56
Tangent	1015+81.127	1020+90.954	0.0966	0.406	0.4061	0.1506	0.2555	4.2059	1.56
Simple Curve 2	1020+90.954	1021+26.829	0.0068	0.029	0.0286	0.0106	0.0180	4.2059	1.56

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.08	0.81	38.821	1.27	61.179
Total	2.08	0.81	38.821	1.27	61.179
Average	2.08	0.81	38.821	1.27	61.179

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0036	0.0110	0.0601	0.1743	0.3250
2	0.0082	0.0247	0.1346	0.3905	0.9469
Total	0.0118	0.0358	0.1947	0.5648	1.2719

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.3	0.01	0.4
Highway Segment	Collision with Fixed Object	0.19	9.1	0.23	10.8	0.41	19.9
Highway Segment	Collision with Other Object	0.01	0.6	0.04	2.1	0.06	2.7
Highway Segment	Other Single-vehicle Collision	0.06	2.6	0.03	1.6	0.09	4.2
Highway Segment	Collision with Parked Vehicle	0.00	0.2	0.01	0.2	0.01	0.4
Highway Segment	Total Single Vehicle Crashes	0.26	12.6	0.31	15.1	0.58	27.7
Highway Segment	Right-Angle Collision	0.02	0.8	0.02	0.8	0.03	1.6
Highway Segment	Head-on Collision	0.00	0.2	0.00	0.1	0.01	0.3
Highway Segment	Other Multi-vehicle Collision	0.02	0.8	0.02	1.1	0.04	1.9
Highway Segment	Rear-end Collision	0.41	19.7	0.66	31.8	1.07	51.4
Highway Segment	Sideswipe, Same Direction Collision	0.10	4.7	0.26	12.3	0.35	17.0
Highway Segment	Total Multiple Vehicle Crashes	0.55	26.2	0.96	46.1	1.50	72.3
Highway Segment	Total Highway Segment Crashes	0.81	38.8	1.27	61.2	2.08	100.0
	Total Crashes	0.81	38.8	1.27	61.2	2.08	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:50:42 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment MLSB32
Highway Comment: Imported from MLSB32.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:50:30 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1041+32.820

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1041+32.820
Functional Class: Freeway C-D Road & System Ramp
Type of Alignment: One Direction
Model Category: C-D Road & System Ramp
Calibration Factor: CD_MV_FI=1.0; CD_MV_PDO=1.0; CD_SV_FI=1.0; CD_SV_PDO=1.0;

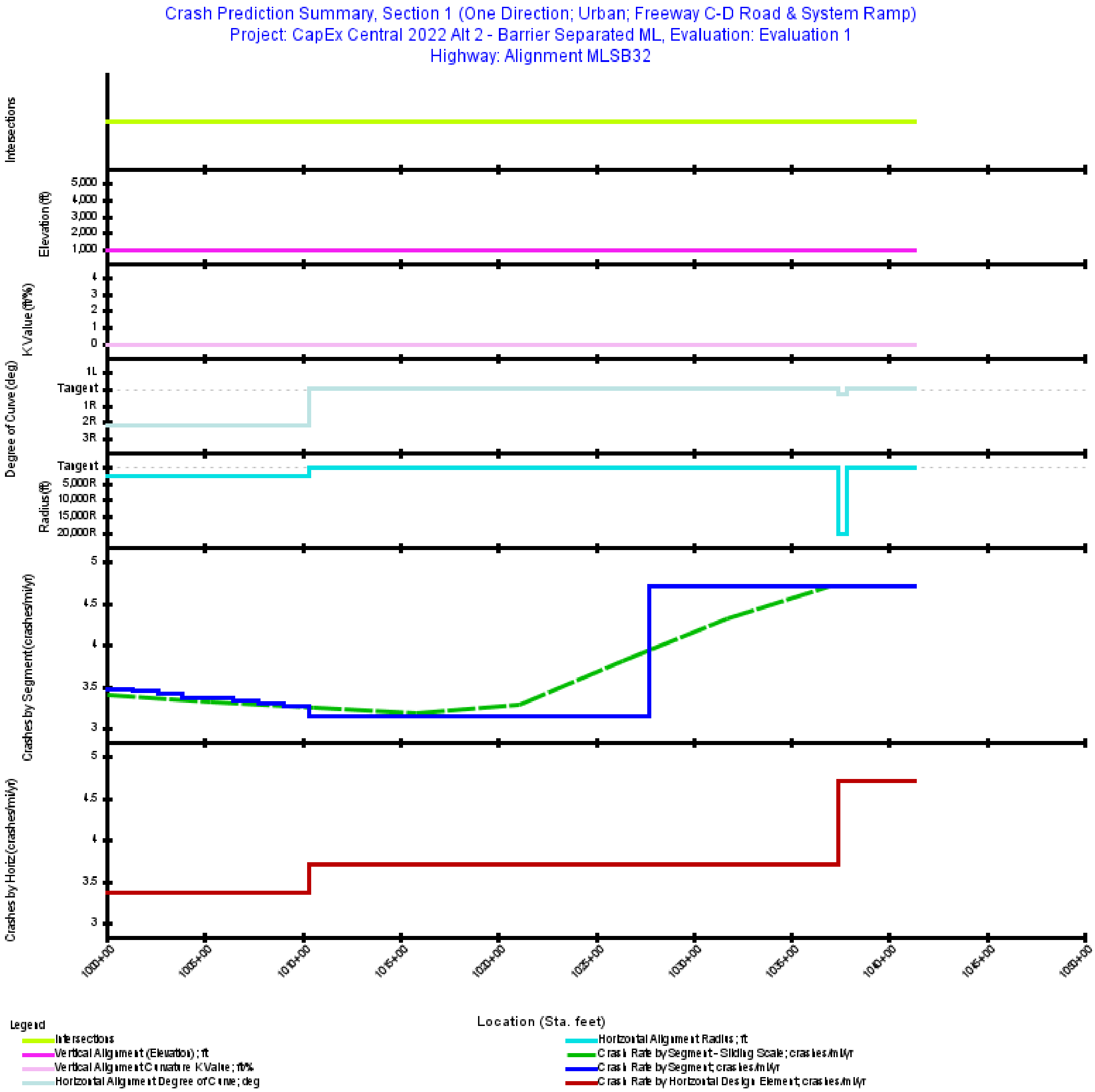

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1000+00.000	1001+30.000	130.00	0.0246	2030: 7,400
2	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1001+30.000	1002+60.000	130.00	0.0246	2030: 7,400
3	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1002+60.000	1003+89.000	129.00	0.0244	2030: 7,400
4	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1003+89.000	1006+48.000	259.00	0.0491	2030: 7,400
5	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1006+48.000	1007+78.000	130.00	0.0246	2030: 7,400
6	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1007+78.000	1009+07.000	129.00	0.0244	2030: 7,400
7	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1009+07.000	1010+36.430	129.43	0.0245	2030: 7,400
8	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1010+36.430	1027+71.000	1,734.57	0.3285	2030: 7,400
9	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1027+71.000	1041+32.820	1,361.82	0.2579	2030: 9,450

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.7827**
Average Future Road AADT (vpd)	**8,076**
Predicted Crashes	
Total Crashes	**2.91**
Fatal and Injury Crashes	**0.96**
Property-Damage-Only Crashes	**1.95**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**33**
Percent Property-Damage-Only Crashes (%)	**67**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**3.7174**
FI Crash Rate (crashes/mi/yr)	**1.2220**
PDO Crash Rate (crashes/mi/yr)	**2.4954**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.31**
Travel Crash Rate (crashes/million veh-mi)	**1.26**
Travel FI Crash Rate (crashes/million veh-mi)	**0.42**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.85**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1001+30.000	0.0246	0.086	0.0855	0.0284	0.0571	3.4716	1.28
2	1001+30.000	1002+60.000	0.0246	0.085	0.0847	0.0280	0.0567	3.4411	1.27
3	1002+60.000	1003+89.000	0.0244	0.083	0.0833	0.0274	0.0559	3.4110	1.26
4	1003+89.000	1006+48.000	0.0491	0.165	0.1651	0.0540	0.1111	3.3665	1.25
5	1006+48.000	1007+78.000	0.0246	0.082	0.0818	0.0266	0.0552	3.3225	1.23
6	1007+78.000	1009+07.000	0.0244	0.081	0.0805	0.0260	0.0545	3.2936	1.22
7	1009+07.000	1010+36.430	0.0245	0.080	0.0800	0.0257	0.0543	3.2651	1.21
8	1010+36.430	1027+71.000	0.3285	1.035	1.0354	0.3314	0.7040	3.1517	1.17
9	1027+71.000	1041+32.820	0.2579	1.213	1.2133	0.4088	0.8045	4.7042	1.36
Total			0.7827	2.910	2.9097	0.9565	1.9532	3.7174	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1010+36.430	0.1963	0.661	0.6610	0.2162	0.4448	3.3673	1.25
Tangent	1010+36.430	1037+42.119	0.5124	1.901	1.9006	0.6230	1.2777	3.7090	1.24
Simple Curve 2	1037+42.119	1037+82.390	0.0076	0.036	0.0359	0.0121	0.0238	4.7042	1.36
Tangent	1037+82.390	1041+32.820	0.0664	0.312	0.3122	0.1052	0.2070	4.7042	1.36

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.91	0.96	32.871	1.95	67.129
Total	2.91	0.96	32.871	1.95	67.129
Average	2.91	0.96	32.871	1.95	67.129

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0004	0.0013	0.0069	0.0199	0.0571
2	0.0004	0.0012	0.0068	0.0196	0.0567
3	0.0004	0.0012	0.0066	0.0192	0.0559
4	0.0008	0.0024	0.0130	0.0378	0.1111
5	0.0004	0.0012	0.0064	0.0186	0.0552
6	0.0004	0.0012	0.0063	0.0182	0.0545
7	0.0004	0.0011	0.0062	0.0180	0.0543
8	0.0048	0.0147	0.0800	0.2319	0.7040
9	0.0060	0.0181	0.0986	0.2861	0.8045
Total	0.0140	0.0424	0.2307	0.6693	1.9532

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.01	0.4	0.01	0.4
Highway Segment	Collision with Fixed Object	0.26	8.8	0.36	12.5	0.62	21.3
Highway Segment	Collision with Other Object	0.02	0.6	0.07	2.4	0.09	3.0
Highway Segment	Other Single-vehicle Collision	0.07	2.5	0.05	1.9	0.13	4.4
Highway Segment	Collision with Parked Vehicle	0.01	0.2	0.01	0.3	0.01	0.5
Highway Segment	Total Single Vehicle Crashes	0.35	12.2	0.51	17.5	0.86	29.7
Highway Segment	Right-Angle Collision	0.02	0.6	0.03	0.9	0.04	1.5
Highway Segment	Head-on Collision	0.01	0.2	0.00	0.1	0.01	0.3
Highway Segment	Other Multi-vehicle Collision	0.02	0.6	0.04	1.2	0.05	1.8
Highway Segment	Rear-end Collision	0.45	15.5	1.00	34.3	1.45	49.8
Highway Segment	Sideswipe, Same Direction Collision	0.11	3.7	0.38	13.2	0.49	16.9
Highway Segment	Total Multiple Vehicle Crashes	0.60	20.7	1.45	49.7	2.05	70.3
Highway Segment	Total Highway Segment Crashes	0.96	32.9	1.95	67.1	2.91	100.0
	Total Crashes	0.96	32.9	1.95	67.1	2.91	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

I-35 Build Alternative 2 Model Freeway Ramps

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

Report Generated: Aug 24, 2022 3:50 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:25:12 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBX2902
Highway Comment: Imported from RGPNBX2902.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:25:02 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1022+80.108

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1022+80.108
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

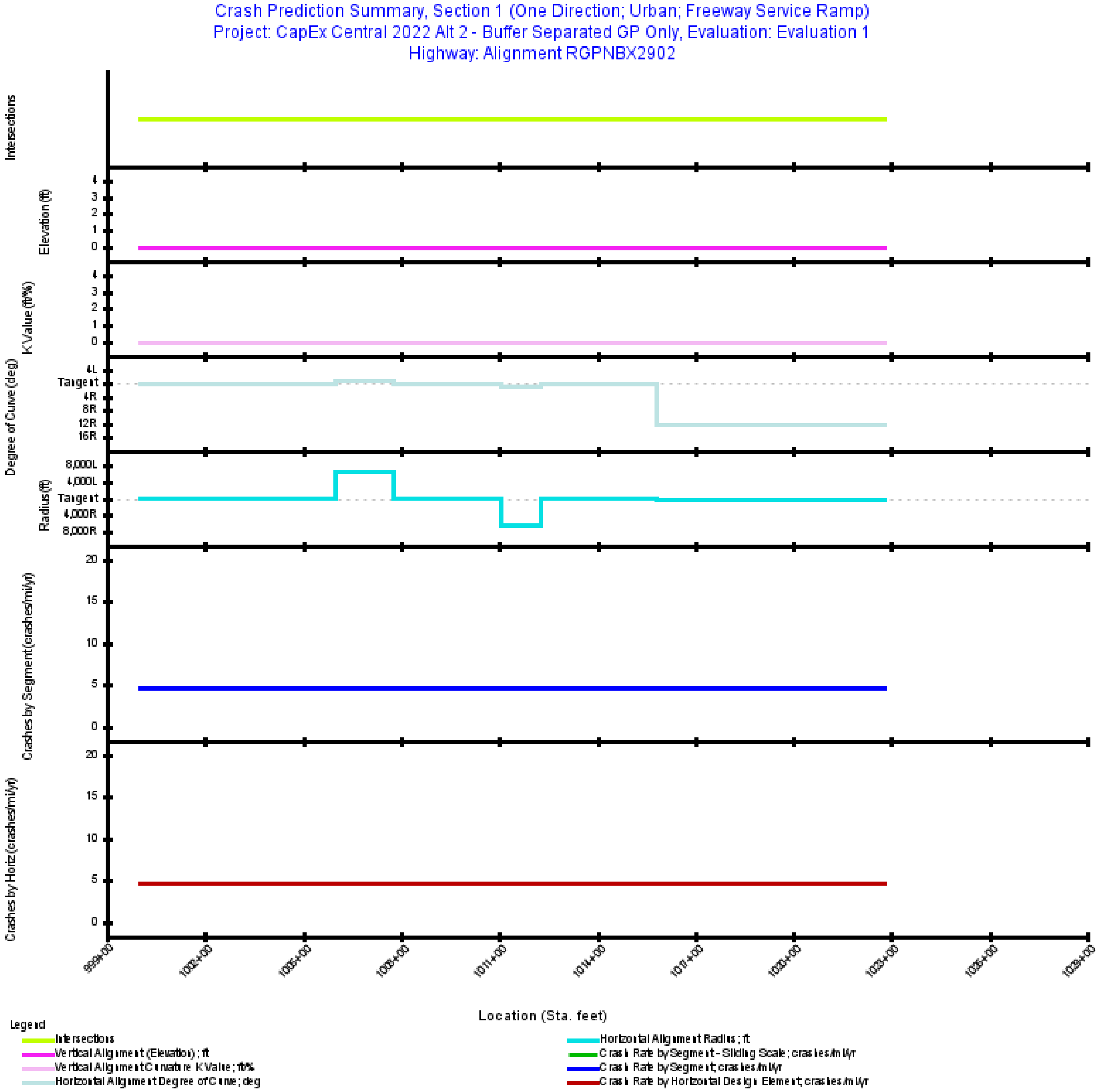

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1022+80.108	2,280.11	0.4318	2030: 7,050

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.4318**
Average Future Road AADT (vpd)	**7,050**
Predicted Crashes	
Total Crashes	**1.98**
Fatal and Injury Crashes	**0.90**
Property-Damage-Only Crashes	**1.08**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**45**
Percent Property-Damage-Only Crashes (%)	**55**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**4.5865**
FI Crash Rate (crashes/mi/yr)	**2.0856**
PDO Crash Rate (crashes/mi/yr)	**2.5009**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.11**
Travel Crash Rate (crashes/million veh-mi)	**1.78**
Travel FI Crash Rate (crashes/million veh-mi)	**0.81**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.97**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1022+80.108	0.4318	1.981	1.9806	0.9006	1.0800	4.5865	1.78
Total			0.4318	1.981	1.9806	0.9006	1.0800	4.5865	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1005+99.862	0.1136	0.521	0.5211	0.2369	0.2841	4.5865	1.78
Simple Curve 1	1005+99.862	1007+78.673	0.0339	0.155	0.1553	0.0706	0.0847	4.5865	1.78
Tangent	1007+78.673	1011+05.800	0.0620	0.284	0.2842	0.1292	0.1549	4.5865	1.78
Simple Curve 2	1011+05.800	1012+27.943	0.0231	0.106	0.1061	0.0482	0.0579	4.5865	1.78
Tangent	1012+27.943	1015+81.805	0.0670	0.307	0.3074	0.1398	0.1676	4.5865	1.78
Simple Curve 3	1015+81.805	1022+80.108	0.1323	0.607	0.6066	0.2758	0.3307	4.5865	1.78

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.98	0.90	45.473	1.08	54.527
Total	1.98	0.90	45.473	1.08	54.527
Average	1.98	0.90	45.473	1.08	54.527

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the

distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0222	0.0673	0.2922	0.5190	1.0800

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.02	1.1	0.03	1.3
Highway Segment	Collision with Fixed Object	0.63	31.9	0.72	36.5	1.35	68.4
Highway Segment	Collision with Other Object	0.04	2.3	0.14	7.1	0.18	9.3
Highway Segment	Other Single-vehicle Collision	0.18	9.2	0.11	5.5	0.29	14.6
Highway Segment	Collision with Parked Vehicle	0.01	0.7	0.02	0.8	0.03	1.5
Highway Segment	Total Single Vehicle Crashes	0.87	44.1	1.01	51.0	1.88	95.1
Highway Segment	Right-Angle Collision	0.00	0.0	0.00	0.1	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.0	0.00	0.1	0.00	0.1
Highway Segment	Rear-end Collision	0.02	1.0	0.05	2.4	0.07	3.4
Highway Segment	Sideswipe, Same Direction Collision	0.01	0.2	0.02	0.9	0.02	1.2
Highway Segment	Total Multiple Vehicle Crashes	0.03	1.3	0.07	3.5	0.10	4.9
Highway Segment	Total Highway Segment Crashes	0.90	45.5	1.08	54.5	1.98	100.0
	Total Crashes	0.90	45.5	1.08	54.5	1.98	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the

distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1022+80.108	Warning: for segment #1 (1000+00.000 to 1022+80.108), The ramp type for Ramp Alignment RGPNBX2902 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:23:10 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBNBARB2
Highway Comment: Imported from RGPNBNBARB2.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:23:00 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1006+26.320

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1006+26.320
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

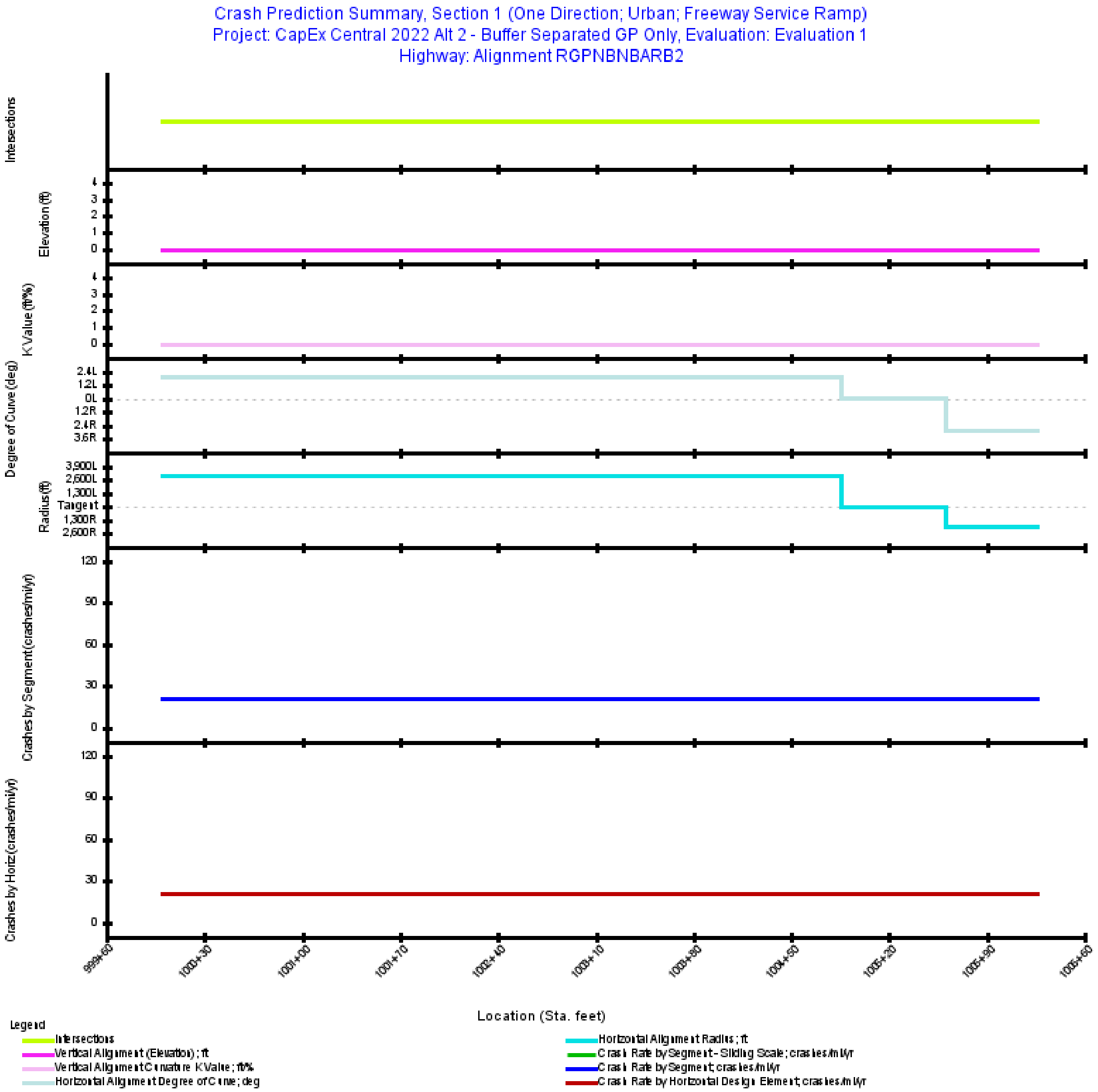

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1006+26.320	626.32	0.1186	2030: 44,400

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1186**
Average Future Road AADT (vpd)	**44,400**
Predicted Crashes	
Total Crashes	**2.49**
Fatal and Injury Crashes	**1.53**
Property-Damage-Only Crashes	**0.96**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**61**
Percent Property-Damage-Only Crashes (%)	**39**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**20.9607**
FI Crash Rate (crashes/mi/yr)	**12.8803**
PDO Crash Rate (crashes/mi/yr)	**8.0803**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.92**
Travel Crash Rate (crashes/million veh-mi)	**1.29**
Travel FI Crash Rate (crashes/million veh-mi)	**0.80**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.50**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1006+26.320	0.1186	2.486	2.4864	1.5279	0.9585	20.9607	1.29
Total			0.1186	2.486	2.4864	1.5279	0.9585	20.9607	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1004+85.799	0.0920	1.929	1.9285	1.1851	0.7435	20.9607	1.29
Tangent	1004+85.799	1005+60.736	0.0142	0.297	0.2975	0.1828	0.1147	20.9607	1.29
Simple Curve 2	1005+60.736	1006+26.320	0.0124	0.260	0.2604	0.1600	0.1004	20.9607	1.29

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.49	1.53	61.450	0.96	38.550
Total	2.49	1.53	61.450	0.96	38.550
Average	2.49	1.53	61.450	0.96	38.550

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0274	0.0830	0.5450	0.8726	0.9585

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.4	0.01	0.5
Highway Segment	Collision with Fixed Object	0.34	13.8	0.34	13.8	0.69	27.6
Highway Segment	Collision with Other Object	0.02	1.0	0.07	2.7	0.09	3.7
Highway Segment	Other Single-vehicle Collision	0.10	4.0	0.05	2.1	0.15	6.0
Highway Segment	Collision with Parked Vehicle	0.01	0.3	0.01	0.3	0.01	0.6
Highway Segment	Total Single Vehicle Crashes	0.47	19.1	0.48	19.3	0.95	38.3
Highway Segment	Right-Angle Collision	0.03	1.3	0.01	0.3	0.04	1.7
Highway Segment	Head-on Collision	0.01	0.3	0.00	0.0	0.01	0.4
Highway Segment	Other Multi-vehicle Collision	0.03	1.3	0.01	0.5	0.04	1.8
Highway Segment	Rear-end Collision	0.79	31.8	0.33	13.3	1.12	45.1
Highway Segment	Sideswipe, Same Direction Collision	0.19	7.6	0.13	5.1	0.32	12.8
Highway Segment	Total Multiple Vehicle Crashes	1.05	42.4	0.48	19.3	1.53	61.7
Highway Segment	Total Highway Segment Crashes	1.53	61.5	0.96	38.5	2.49	100.0
	Total Crashes	1.53	61.5	0.96	38.5	2.49	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1006+26.320	Warning: for segment #1 (1000+00.000 to 1006+26.320), The ramp type for Ramp Alignment RGPNBNBARB2 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1006+26.320	Warning: for segment #1 (1000+00.000 to 1006+26.320), traffic volume (44,400 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Notice

The use of the IHSDM software is being done strictly on a voluntary basis. In exchange for provision of IHSDM, the user agrees that the Federal Highway Administration (FHWA), U.S. Department of Transportation and any other agency of the Federal Government shall not be responsible for any errors, damage or other liability that may result from any and all use of the software, including installation and testing of the software. The user further agrees to hold the FHWA and the Federal Government harmless from any resulting liability. The user agrees that this hold harmless provision shall flow to any person to whom or any entity to which the user provides the IHSDM software. It is the user's full responsibility to inform any person to whom or any entity to which it provides the IHSDM software of this hold harmless provision.

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Report Overview

Report Generated: Aug 24, 2022 3:52 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:25:37 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBX412
Highway Comment: Imported from RGPNBX412.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:25:26 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1015+07.217

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1015+07.217
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

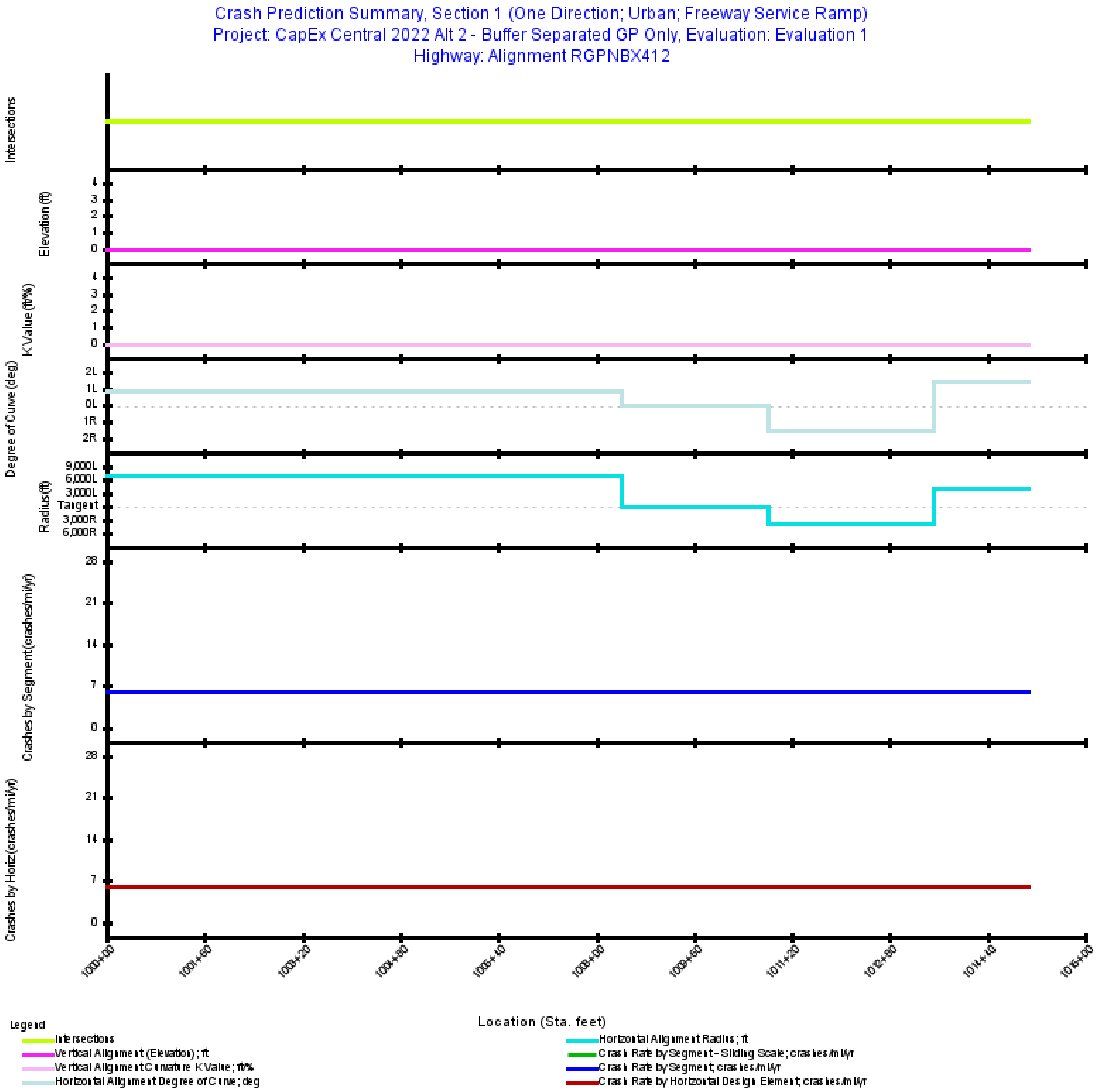

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1015+07.217	1,507.22	0.2855	2030: 18,500

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2855**
Average Future Road AADT (vpd)	**18,500**
Predicted Crashes	
Total Crashes	**1.74**
Fatal and Injury Crashes	**0.84**
Property-Damage-Only Crashes	**0.89**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**49**
Percent Property-Damage-Only Crashes (%)	**51**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**6.0803**
FI Crash Rate (crashes/mi/yr)	**2.9492**
PDO Crash Rate (crashes/mi/yr)	**3.1311**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.93**
Travel Crash Rate (crashes/million veh-mi)	**0.90**
Travel FI Crash Rate (crashes/million veh-mi)	**0.44**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.46**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1015+07.217	0.2855	1.736	1.7357	0.8419	0.8938	6.0803	0.90
Total			0.2855	1.736	1.7357	0.8419	0.8938	6.0803	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1008+41.945	0.1595	0.970	0.9696	0.4703	0.4993	6.0803	0.90
Tangent	1008+41.945	1010+81.629	0.0454	0.276	0.2760	0.1339	0.1421	6.0803	0.90
Simple Curve 2	1010+81.629	1013+52.764	0.0514	0.312	0.3122	0.1514	0.1608	6.0803	0.90
Simple Curve 3	1013+52.764	1015+07.217	0.0293	0.178	0.1779	0.0863	0.0916	6.0803	0.90

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.74	0.84	48.504	0.89	51.496
Total	1.74	0.84	48.504	0.89	51.496
Average	1.74	0.84	48.504	0.89	51.496

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0214	0.0649	0.2803	0.4752	0.8938

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.02	1.0	0.02	1.1
Highway Segment	Collision with Fixed Object	0.57	32.6	0.54	31.2	1.11	63.8
Highway Segment	Collision with Other Object	0.04	2.3	0.10	6.1	0.14	8.4
Highway Segment	Other Single-vehicle Collision	0.16	9.4	0.08	4.7	0.24	14.1
Highway Segment	Collision with Parked Vehicle	0.01	0.7	0.01	0.7	0.02	1.4
Highway Segment	Total Single Vehicle Crashes	0.78	45.2	0.76	43.6	1.54	88.7
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.2	0.01	0.3
Highway Segment	Rear-end Collision	0.04	2.5	0.10	5.5	0.14	8.0
Highway Segment	Sideswipe, Same Direction Collision	0.01	0.6	0.04	2.1	0.05	2.7
Highway Segment	Total Multiple Vehicle Crashes	0.06	3.3	0.14	7.9	0.20	11.3
Highway Segment	Total Highway Segment Crashes	0.84	48.5	0.89	51.5	1.74	100.0
	Total Crashes	0.84	48.5	0.89	51.5	1.74	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1015+07.217	Warning: for segment #1 (1000+00.000 to 1015+07.217), The ramp type for Ramp Alignment RGPNBX412 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1015+07.217	Warning: for segment #1 (1000+00.000 to 1015+07.217), traffic volume (18,500 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

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Evaluation Date: Thu Jun 23 10:26:01 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBXHALF2
Highway Comment: Imported from RGPNBXHALF2.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:25:50 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1014+98.277

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1014+98.277
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

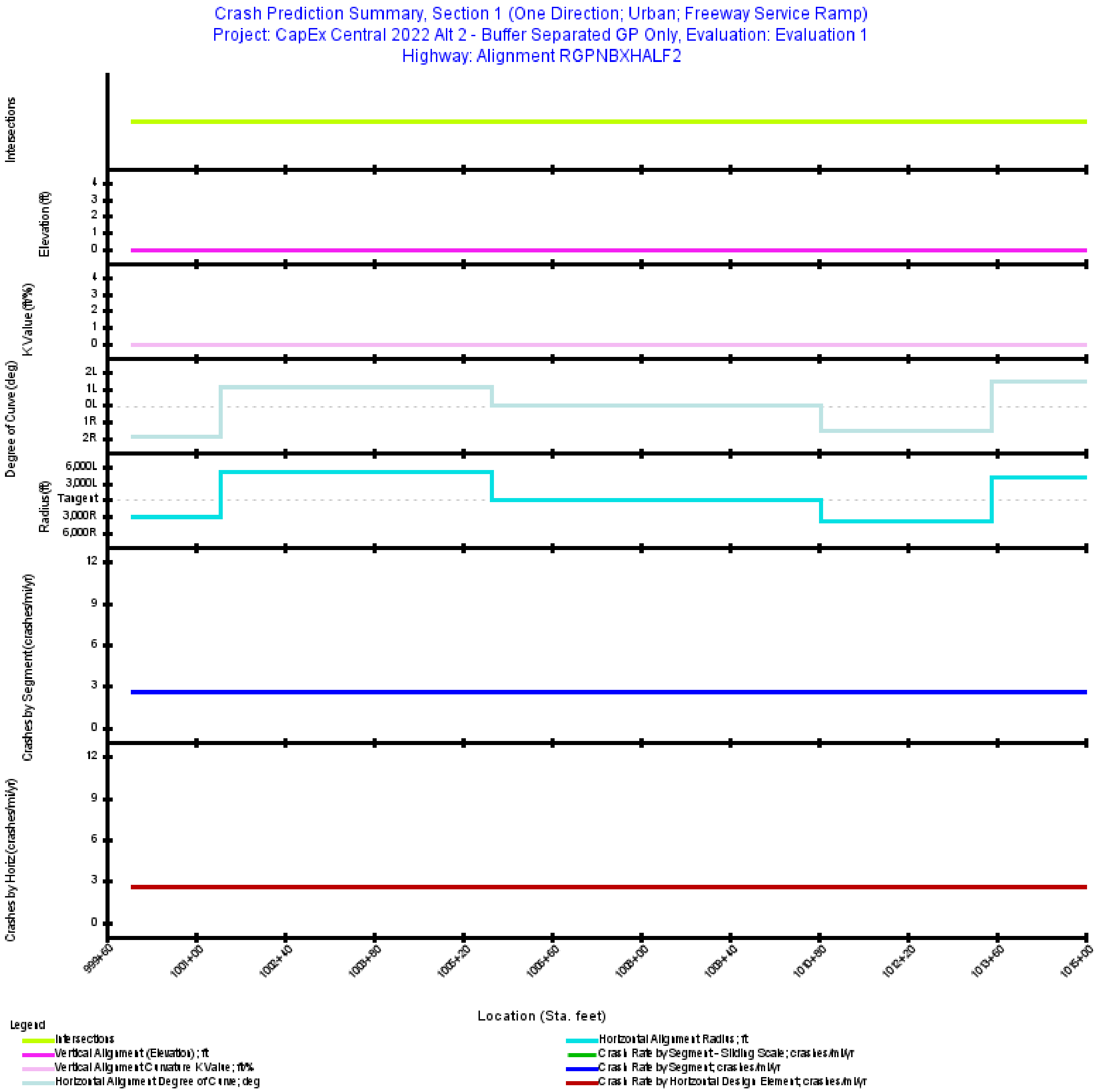

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1014+98.277	1,498.28	0.2838	2030: 5,800

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2838**
Average Future Road AADT (vpd)	**5,800**
Predicted Crashes	
Total Crashes	**0.73**
Fatal and Injury Crashes	**0.36**
Property-Damage-Only Crashes	**0.38**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**49**
Percent Property-Damage-Only Crashes (%)	**51**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**2.5904**
FI Crash Rate (crashes/mi/yr)	**1.2630**
PDO Crash Rate (crashes/mi/yr)	**1.3275**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.60**
Travel Crash Rate (crashes/million veh-mi)	**1.22**
Travel FI Crash Rate (crashes/million veh-mi)	**0.60**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.63**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1014+98.277	0.2838	0.735	0.7351	0.3584	0.3767	2.5904	1.22
Total			0.2838	0.735	0.7351	0.3584	0.3767	2.5904	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+38.102	0.0262	0.068	0.0678	0.0330	0.0347	2.5904	1.22
Simple Curve 2	1001+38.102	1005+66.600	0.0812	0.210	0.2102	0.1025	0.1077	2.5904	1.22
Tangent	1005+66.600	1010+84.313	0.0981	0.254	0.2540	0.1238	0.1302	2.5904	1.22
Simple Curve 3	1010+84.313	1013+51.329	0.0506	0.131	0.1310	0.0639	0.0671	2.5904	1.22
Simple Curve 4	1013+51.329	1014+98.277	0.0278	0.072	0.0721	0.0351	0.0369	2.5904	1.22

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.73	0.36	48.755	0.38	51.245
Total	0.73	0.36	48.755	0.38	51.245
Average	0.73	0.36	48.755	0.38	51.245

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0090	0.0274	0.1185	0.2034	0.3767

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.25	33.9	0.25	33.5	0.50	67.5
Highway Segment	Collision with Other Object	0.02	2.4	0.05	6.5	0.07	8.9
Highway Segment	Other Single-vehicle Collision	0.07	9.8	0.04	5.0	0.11	14.8
Highway Segment	Collision with Parked Vehicle	0.01	0.7	0.01	0.7	0.01	1.5
Highway Segment	Total Single Vehicle Crashes	0.34	47.0	0.34	46.8	0.69	93.8
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Rear-end Collision	0.01	1.3	0.02	3.0	0.03	4.4
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.3	0.01	1.2	0.01	1.5
Highway Segment	Total Multiple Vehicle Crashes	0.01	1.8	0.03	4.4	0.04	6.2
Highway Segment	Total Highway Segment Crashes	0.36	48.8	0.38	51.2	0.73	100.0
	Total Crashes	0.36	48.8	0.38	51.2	0.73	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1014+98.277	Warning: for segment #1 (1000+00.000 to 1014+98.277), The ramp type for Ramp Alignment RGPNBXHALF2 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Under no circumstances will the FHWA be liable to the end-user for any damages or claimed lost profits, lost savings, or other incidental or consequential damages rising out of the use or inability to use the software (even if these organizations have been advised of the possibility of such damages), or for any claim by any other party.

Notice

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Report Overview

Report Generated: Aug 24, 2022 3:53 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:23:34 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBNMLKBYP2
Highway Comment: Imported from RGPNBNMLKBYP2.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:23:24 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1013+96.045

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1013+96.045
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

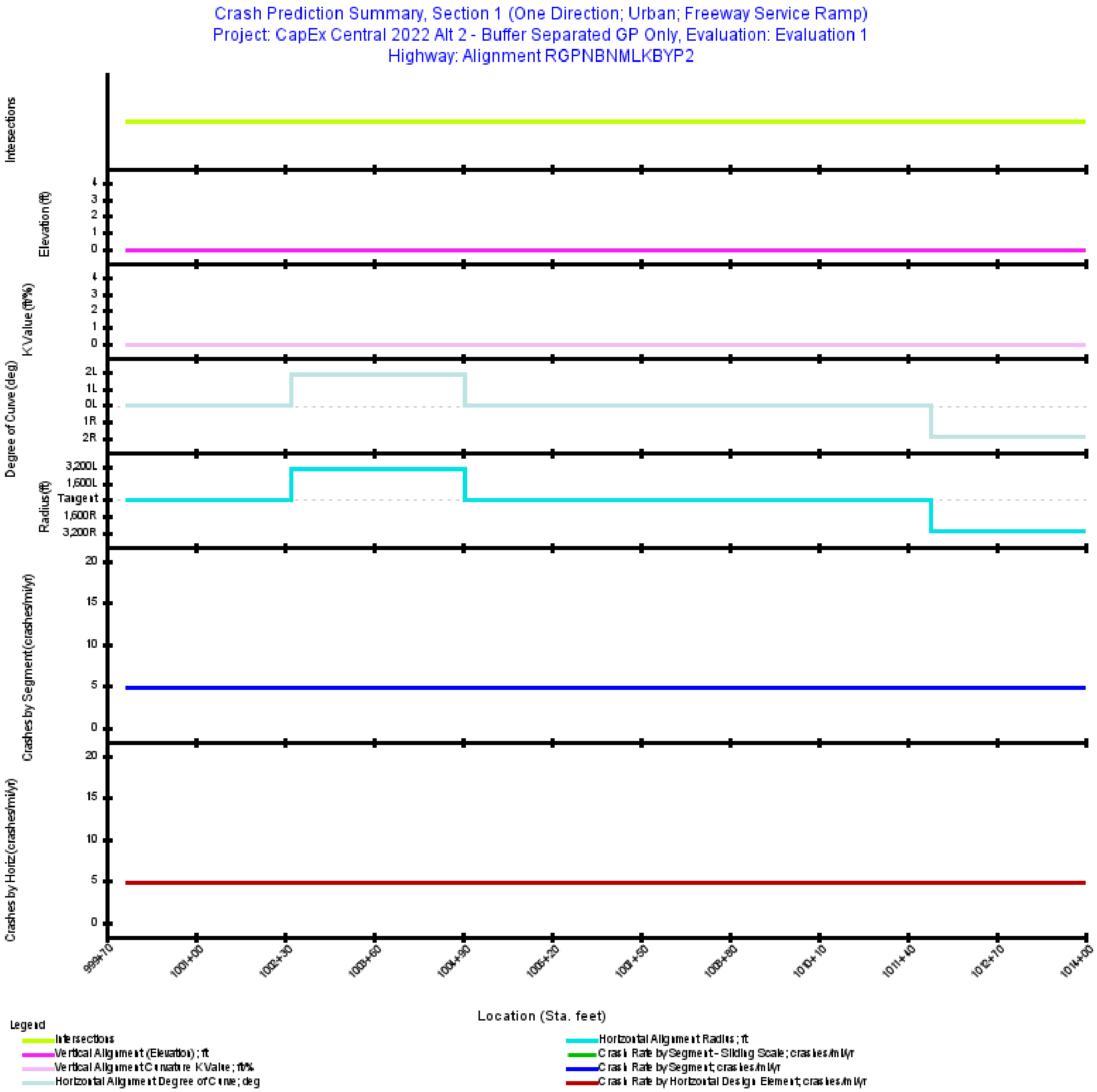

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane Ramp Entrance	Urban	1000+00.000	1013+96.045	1,396.05	0.2644	2030: 8,350

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2644**
Average Future Road AADT (vpd)	**8,350**
Predicted Crashes	
Total Crashes	**1.28**
Fatal and Injury Crashes	**0.49**
Property-Damage-Only Crashes	**0.79**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**38**
Percent Property-Damage-Only Crashes (%)	**62**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**4.8252**
FI Crash Rate (crashes/mi/yr)	**1.8541**
PDO Crash Rate (crashes/mi/yr)	**2.9712**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.81**
Travel Crash Rate (crashes/million veh-mi)	**1.58**
Travel FI Crash Rate (crashes/million veh-mi)	**0.61**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.97**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1013+96.045	0.2644	1.276	1.2758	0.4902	0.7856	4.8252	1.58
Total			0.2644	1.276	1.2758	0.4902	0.7856	4.8252	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1002+38.960	0.0453	0.218	0.2184	0.0839	0.1345	4.8252	1.58
Simple Curve 1	1002+38.960	1004+93.194	0.0482	0.232	0.2323	0.0893	0.1431	4.8252	1.58
Tangent	1004+93.194	1011+73.776	0.1289	0.622	0.6220	0.2390	0.3830	4.8252	1.58
Simple Curve 2	1011+73.776	1013+96.045	0.0421	0.203	0.2031	0.0781	0.1251	4.8252	1.58

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.28	0.49	38.425	0.79	61.575
Total	1.28	0.49	38.425	0.79	61.575
Average	1.28	0.49	38.425	0.79	61.575

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0076	0.0229	0.1239	0.3358	0.7856

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.8	0.01	0.9
Highway Segment	Collision with Fixed Object	0.25	19.5	0.34	26.3	0.58	45.9
Highway Segment	Collision with Other Object	0.02	1.4	0.07	5.1	0.08	6.5
Highway Segment	Other Single-vehicle Collision	0.07	5.6	0.05	3.9	0.12	9.6
Highway Segment	Collision with Parked Vehicle	0.01	0.4	0.01	0.6	0.01	1.0
Highway Segment	Total Single Vehicle Crashes	0.34	27.0	0.47	36.8	0.81	63.8
Highway Segment	Right-Angle Collision	0.01	0.4	0.01	0.4	0.01	0.8
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.1	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.01	0.4	0.01	0.6	0.01	0.9
Highway Segment	Rear-end Collision	0.11	8.6	0.22	17.1	0.33	25.7
Highway Segment	Sideswipe, Same Direction Collision	0.03	2.1	0.08	6.6	0.11	8.6
Highway Segment	Total Multiple Vehicle Crashes	0.15	11.4	0.32	24.8	0.46	36.2
Highway Segment	Total Highway Segment Crashes	0.49	38.4	0.79	61.6	1.28	100.0
	Total Crashes	0.49	38.4	0.79	61.6	1.28	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1013+96.045	Warning: for segment #1 (1000+00.000 to 1013+96.045), The ramp type for Ramp Alignment RGPNBNMLKBYP2 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

Report Generated: Aug 24, 2022 3:54 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:26:49 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBXMAN2
Highway Comment: Imported from RGPNBXMAN2.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:26:39 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1011+94.067

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1011+94.067
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

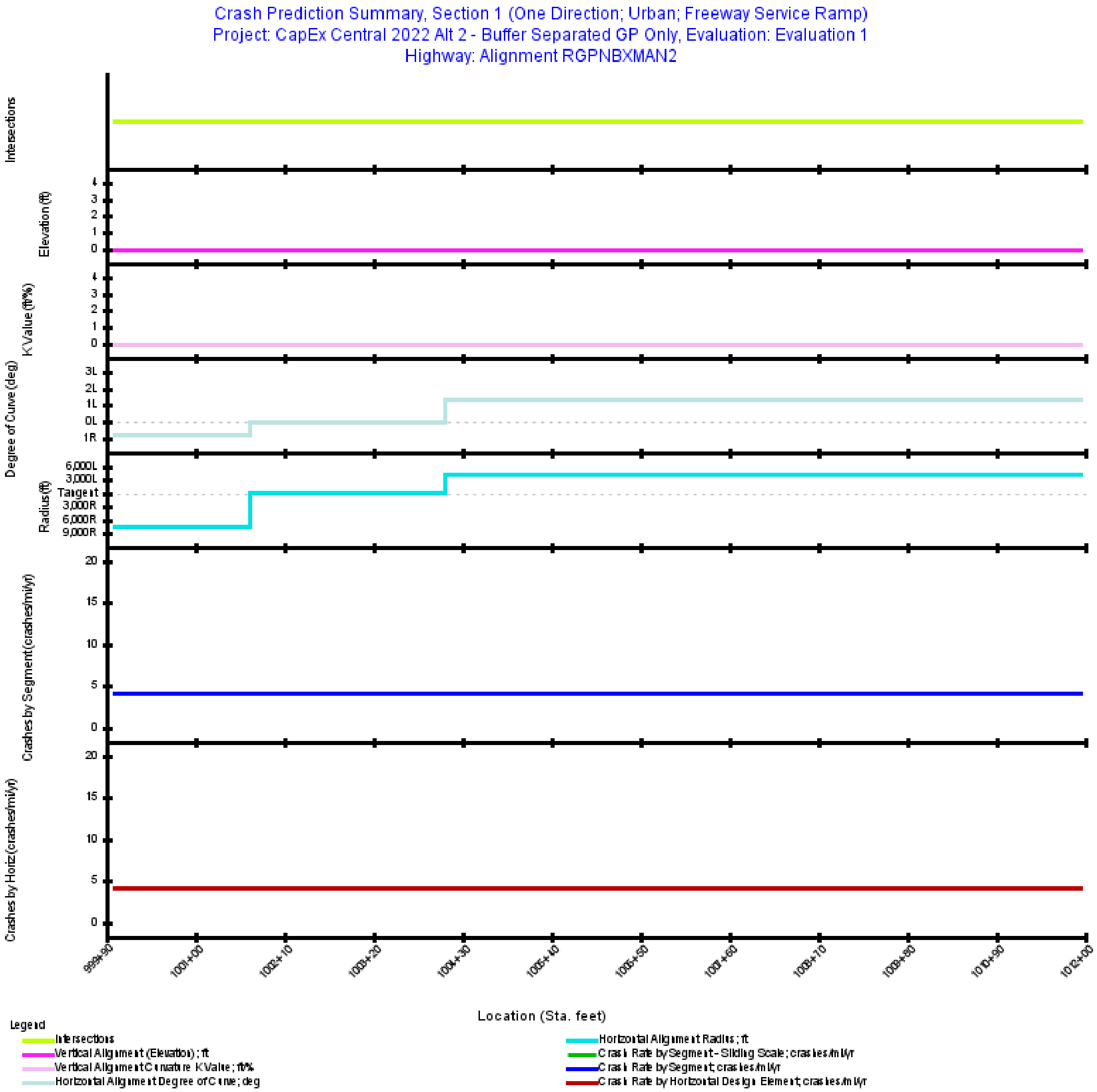

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1011+94.067	1,194.07	0.2261	2030: 10,450

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2261**
Average Future Road AADT (vpd)	**10,450**
Predicted Crashes	
Total Crashes	**0.93**
Fatal and Injury Crashes	**0.45**
Property-Damage-Only Crashes	**0.48**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**49**
Percent Property-Damage-Only Crashes (%)	**51**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**4.1149**
FI Crash Rate (crashes/mi/yr)	**2.0003**
PDO Crash Rate (crashes/mi/yr)	**2.1146**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.86**
Travel Crash Rate (crashes/million veh-mi)	**1.08**
Travel FI Crash Rate (crashes/million veh-mi)	**0.52**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.55**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1011+94.067	0.2261	0.931	0.9306	0.4524	0.4782	4.1149	1.08
Total			0.2261	0.931	0.9306	0.4524	0.4782	4.1149	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+66.930	0.0316	0.130	0.1301	0.0632	0.0669	4.1149	1.08
Tangent	1001+66.930	1004+07.765	0.0456	0.188	0.1877	0.0912	0.0965	4.1149	1.08
Simple Curve 2	1004+07.765	1011+94.067	0.1489	0.613	0.6128	0.2979	0.3149	4.1149	1.08

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.93	0.45	48.611	0.48	51.389
Total	0.93	0.45	48.611	0.48	51.389
Average	0.93	0.45	48.611	0.48	51.389

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0112	0.0340	0.1476	0.2595	0.4782

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.31	33.5	0.30	32.5	0.61	66.0
Highway Segment	Collision with Other Object	0.02	2.4	0.06	6.3	0.08	8.7
Highway Segment	Other Single-vehicle Collision	0.09	9.7	0.04	4.9	0.14	14.5
Highway Segment	Collision with Parked Vehicle	0.01	0.7	0.01	0.7	0.01	1.4
Highway Segment	Total Single Vehicle Crashes	0.43	46.4	0.42	45.4	0.85	91.9
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Rear-end Collision	0.01	1.6	0.04	4.1	0.05	5.7
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.4	0.01	1.6	0.02	2.0
Highway Segment	Total Multiple Vehicle Crashes	0.02	2.2	0.06	6.0	0.08	8.1
Highway Segment	Total Highway Segment Crashes	0.45	48.6	0.48	51.4	0.93	100.0
	Total Crashes	0.45	48.6	0.48	51.4	0.93	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1011+94.067	Warning: for segment #1 (1000+00.000 to 1011+94.067), The ramp type for Ramp Alignment RGPNBXMAN2 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Under no circumstances will the FHWA be liable to the end-user for any damages or claimed lost profits, lost savings, or other incidental or consequential damages rising out of the use or inability to use the software (even if these organizations have been advised of the possibility of such damages), or for any claim by any other party.

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The use of the IHSDM software is being done strictly on a voluntary basis. In exchange for provision of IHSDM, the user agrees that the Federal Highway Administration (FHWA), U.S. Department of Transportation and any other agency of the Federal Government shall not be responsible for any errors, damage or other liability that may result from any and all use of the software, including installation and testing of the software. The user further agrees to hold the FHWA and the Federal Government harmless from any resulting liability. The user agrees that this hold harmless provision shall flow to any person to whom or any entity to which the user provides the IHSDM software. It is the user's full responsibility to inform any person to whom or any entity to which it provides the IHSDM software of this hold harmless provision.

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Report Overview

Report Generated: Aug 24, 2022 3:54 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:27:13 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBXMLKBYP2
Highway Comment: Imported from RGPNBXMLKBYP2.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:27:03 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1008+79.542

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1008+79.542
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

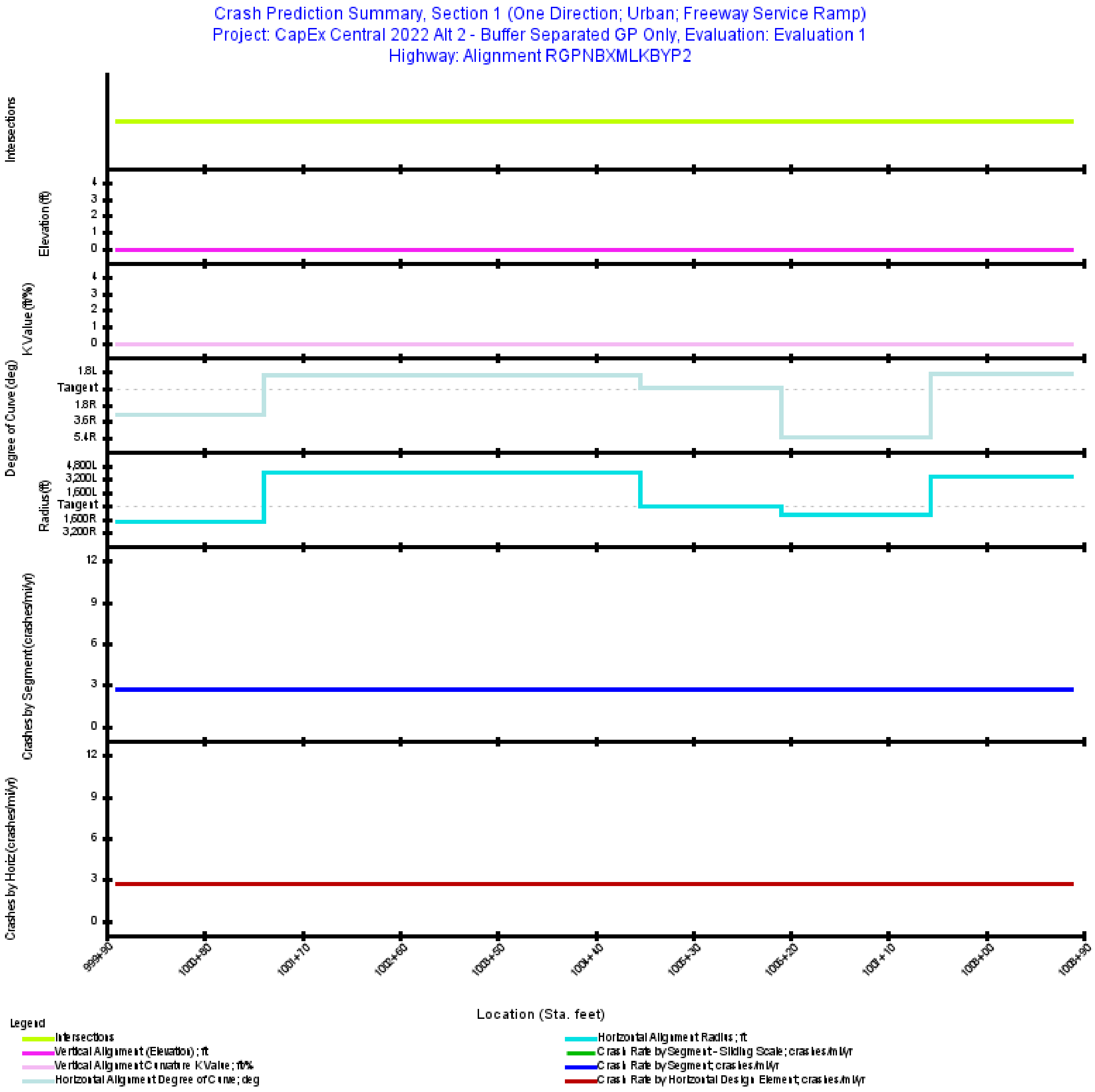

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1008+79.542	879.54	0.1666	2030: 5,600

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1666**
Average Future Road AADT (vpd)	**5,600**
Predicted Crashes	
Total Crashes	**0.44**
Fatal and Injury Crashes	**0.21**
Property-Damage-Only Crashes	**0.23**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**2.6640**
FI Crash Rate (crashes/mi/yr)	**1.2888**
PDO Crash Rate (crashes/mi/yr)	**1.3753**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.34**
Travel Crash Rate (crashes/million veh-mi)	**1.30**
Travel FI Crash Rate (crashes/million veh-mi)	**0.63**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.67**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1008+79.542	0.1666	0.444	0.4438	0.2147	0.2291	2.6640	1.30
Total			0.1666	0.444	0.4438	0.2147	0.2291	2.6640	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+34.880	0.0255	0.068	0.0681	0.0329	0.0351	2.6640	1.30
Simple Curve 2	1001+34.880	1004+81.617	0.0657	0.175	0.1749	0.0846	0.0903	2.6640	1.30
Tangent	1004+81.617	1006+10.785	0.0245	0.065	0.0652	0.0315	0.0336	2.6640	1.30
Simple Curve 3	1006+10.785	1007+49.386	0.0263	0.070	0.0699	0.0338	0.0361	2.6640	1.30
Simple Curve 4	1007+49.386	1008+79.542	0.0247	0.066	0.0657	0.0318	0.0339	2.6640	1.30

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.44	0.21	48.376	0.23	51.624
Total	0.44	0.21	48.376	0.23	51.624
Average	0.44	0.21	48.376	0.23	51.624

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0055	0.0166	0.0716	0.1211	0.2291

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.15	33.7	0.15	34.0	0.30	67.7
Highway Segment	Collision with Other Object	0.01	2.4	0.03	6.6	0.04	9.0
Highway Segment	Other Single-vehicle Collision	0.04	9.7	0.02	5.1	0.07	14.8
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.8	0.01	1.5
Highway Segment	Total Single Vehicle Crashes	0.21	46.7	0.21	47.5	0.42	94.2
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Rear-end Collision	0.01	1.3	0.01	2.8	0.02	4.1
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.3	0.01	1.1	0.01	1.4
Highway Segment	Total Multiple Vehicle Crashes	0.01	1.7	0.02	4.1	0.03	5.8
Highway Segment	Total Highway Segment Crashes	0.21	48.4	0.23	51.6	0.44	100.0
	Total Crashes	0.21	48.4	0.23	51.6	0.44	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1008+79.542	Warning: for segment #1 (1000+00.000 to 1008+79.542), The ramp type for Ramp Alignment RGPNBXMLKBYP2 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:22:46 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBN82
Highway Comment: Imported from RGPNBN82.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:22:36 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1011+85.650

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1011+85.650
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

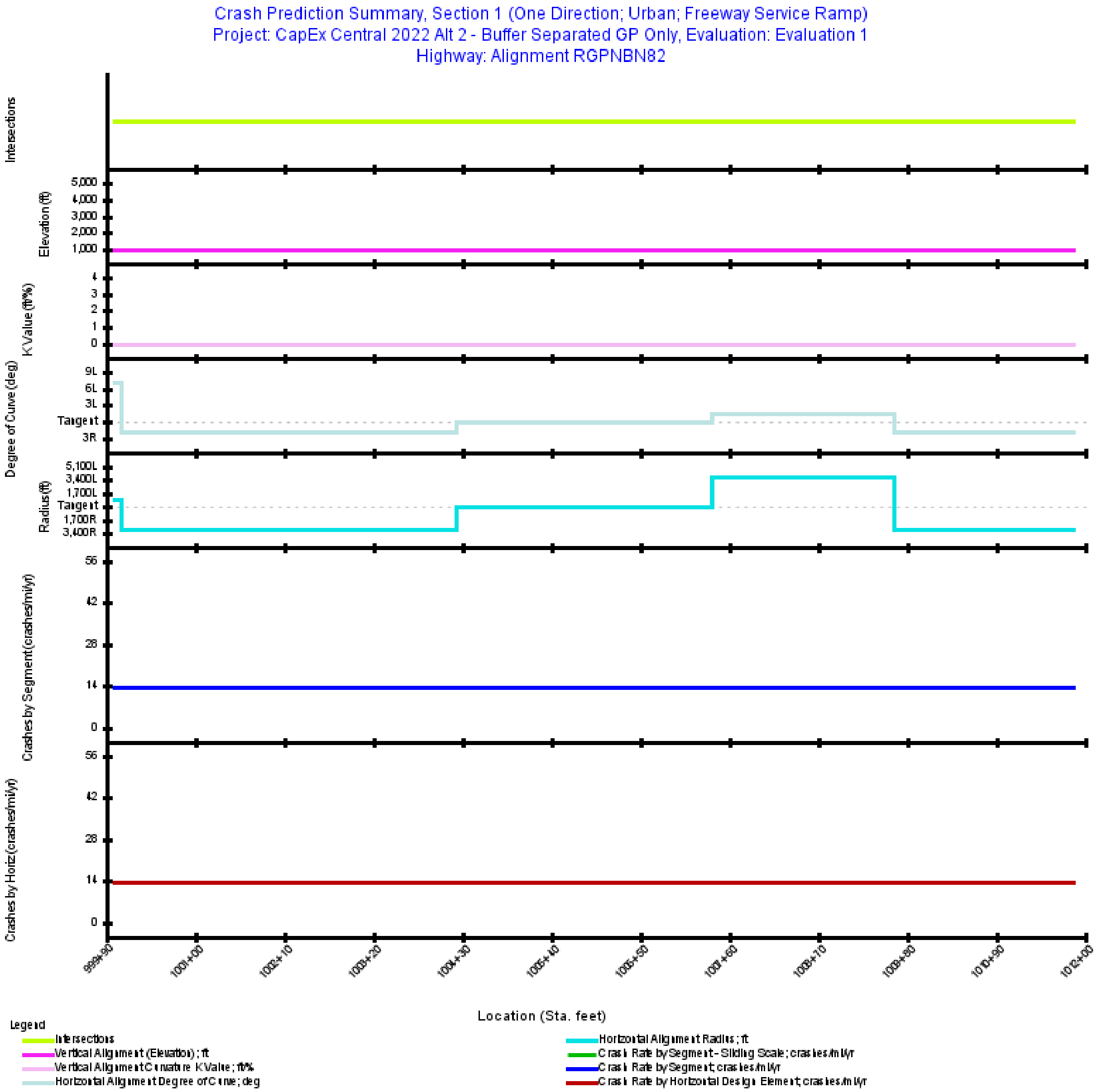

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1011+85.650	1,185.65	0.2246	2030: 33,600

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2246**
Average Future Road AADT (vpd)	**33,600**
Predicted Crashes	
Total Crashes	**3.08**
Fatal and Injury Crashes	**1.59**
Property-Damage-Only Crashes	**1.49**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**52**
Percent Property-Damage-Only Crashes (%)	**48**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**13.7159**
FI Crash Rate (crashes/mi/yr)	**7.0762**
PDO Crash Rate (crashes/mi/yr)	**6.6397**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.75**
Travel Crash Rate (crashes/million veh-mi)	**1.12**
Travel FI Crash Rate (crashes/million veh-mi)	**0.58**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.54**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1011+85.650	0.2246	3.080	3.0800	1.5890	1.4910	13.7159	1.12
Total			0.2246	3.080	3.0800	1.5890	1.4910	13.7159	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1000+09.008	0.0017	0.023	0.0234	0.0121	0.0113	13.7159	1.12
Simple Curve 2	1000+09.008	1004+22.653	0.0783	1.075	1.0745	0.5544	0.5202	13.7159	1.12
Tangent	1004+22.653	1007+37.536	0.0596	0.818	0.8180	0.4220	0.3960	13.7159	1.12
Simple Curve 3	1007+37.536	1009+64.242	0.0429	0.589	0.5889	0.3038	0.2851	13.7159	1.12
Simple Curve 4	1009+64.242	1011+85.650	0.0419	0.575	0.5752	0.2967	0.2784	13.7159	1.12

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	3.08	1.59	51.591	1.49	48.409
Total	3.08	1.59	51.591	1.49	48.409
Average	3.08	1.59	51.591	1.49	48.409

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0262	0.0796	0.5298	0.9534	1.4910

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.02	0.6	0.02	0.7
Highway Segment	Collision with Fixed Object	0.54	17.6	0.57	18.6	1.12	36.2
Highway Segment	Collision with Other Object	0.04	1.2	0.11	3.6	0.15	4.9
Highway Segment	Other Single-vehicle Collision	0.16	5.1	0.09	2.8	0.24	7.9
Highway Segment	Collision with Parked Vehicle	0.01	0.4	0.01	0.4	0.02	0.8
Highway Segment	Total Single Vehicle Crashes	0.75	24.4	0.80	26.0	1.55	50.4
Highway Segment	Right-Angle Collision	0.03	0.8	0.01	0.4	0.04	1.2
Highway Segment	Head-on Collision	0.01	0.2	0.00	0.0	0.01	0.3
Highway Segment	Other Multi-vehicle Collision	0.03	0.8	0.02	0.5	0.04	1.4
Highway Segment	Rear-end Collision	0.63	20.4	0.48	15.5	1.10	35.8
Highway Segment	Sideswipe, Same Direction Collision	0.15	4.9	0.18	6.0	0.33	10.9
Highway Segment	Total Multiple Vehicle Crashes	0.84	27.2	0.69	22.4	1.53	49.6
Highway Segment	Total Highway Segment Crashes	1.59	51.6	1.49	48.4	3.08	100.0
	Total Crashes	1.59	51.6	1.49	48.4	3.08	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1011+85.650	Warning: for segment #1 (1000+00.000 to 1011+85.650), The ramp type for Ramp Alignment RGPNBN82 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1011+85.650	Warning: for segment #1 (1000+00.000 to 1011+85.650), traffic volume (33,600 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN

Interactive Highway Safety Design Model

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Report Overview

Report Generated: Aug 24, 2022 3:55 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:24:48 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBX152
Highway Comment: Imported from RGPNBX152.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:24:37 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1028+85.965

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1028+85.965
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

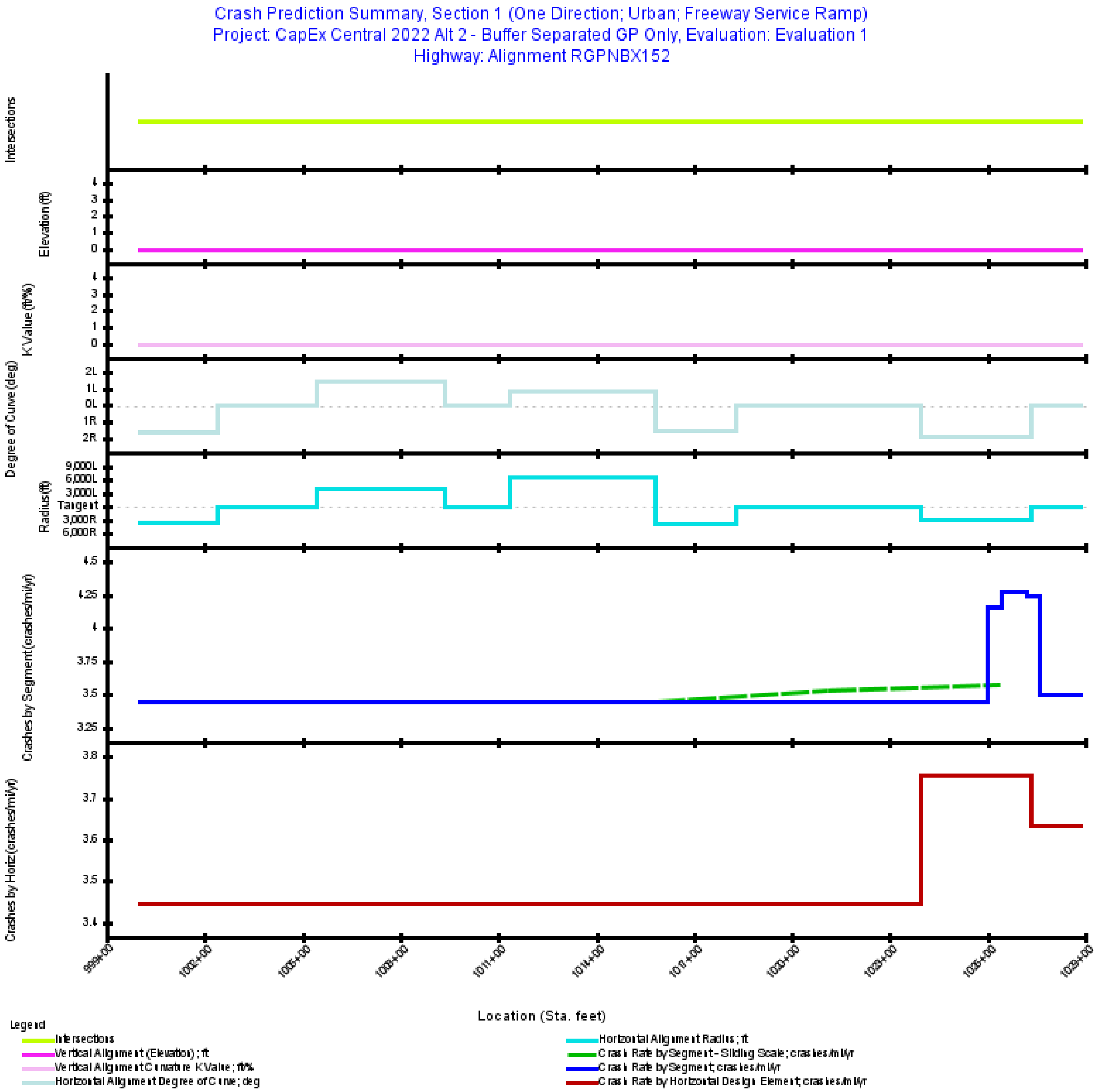

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1026+00.500	2,600.50	0.4925	2030: 7,700
2	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1026+00.500	1026+41.000	40.50	0.0077	2030: 7,700
3	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1026+41.000	1027+21.000	80.00	0.0152	2030: 7,700
4	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1027+21.000	1027+61.000	40.00	0.0076	2030: 7,700
5	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1027+61.000	1028+85.965	124.96	0.0237	2030: 7,700

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.5466**
Average Future Road AADT (vpd)	**7,700**
Predicted Crashes	
Total Crashes	**1.91**
Fatal and Injury Crashes	**0.90**
Property-Damage-Only Crashes	**1.01**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**47**
Percent Property-Damage-Only Crashes (%)	**53**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**3.4926**
FI Crash Rate (crashes/mi/yr)	**1.6527**
PDO Crash Rate (crashes/mi/yr)	**1.8399**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.54**
Travel Crash Rate (crashes/million veh-mi)	**1.24**
Travel FI Crash Rate (crashes/million veh-mi)	**0.59**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.66**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1026+00.500	0.4925	1.698	1.6975	0.8287	0.8688	3.4466	1.23
2	1026+00.500	1026+41.000	0.0077	0.032	0.0319	0.0109	0.0210	4.1576	1.48
3	1026+41.000	1027+21.000	0.0152	0.065	0.0647	0.0223	0.0424	4.2699	1.52
4	1027+21.000	1027+61.000	0.0076	0.032	0.0322	0.0113	0.0209	4.2450	1.51
5	1027+61.000	1028+85.965	0.0237	0.083	0.0827	0.0302	0.0526	3.4953	1.24
Total			0.5466	1.909	1.9090	0.9034	1.0057	3.4926	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1002+41.854	0.0458	0.158	0.1579	0.0771	0.0808	3.4466	1.23
Tangent	1002+41.854	1005+41.984	0.0568	0.196	0.1959	0.0956	0.1003	3.4466	1.23
Simple Curve 2	1005+41.984	1009+36.122	0.0746	0.257	0.2573	0.1256	0.1317	3.4466	1.23
Tangent	1009+36.122	1011+37.067	0.0381	0.131	0.1312	0.0640	0.0671	3.4466	1.23
Simple Curve 3	1011+37.067	1015+83.132	0.0845	0.291	0.2912	0.1422	0.1490	3.4466	1.23
Simple Curve 4	1015+83.132	1018+28.317	0.0464	0.160	0.1601	0.0781	0.0819	3.4466	1.23
Tangent	1018+28.317	1023+95.864	0.1075	0.370	0.3705	0.1809	0.1896	3.4466	1.23
Simple Curve 5	1023+95.864	1027+32.921	0.0638	0.240	0.2398	0.1017	0.1380	3.7557	1.34
Tangent	1027+32.921	1028+85.965	0.0290	0.105	0.1053	0.0381	0.0672	3.6328	1.29

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.91	0.90	47.321	1.01	52.679
Total	1.91	0.90	47.321	1.01	52.679
Average	1.91	0.90	47.321	1.01	52.679

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0199	0.0604	0.2635	0.4849	0.8688
2	0.0002	0.0007	0.0025	0.0074	0.0210
3	0.0005	0.0015	0.0052	0.0151	0.0424
4	0.0002	0.0007	0.0026	0.0077	0.0209
5	0.0008	0.0023	0.0079	0.0192	0.0526
Total	0.0216	0.0656	0.2818	0.5343	1.0057

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.02	1.0	0.02	1.2
Highway Segment	Collision with Fixed Object	0.62	32.8	0.64	33.7	1.27	66.4
Highway Segment	Collision with Other Object	0.04	2.3	0.12	6.5	0.17	8.8
Highway Segment	Other Single-vehicle Collision	0.18	9.4	0.10	5.0	0.28	14.5
Highway Segment	Collision with Parked Vehicle	0.01	0.7	0.01	0.8	0.03	1.4
Highway Segment	Total Single Vehicle Crashes	0.87	45.4	0.90	47.0	1.76	92.4
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Rear-end Collision	0.03	1.5	0.07	3.9	0.10	5.4
Highway Segment	Sideswipe, Same Direction Collision	0.01	0.4	0.03	1.5	0.04	1.9
Highway Segment	Total Multiple Vehicle Crashes	0.04	2.0	0.11	5.7	0.14	7.6
Highway Segment	Total Highway Segment Crashes	0.90	47.3	1.01	52.7	1.91	100.0
	Total Crashes	0.90	47.3	1.01	52.7	1.91	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1026+00.500	Warning: for segment #1 (1000+00.000 to 1026+00.500), The ramp type for Ramp Alignment RGPNBX152 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1026+00.500	1026+41.000	Warning: for segment #2 (1026+00.500 to 1026+41.000), The ramp type for Ramp Alignment RGPNBX152 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1026+41.000	1027+21.000	Warning: for segment #3 (1026+41.000 to 1027+21.000), The ramp type for Ramp Alignment RGPNBX152 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1027+21.000	1027+61.000	Warning: for segment #4 (1027+21.000 to 1027+61.000), The ramp type for Ramp Alignment RGPNBX152 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1027+61.000	1028+85.965	Warning: for segment #5 (1027+61.000 to 1028+85.965), The ramp type for Ramp Alignment RGPNBX152 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Evaluation Date: Thu Jun 23 10:23:58 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBNNASH2
Highway Comment: Imported from RGPNBNNASH2.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:23:48 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1005+97.108

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1005+97.108
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

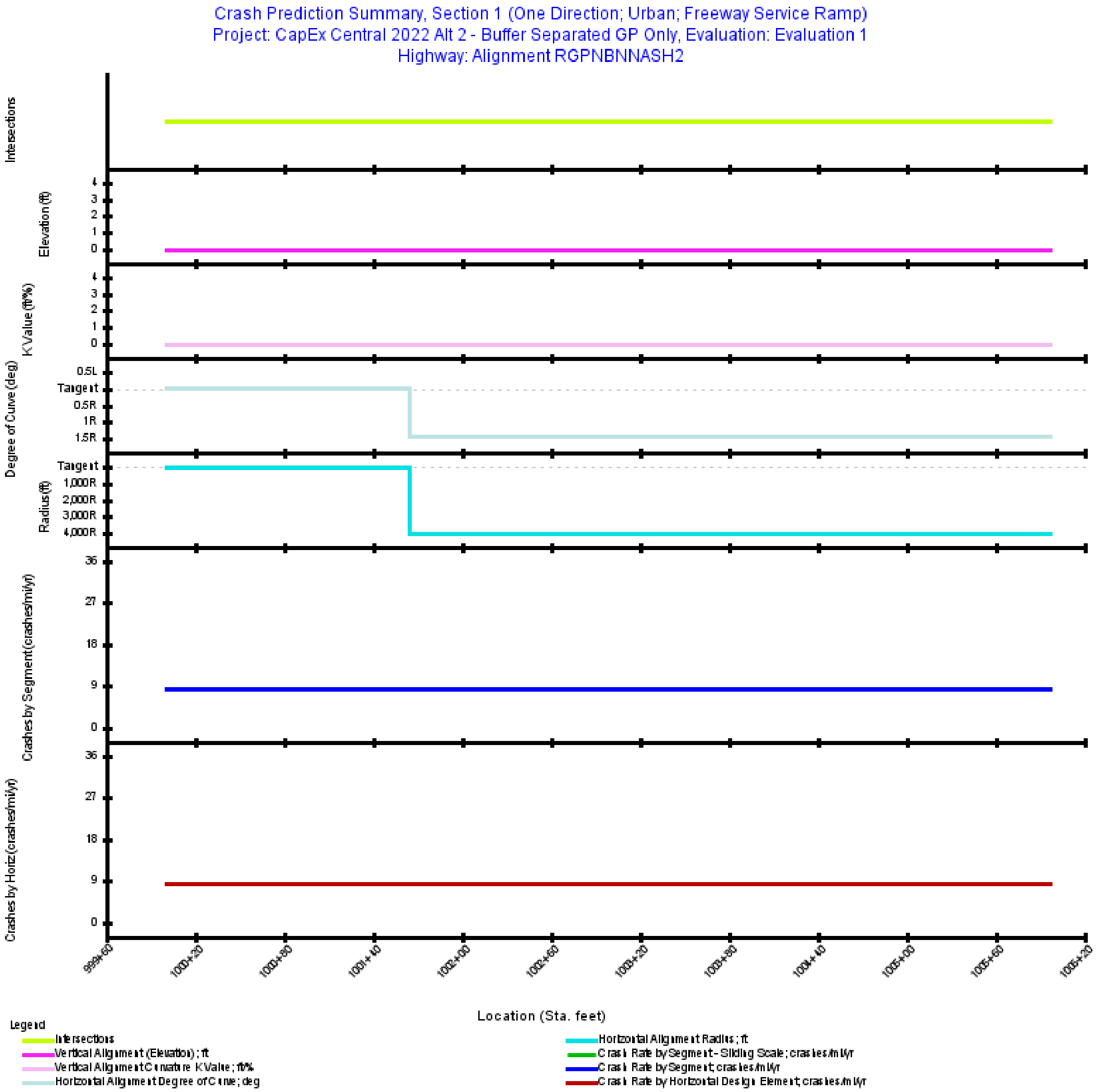

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1005+97.108	597.11	0.1131	2030: 25,500

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1131**
Average Future Road AADT (vpd)	**25,500**
Predicted Crashes	
Total Crashes	**0.93**
Fatal and Injury Crashes	**0.44**
Property-Damage-Only Crashes	**0.49**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**47**
Percent Property-Damage-Only Crashes (%)	**53**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**8.2504**
FI Crash Rate (crashes/mi/yr)	**3.8736**
PDO Crash Rate (crashes/mi/yr)	**4.3768**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.05**
Travel Crash Rate (crashes/million veh-mi)	**0.89**
Travel FI Crash Rate (crashes/million veh-mi)	**0.42**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.47**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1005+97.108	0.1131	0.933	0.9330	0.4381	0.4950	8.2504	0.89
Total			0.1131	0.933	0.9330	0.4381	0.4950	8.2504	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1001+64.253	0.0311	0.257	0.2567	0.1205	0.1362	8.2504	0.89
Simple Curve 1	1001+64.253	1005+97.108	0.0820	0.676	0.6764	0.3176	0.3588	8.2504	0.89

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.93	0.44	46.951	0.49	53.049
Total	0.93	0.44	46.951	0.49	53.049
Average	0.93	0.44	46.951	0.49	53.049

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0079	0.0240	0.1574	0.2488	0.4950

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.7	0.01	0.8
Highway Segment	Collision with Fixed Object	0.19	20.3	0.20	21.7	0.39	42.0
Highway Segment	Collision with Other Object	0.01	1.4	0.04	4.2	0.05	5.6
Highway Segment	Other Single-vehicle Collision	0.05	5.8	0.03	3.2	0.09	9.1
Highway Segment	Collision with Parked Vehicle	0.00	0.4	0.01	0.5	0.01	0.9
Highway Segment	Total Single Vehicle Crashes	0.26	28.1	0.28	30.3	0.55	58.4
Highway Segment	Right-Angle Collision	0.01	0.6	0.00	0.4	0.01	1.0
Highway Segment	Head-on Collision	0.00	0.2	0.00	0.0	0.00	0.2
Highway Segment	Other Multi-vehicle Collision	0.01	0.6	0.01	0.5	0.01	1.1
Highway Segment	Rear-end Collision	0.13	14.2	0.15	15.7	0.28	29.9
Highway Segment	Sideswipe, Same Direction Collision	0.03	3.4	0.06	6.0	0.09	9.4
Highway Segment	Total Multiple Vehicle Crashes	0.18	18.9	0.21	22.7	0.39	41.6
Highway Segment	Total Highway Segment Crashes	0.44	47.0	0.49	53.0	0.93	100.0
	Total Crashes	0.44	47.0	0.49	53.0	0.93	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1005+97.108	Warning: for segment #1 (1000+00.000 to 1005+97.108), The ramp type for Ramp Alignment RGPNBNNASH2 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1005+97.108	Warning: for segment #1 (1000+00.000 to 1005+97.108), traffic volume (25,500 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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This software product is provided "as-is," without warranty of any kind-either expressed or implied (but not limited to the implied warranties of merchantability and fitness for a particular purpose). The FHWA do not warrant that the functions contained in the software will meet the end-user's requirements or that the operation of the software will be uninterrupted and error-free.

Under no circumstances will the FHWA be liable to the end-user for any damages or claimed lost profits, lost savings, or other incidental or consequential damages rising out of the use or inability to use the software (even if these organizations have been advised of the possibility of such damages), or for any claim by any other party.

Notice

The use of the IHSDM software is being done strictly on a voluntary basis. In exchange for provision of IHSDM, the user agrees that the Federal Highway Administration (FHWA), U.S. Department of Transportation and any other agency of the Federal Government shall not be responsible for any errors, damage or other liability that may result from any and all use of the software, including installation and testing of the software. The user further agrees to hold the FHWA and the Federal Government harmless from any resulting liability. The user agrees that this hold harmless provision shall flow to any person to whom or any entity to which the user provides the IHSDM software. It is the user's full responsibility to inform any person to whom or any entity to which it provides the IHSDM software of this hold harmless provision.

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Report Overview

Report Generated: Aug 24, 2022 3:56 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:26:25 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBXHLY2
Highway Comment: Imported from RGPNBXHLY2.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:26:15 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1012+63.750

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1012+63.750
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

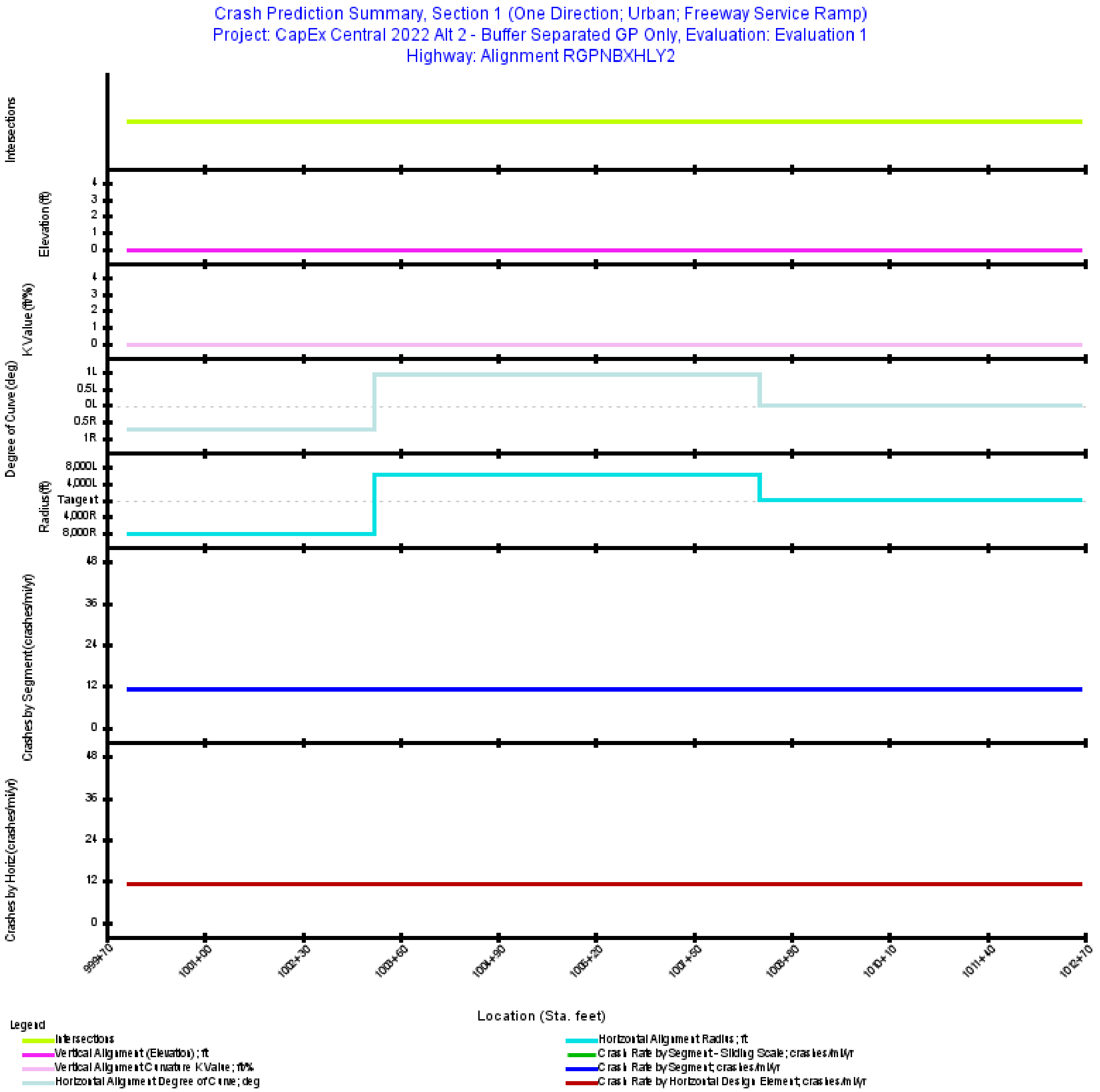

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1000+00.000	1012+63.750	1,263.75	0.2393	2030: 27,300

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2393**
Average Future Road AADT (vpd)	**27,300**
Predicted Crashes	
Total Crashes	**2.65**
Fatal and Injury Crashes	**1.13**
Property-Damage-Only Crashes	**1.52**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**43**
Percent Property-Damage-Only Crashes (%)	**57**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**11.0628**
FI Crash Rate (crashes/mi/yr)	**4.7175**
PDO Crash Rate (crashes/mi/yr)	**6.3453**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.38**
Travel Crash Rate (crashes/million veh-mi)	**1.11**
Travel FI Crash Rate (crashes/million veh-mi)	**0.47**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.64**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1012+63.750	0.2393	2.648	2.6478	1.1291	1.5187	11.0628	1.11
Total			0.2393	2.648	2.6478	1.1291	1.5187	11.0628	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi /yr)	Predicted Travel Crash Rate (crashes/mi llion veh-mi)
Simple Curve 1	1000+00.000	1003+24.969	0.0615	0.681	0.6809	0.2903	0.3905	11.0628	1.11
Simple Curve 2	1003+24.969	1008+37.337	0.0970	1.073	1.0735	0.4578	0.6157	11.0628	1.11
Tangent	1008+37.337	1012+63.750	0.0808	0.893	0.8934	0.3810	0.5124	11.0628	1.11

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.65	1.13	42.643	1.52	57.357
Total	2.65	1.13	42.643	1.52	57.357
Average	2.65	1.13	42.643	1.52	57.357

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0270	0.0819	0.2868	0.7334	1.5187

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.02	0.9	0.03	1.1
Highway Segment	Collision with Fixed Object	0.67	25.4	0.79	29.6	1.46	55.0
Highway Segment	Collision with Other Object	0.05	1.8	0.15	5.8	0.20	7.5
Highway Segment	Other Single-vehicle Collision	0.19	7.3	0.12	4.4	0.31	11.7
Highway Segment	Collision with Parked Vehicle	0.01	0.5	0.02	0.7	0.03	1.2
Highway Segment	Total Single Vehicle Crashes	0.93	35.2	1.10	41.4	2.03	76.6
Highway Segment	Right-Angle Collision	0.01	0.2	0.01	0.3	0.01	0.5
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.01	0.2	0.01	0.4	0.02	0.6
Highway Segment	Rear-end Collision	0.15	5.6	0.29	11.0	0.44	16.6
Highway Segment	Sideswipe, Same Direction Collision	0.04	1.3	0.11	4.2	0.15	5.6
Highway Segment	Total Multiple Vehicle Crashes	0.20	7.5	0.42	16.0	0.62	23.4
Highway Segment	Total Highway Segment Crashes	1.13	42.6	1.52	57.4	2.65	100.0
	Total Crashes	1.13	42.6	1.52	57.4	2.65	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1012+63.750	Warning: for segment #1 (1000+00.000 to 1012+63.750), The ramp type for Ramp Alignment RGPNBXHLY2 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

Report Generated: Aug 24, 2022 3:57 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:24:23 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBNWODW2
Highway Comment: Imported from RGPNBNWODW2.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:24:12 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1022+41.323

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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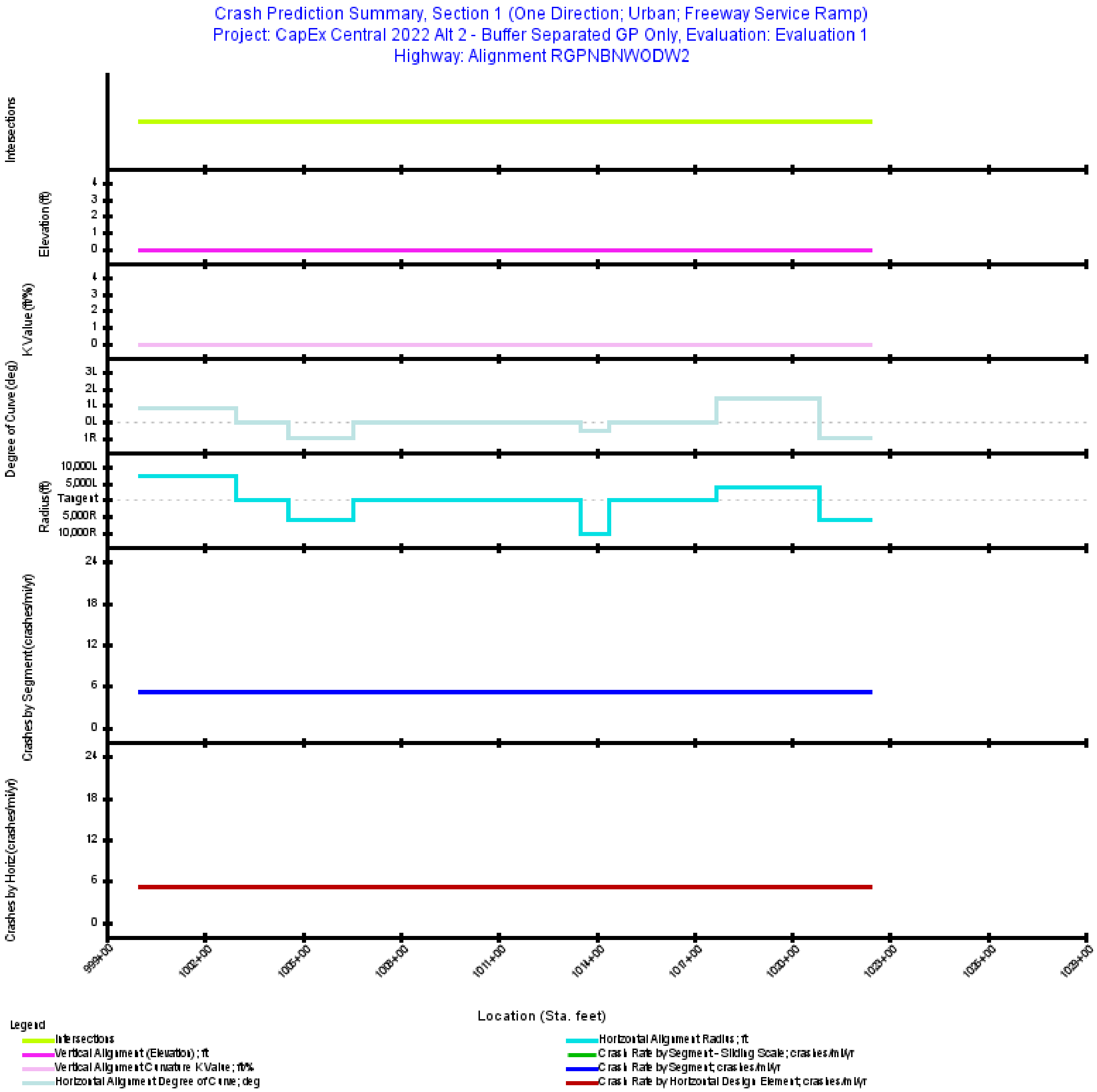
Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1022+41.323
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;



Crash Prediction Summary, Section 1 (One Direction; Urban; Freeway Service Ramp)
Project: CapEx Central 2022 Alt 2 - Buffer Separated GP Only, Evaluation: Evaluation 1
Highway: Alignment RGPNBNWODW2

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1022+41.323	2,241.32	0.4245	2030: 14,100

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.4245**
Average Future Road AADT (vpd)	**14,100**
Predicted Crashes	
Total Crashes	**2.20**
Fatal and Injury Crashes	**0.98**
Property-Damage-Only Crashes	**1.22**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**45**
Percent Property-Damage-Only Crashes (%)	**55**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.1827**
FI Crash Rate (crashes/mi/yr)	**2.3090**
PDO Crash Rate (crashes/mi/yr)	**2.8737**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.18**
Travel Crash Rate (crashes/million veh-mi)	**1.01**
Travel FI Crash Rate (crashes/million veh-mi)	**0.45**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.56**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1022+41.323	0.4245	2.200	2.2000	0.9802	1.2199	5.1827	1.01
Total			0.4245	2.200	2.2000	0.9802	1.2199	5.1827	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1002+98.217	0.0565	0.293	0.2927	0.1304	0.1623	5.1827	1.01
Tangent	1002+98.217	1004+56.235	0.0299	0.155	0.1551	0.0691	0.0860	5.1827	1.01
Simple Curve 2	1004+56.235	1006+53.990	0.0375	0.194	0.1941	0.0865	0.1076	5.1827	1.01
Tangent	1006+53.990	1013+53.076	0.1324	0.686	0.6862	0.3057	0.3805	5.1827	1.01
Simple Curve 3	1013+53.076	1014+37.871	0.0161	0.083	0.0832	0.0371	0.0462	5.1827	1.01
Tangent	1014+37.871	1017+68.231	0.0626	0.324	0.3243	0.1445	0.1798	5.1827	1.01
Simple Curve 4	1017+68.231	1020+86.035	0.0602	0.312	0.3119	0.1390	0.1730	5.1827	1.01
Simple Curve 5	1020+86.035	1022+41.323	0.0294	0.152	0.1524	0.0679	0.0845	5.1827	1.01

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.20	0.98	44.552	1.22	55.448
Total	2.20	0.98	44.552	1.22	55.448
Average	2.20	0.98	44.552	1.22	55.448

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0164	0.0496	0.3297	0.5845	1.2199

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.02	0.8	0.02	0.9
Highway Segment	Collision with Fixed Object	0.53	24.0	0.57	25.7	1.09	49.7
Highway Segment	Collision with Other Object	0.04	1.7	0.11	5.0	0.15	6.7
Highway Segment	Other Single-vehicle Collision	0.15	6.9	0.09	3.8	0.24	10.7
Highway Segment	Collision with Parked Vehicle	0.01	0.5	0.01	0.6	0.02	1.1
Highway Segment	Total Single Vehicle Crashes	0.73	33.2	0.79	35.9	1.52	69.1
Highway Segment	Right-Angle Collision	0.01	0.4	0.01	0.4	0.01	0.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.01	0.4	0.01	0.5	0.02	0.8
Highway Segment	Rear-end Collision	0.19	8.5	0.30	13.5	0.48	22.0
Highway Segment	Sideswipe, Same Direction Collision	0.04	2.0	0.11	5.2	0.16	7.2
Highway Segment	Total Multiple Vehicle Crashes	0.25	11.4	0.43	19.5	0.68	30.9
Highway Segment	Total Highway Segment Crashes	0.98	44.6	1.22	55.4	2.20	100.0
	Total Crashes	0.98	44.6	1.22	55.4	2.20	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1022+41.323	Warning: for segment #1 (1000+00.000 to 1022+41.323), The ramp type for Ramp Alignment RGPNBNWODW2 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Notice

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Report Overview

Report Generated: Aug 24, 2022 3:57 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:27:37 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBXOLF2
Highway Comment: Imported from RGPNBXOLF2.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:27:27 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1004+21.621

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1004+21.621
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

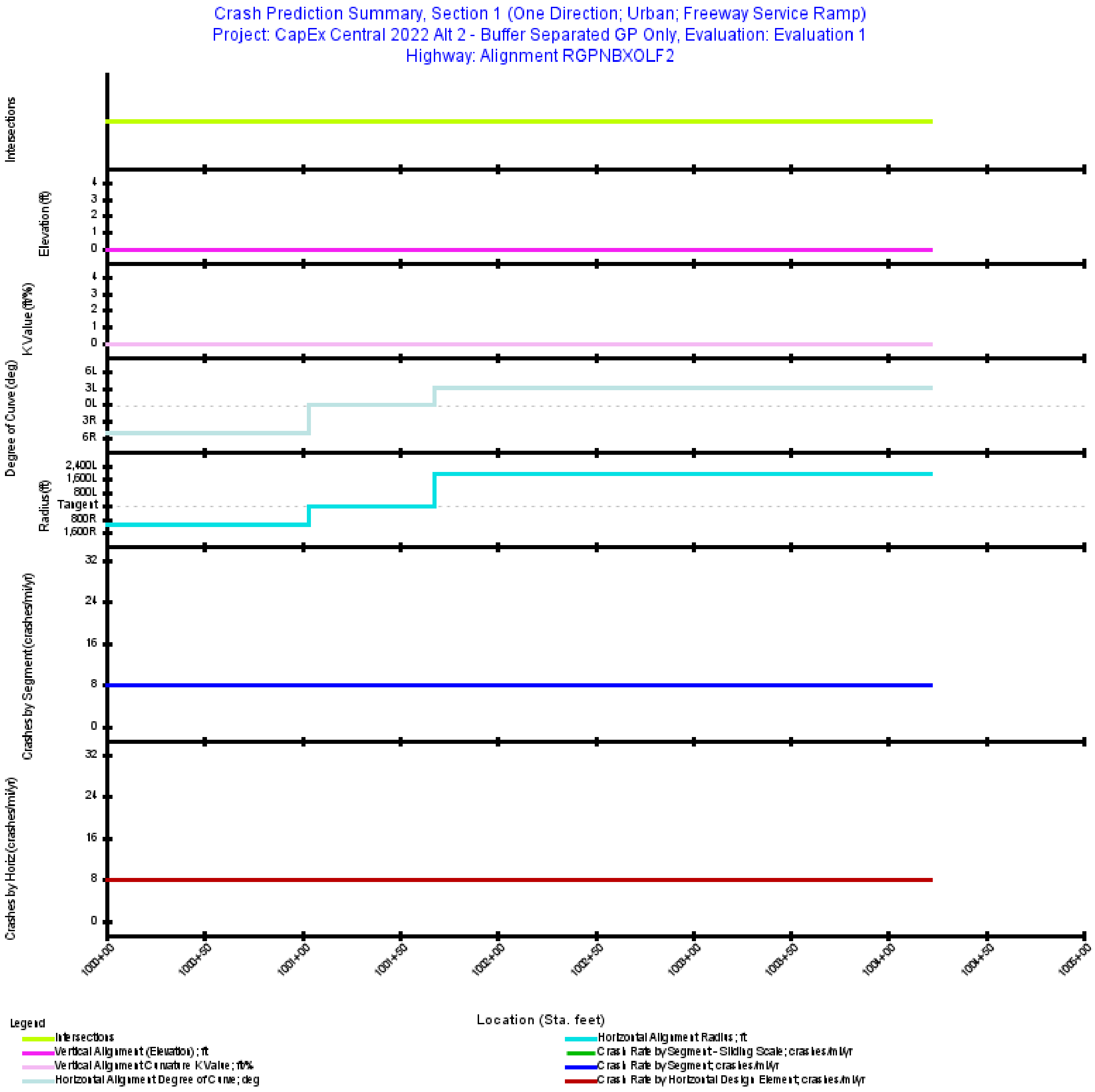

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1004+21.621	421.62	0.0799	2030: 24,050

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0799**
Average Future Road AADT (vpd)	**24,050**
Predicted Crashes	
Total Crashes	**0.63**
Fatal and Injury Crashes	**0.30**
Property-Damage-Only Crashes	**0.33**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**7.8761**
FI Crash Rate (crashes/mi/yr)	**3.7874**
PDO Crash Rate (crashes/mi/yr)	**4.0888**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.70**
Travel Crash Rate (crashes/million veh-mi)	**0.90**
Travel FI Crash Rate (crashes/million veh-mi)	**0.43**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.47**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1004+21.621	0.0799	0.629	0.6289	0.3024	0.3265	7.8761	0.90
Total			0.0799	0.629	0.6289	0.3024	0.3265	7.8761	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+03.265	0.0196	0.154	0.1540	0.0741	0.0800	7.8761	0.90
Tangent	1001+03.265	1001+68.100	0.0123	0.097	0.0967	0.0465	0.0502	7.8761	0.90
Simple Curve 2	1001+68.100	1004+21.621	0.0480	0.378	0.3782	0.1819	0.1963	7.8761	0.90

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.63	0.30	48.087	0.33	51.913
Total	0.63	0.30	48.087	0.33	51.913
Average	0.63	0.30	48.087	0.33	51.913

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0080	0.0244	0.1045	0.1655	0.3265

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.1
Highway Segment	Collision with Fixed Object	0.20	31.7	0.20	31.3	0.40	63.1
Highway Segment	Collision with Other Object	0.01	2.2	0.04	6.1	0.05	8.3
Highway Segment	Other Single-vehicle Collision	0.06	9.1	0.03	4.7	0.09	13.8
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.7	0.01	1.4
Highway Segment	Total Single Vehicle Crashes	0.28	43.9	0.28	43.8	0.55	87.7
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.3
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.2	0.00	0.3
Highway Segment	Rear-end Collision	0.02	3.1	0.04	5.6	0.06	8.7
Highway Segment	Sideswipe, Same Direction Collision	0.01	0.8	0.01	2.2	0.02	2.9
Highway Segment	Total Multiple Vehicle Crashes	0.03	4.2	0.05	8.1	0.08	12.3
Highway Segment	Total Highway Segment Crashes	0.30	48.1	0.33	51.9	0.63	100.0
	Total Crashes	0.30	48.1	0.33	51.9	0.63	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1004+21.621	Warning: for segment #1 (1000+00.000 to 1004+21.621), The ramp type for Ramp Alignment RGPNBXOLF2 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1004+21.621	Warning: for segment #1 (1000+00.000 to 1004+21.621), traffic volume (24,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 24, 2022

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Report Overview

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:22:22 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBN712
Highway Comment: Imported from RGPNBN712.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:22:12 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1010+50.147

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1010+50.147
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

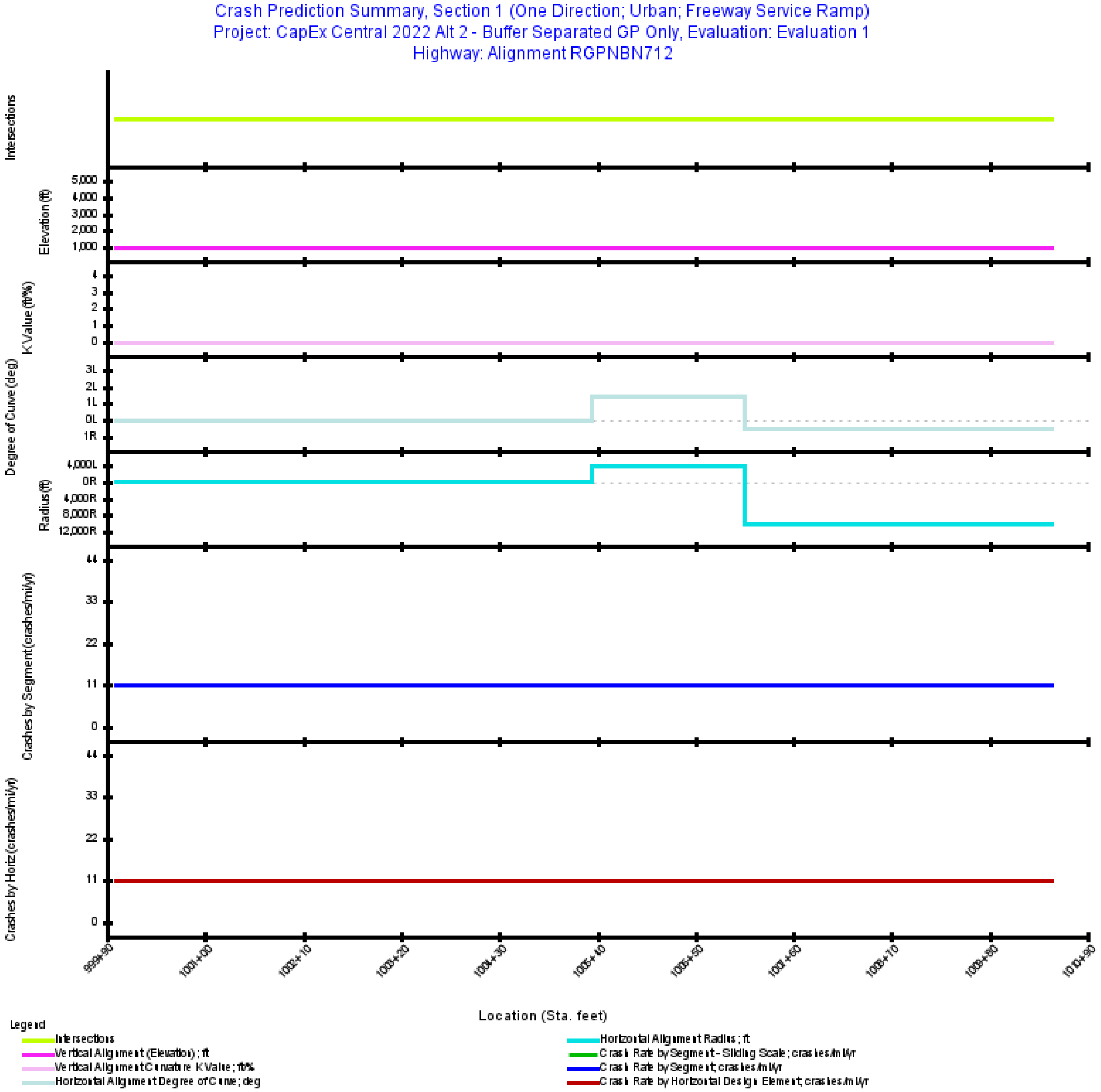

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane Ramp Entrance	Urban	1000+00.000	1010+50.147	1,050.15	0.1989	2030: 21,000

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1989**
Average Future Road AADT (vpd)	**21,000**
Predicted Crashes	
Total Crashes	**2.17**
Fatal and Injury Crashes	**0.83**
Property-Damage-Only Crashes	**1.33**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**38**
Percent Property-Damage-Only Crashes (%)	**62**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**10.8900**
FI Crash Rate (crashes/mi/yr)	**4.1790**
PDO Crash Rate (crashes/mi/yr)	**6.7109**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.52**
Travel Crash Rate (crashes/million veh-mi)	**1.42**
Travel FI Crash Rate (crashes/million veh-mi)	**0.55**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.88**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1010+50.147	0.1989	2.166	2.1659	0.8312	1.3347	10.8900	1.42
Total			0.1989	2.166	2.1659	0.8312	1.3347	10.8900	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1005+34.189	0.1012	1.102	1.1018	0.4228	0.6790	10.8900	1.42
Simple Curve 1	1005+34.189	1007+04.505	0.0323	0.351	0.3513	0.1348	0.2165	10.8900	1.42
Simple Curve 2	1007+04.505	1010+50.147	0.0655	0.713	0.7129	0.2736	0.4393	10.8900	1.42

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.17	0.83	38.375	1.33	61.625
Total	2.17	0.83	38.375	1.33	61.625
Average	2.17	0.83	38.375	1.33	61.625

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0133	0.0405	0.2171	0.5602	1.3347

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.6	0.01	0.7
Highway Segment	Collision with Fixed Object	0.32	14.9	0.45	20.5	0.77	35.4
Highway Segment	Collision with Other Object	0.02	1.1	0.09	4.0	0.11	5.0
Highway Segment	Other Single-vehicle Collision	0.09	4.3	0.07	3.1	0.16	7.4
Highway Segment	Collision with Parked Vehicle	0.01	0.3	0.01	0.5	0.02	0.8
Highway Segment	Total Single Vehicle Crashes	0.45	20.6	0.62	28.7	1.07	49.3
Highway Segment	Right-Angle Collision	0.01	0.6	0.01	0.6	0.03	1.1
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.1	0.01	0.2
Highway Segment	Other Multi-vehicle Collision	0.01	0.6	0.02	0.8	0.03	1.3
Highway Segment	Rear-end Collision	0.29	13.3	0.49	22.7	0.78	36.0
Highway Segment	Sideswipe, Same Direction Collision	0.07	3.2	0.19	8.8	0.26	12.0
Highway Segment	Total Multiple Vehicle Crashes	0.38	17.7	0.71	32.9	1.10	50.7
Highway Segment	Total Highway Segment Crashes	0.83	38.4	1.33	61.6	2.17	100.0
	Total Crashes	0.83	38.4	1.33	61.6	2.17	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1010+50.147	Warning: for segment #1 (1000+00.000 to 1010+50.147), The ramp type for Ramp Alignment RGPNBN712 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Under no circumstances will the FHWA be liable to the end-user for any damages or claimed lost profits, lost savings, or other incidental or consequential damages rising out of the use or inability to use the software (even if these organizations have been advised of the possibility of such damages), or for any claim by any other party.

Notice

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Report Overview

Report Generated: Aug 25, 2022 8:38 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:28:25 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBN2902
Highway Comment: Imported from RGPSBN2902.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:28:15 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1014+63.283

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1014+63.283
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

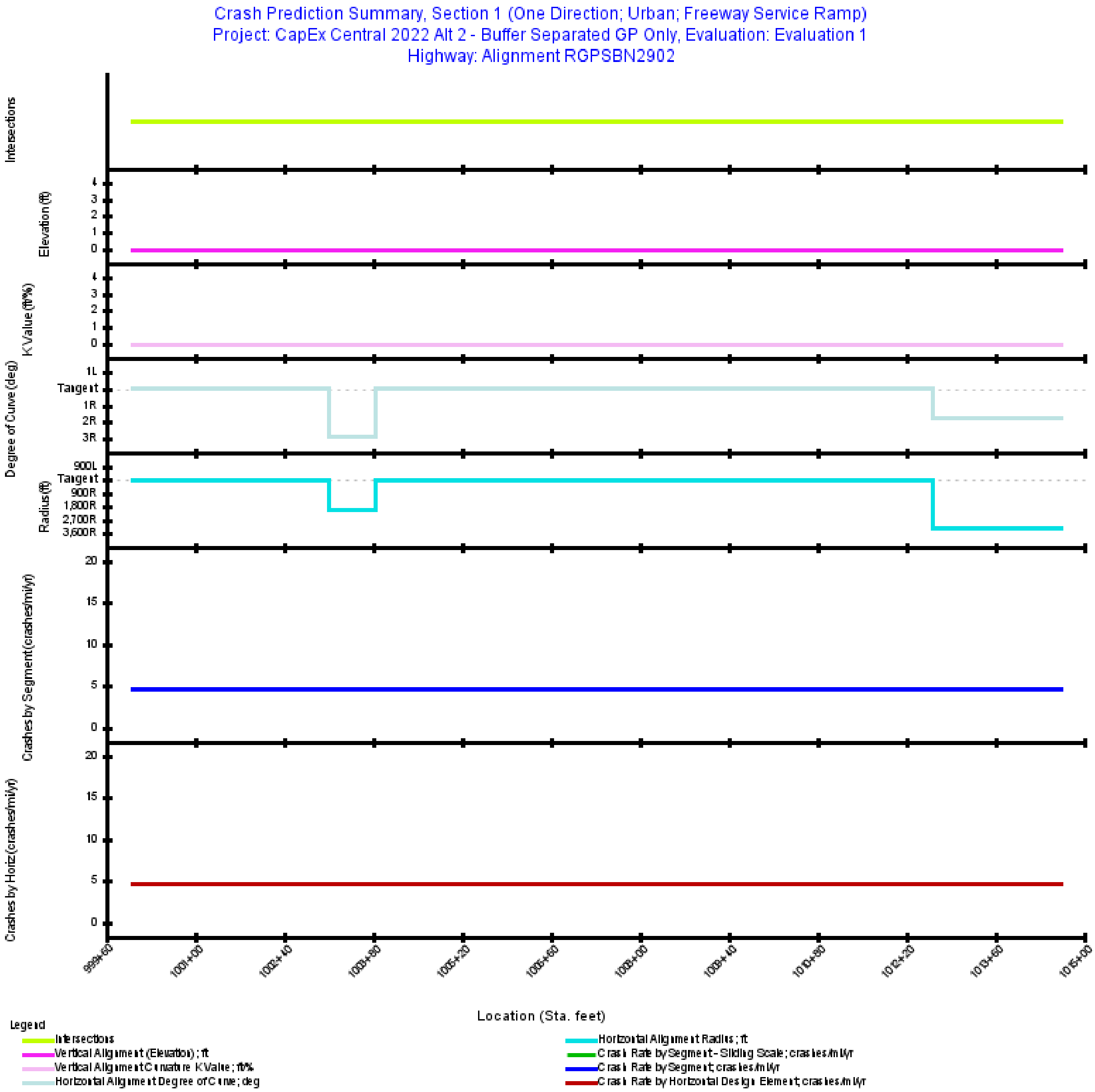

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1014+63.283	1,463.28	0.2771	2030: 13,350

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2771**
Average Future Road AADT (vpd)	**13,350**
Predicted Crashes	
Total Crashes	**1.27**
Fatal and Injury Crashes	**0.55**
Property-Damage-Only Crashes	**0.72**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**43**
Percent Property-Damage-Only Crashes (%)	**57**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**4.5913**
FI Crash Rate (crashes/mi/yr)	**1.9803**
PDO Crash Rate (crashes/mi/yr)	**2.6110**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.35**
Travel Crash Rate (crashes/million veh-mi)	**0.94**
Travel FI Crash Rate (crashes/million veh-mi)	**0.41**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.54**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1014+63.283	0.2771	1.272	1.2724	0.5488	0.7236	4.5913	0.94
Total			0.2771	1.272	1.2724	0.5488	0.7236	4.5913	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1003+09.382	0.0586	0.269	0.2690	0.1160	0.1530	4.5913	0.94
Simple Curve 1	1003+09.382	1003+83.003	0.0139	0.064	0.0640	0.0276	0.0364	4.5913	0.94
Tangent	1003+83.003	1012+61.167	0.1663	0.764	0.7636	0.3294	0.4343	4.5913	0.94
Simple Curve 2	1012+61.167	1014+63.283	0.0383	0.176	0.1758	0.0758	0.0999	4.5913	0.94

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.27	0.55	43.132	0.72	56.868
Total	1.27	0.55	43.132	0.72	56.868
Average	1.27	0.55	43.132	0.72	56.868

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0091	0.0277	0.1844	0.3275	0.7236

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.8	0.01	1.0
Highway Segment	Collision with Fixed Object	0.30	23.5	0.34	26.7	0.64	50.2
Highway Segment	Collision with Other Object	0.02	1.7	0.07	5.2	0.09	6.8
Highway Segment	Other Single-vehicle Collision	0.09	6.8	0.05	4.0	0.14	10.7
Highway Segment	Collision with Parked Vehicle	0.01	0.5	0.01	0.6	0.01	1.1
Highway Segment	Total Single Vehicle Crashes	0.41	32.5	0.47	37.3	0.89	69.8
Highway Segment	Right-Angle Collision	0.00	0.3	0.00	0.4	0.01	0.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.3	0.01	0.5	0.01	0.8
Highway Segment	Rear-end Collision	0.10	8.0	0.17	13.5	0.27	21.5
Highway Segment	Sideswipe, Same Direction Collision	0.02	1.9	0.07	5.2	0.09	7.1
Highway Segment	Total Multiple Vehicle Crashes	0.14	10.6	0.25	19.6	0.38	30.2
Highway Segment	Total Highway Segment Crashes	0.55	43.1	0.72	56.9	1.27	100.0
	Total Crashes	0.55	43.1	0.72	56.9	1.27	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1014+63.283	Warning: for segment #1 (1000+00.000 to 1014+63.283), The ramp type for Ramp Alignment RGPSBN2902 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:30:02 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBX492
Highway Comment: Imported from RGPSBX492.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:29:52 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1008+98.266

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1008+98.266
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

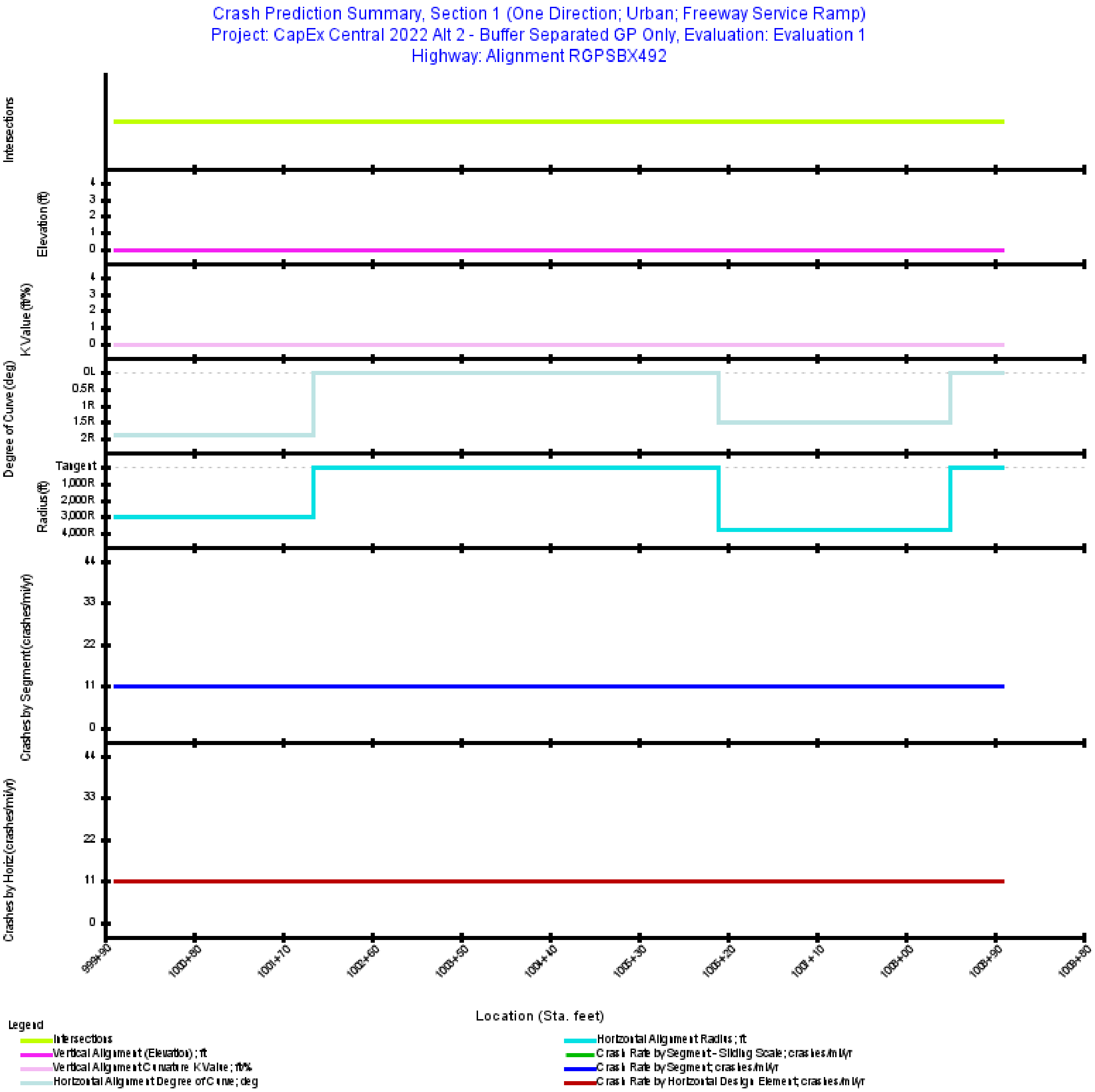

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1008+98.266	898.27	0.1701	2030: 37,100

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1701**
Average Future Road AADT (vpd)	**37,100**
Predicted Crashes	
Total Crashes	**1.85**
Fatal and Injury Crashes	**0.96**
Property-Damage-Only Crashes	**0.89**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**52**
Percent Property-Damage-Only Crashes (%)	**48**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**10.8951**
FI Crash Rate (crashes/mi/yr)	**5.6564**
PDO Crash Rate (crashes/mi/yr)	**5.2387**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.30**
Travel Crash Rate (crashes/million veh-mi)	**0.81**
Travel FI Crash Rate (crashes/million veh-mi)	**0.42**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.39**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1008+98.266	0.1701	1.853	1.8535	0.9623	0.8912	10.8951	0.81
Total			0.1701	1.853	1.8535	0.9623	0.8912	10.8951	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1002+00.357	0.0379	0.413	0.4134	0.2146	0.1988	10.8951	0.81
Tangent	1002+00.357	1006+10.283	0.0776	0.846	0.8459	0.4391	0.4067	10.8951	0.81
Simple Curve 2	1006+10.283	1008+44.380	0.0443	0.483	0.4831	0.2508	0.2323	10.8951	0.81
Tangent	1008+44.380	1008+98.266	0.0102	0.111	0.1112	0.0577	0.0535	10.8951	0.81

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.85	0.96	51.917	0.89	48.083
Total	1.85	0.96	51.917	0.89	48.083
Average	1.85	0.96	51.917	0.89	48.083

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0258	0.0783	0.3350	0.5231	0.8912

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	0.8	0.02	1.0
Highway Segment	Collision with Fixed Object	0.56	30.3	0.50	27.1	1.06	57.5
Highway Segment	Collision with Other Object	0.04	2.1	0.10	5.3	0.14	7.4
Highway Segment	Other Single-vehicle Collision	0.16	8.7	0.07	4.1	0.24	12.8
Highway Segment	Collision with Parked Vehicle	0.01	0.6	0.01	0.6	0.02	1.2
Highway Segment	Total Single Vehicle Crashes	0.78	42.0	0.70	37.9	1.48	79.9
Highway Segment	Right-Angle Collision	0.01	0.3	0.00	0.2	0.01	0.5
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.01	0.3	0.01	0.2	0.01	0.6
Highway Segment	Rear-end Collision	0.14	7.4	0.13	7.0	0.27	14.5
Highway Segment	Sideswipe, Same Direction Collision	0.03	1.8	0.05	2.7	0.08	4.5
Highway Segment	Total Multiple Vehicle Crashes	0.18	9.9	0.19	10.2	0.37	20.1
Highway Segment	Total Highway Segment Crashes	0.96	51.9	0.89	48.1	1.85	100.0
	Total Crashes	0.96	51.9	0.89	48.1	1.85	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1008+98.266	Warning: for segment #1 (1000+00.000 to 1008+98.266), The ramp type for Ramp Alignment RGPSBX492 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1008+98.266	Warning: for segment #1 (1000+00.000 to 1008+98.266), traffic volume (37,100 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX

Interactive Highway Safety Design Model

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August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 8:40 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:28:50 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBN412
Highway Comment: Imported from RGPSBN412.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:28:39 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1013+26.687

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

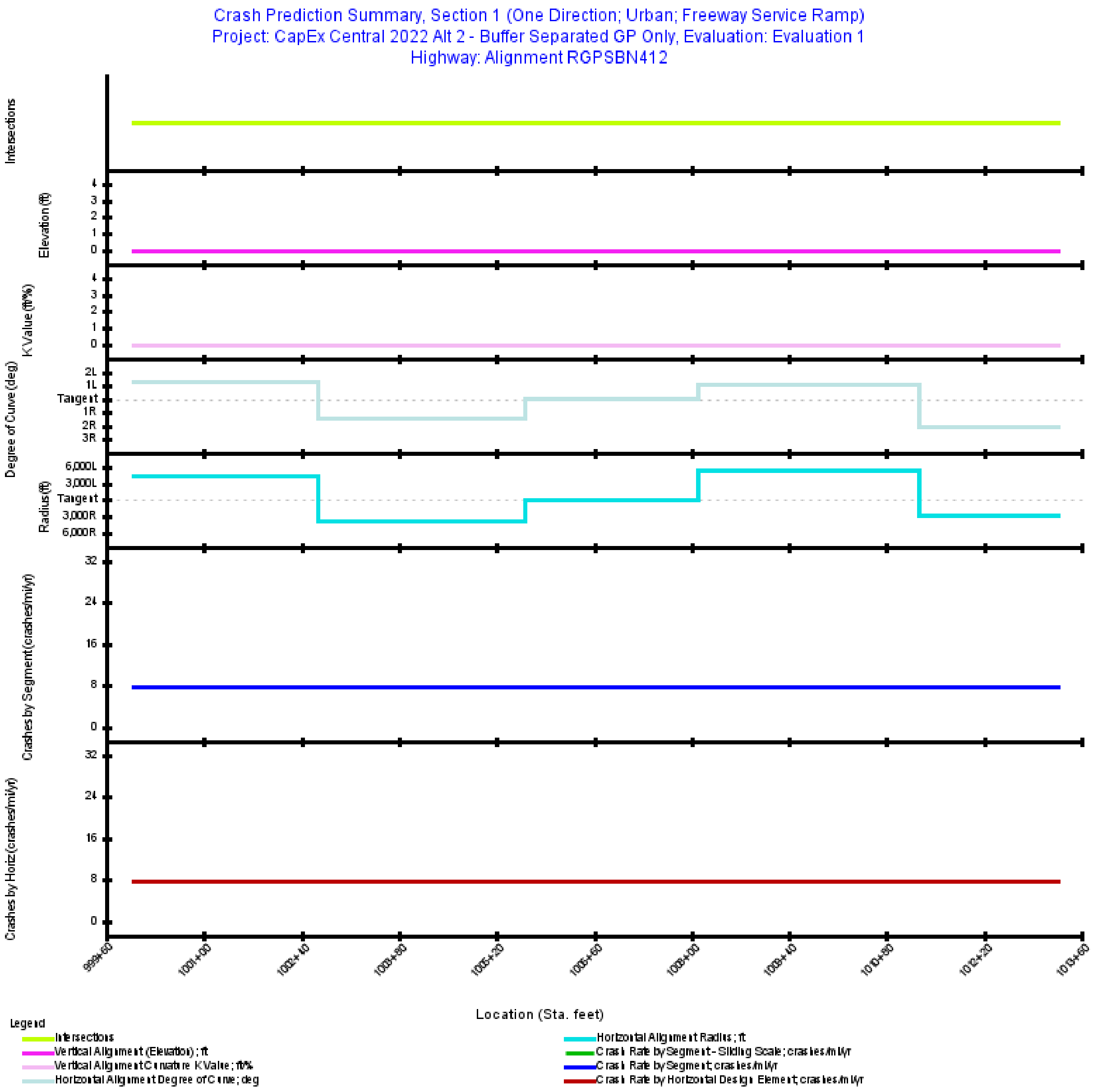
The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1013+26.687
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;



Crash Prediction Summary, Section 1 (One Direction; Urban; Freeway Service Ramp)
Project: CapEx Central 2022 Alt 2 - Buffer Separated GP Only, Evaluation: Evaluation 1
Highway: Alignment RGPSBN412

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1013+26.687	1,326.69	0.2513	2030: 21,900

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2513**
Average Future Road AADT (vpd)	**21,900**
Predicted Crashes	
Total Crashes	**1.92**
Fatal and Injury Crashes	**0.88**
Property-Damage-Only Crashes	**1.04**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**46**
Percent Property-Damage-Only Crashes (%)	**54**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**7.6538**
FI Crash Rate (crashes/mi/yr)	**3.5075**
PDO Crash Rate (crashes/mi/yr)	**4.1463**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.01**
Travel Crash Rate (crashes/million veh-mi)	**0.96**
Travel FI Crash Rate (crashes/million veh-mi)	**0.44**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.52**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1013+26.687	0.2513	1.923	1.9231	0.8813	1.0418	7.6538	0.96
Total			0.2513	1.923	1.9231	0.8813	1.0418	7.6538	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1002+63.096	0.0498	0.381	0.3814	0.1748	0.2066	7.6538	0.96
Simple Curve 2	1002+63.096	1005+60.536	0.0563	0.431	0.4312	0.1976	0.2336	7.6538	0.96
Tangent	1005+60.536	1008+10.419	0.0473	0.362	0.3622	0.1660	0.1962	7.6538	0.96
Simple Curve 3	1008+10.419	1011+25.773	0.0597	0.457	0.4571	0.2095	0.2476	7.6538	0.96
Simple Curve 4	1011+25.773	1013+26.687	0.0381	0.291	0.2912	0.1335	0.1578	7.6538	0.96

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.92	0.88	45.827	1.04	54.173
Total	1.92	0.88	45.827	1.04	54.173
Average	1.92	0.88	45.827	1.04	54.173

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0151	0.0459	0.3036	0.5167	1.0418

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.7	0.02	0.8
Highway Segment	Collision with Fixed Object	0.41	21.5	0.44	23.0	0.86	44.5
Highway Segment	Collision with Other Object	0.03	1.5	0.09	4.5	0.12	6.0
Highway Segment	Other Single-vehicle Collision	0.12	6.2	0.07	3.4	0.18	9.6
Highway Segment	Collision with Parked Vehicle	0.01	0.4	0.01	0.5	0.02	1.0
Highway Segment	Total Single Vehicle Crashes	0.57	29.8	0.62	32.1	1.19	61.9
Highway Segment	Right-Angle Collision	0.01	0.5	0.01	0.4	0.02	0.9
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.2
Highway Segment	Other Multi-vehicle Collision	0.01	0.5	0.01	0.5	0.02	1.0
Highway Segment	Rear-end Collision	0.23	12.0	0.29	15.2	0.52	27.2
Highway Segment	Sideswipe, Same Direction Collision	0.06	2.9	0.11	5.9	0.17	8.7
Highway Segment	Total Multiple Vehicle Crashes	0.31	16.0	0.42	22.0	0.73	38.1
Highway Segment	Total Highway Segment Crashes	0.88	45.8	1.04	54.2	1.92	100.0
	Total Crashes	0.88	45.8	1.04	54.2	1.92	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1013+26.687	Warning: for segment #1 (1000+00.000 to 1013+26.687), The ramp type for Ramp Alignment RGPSBN412 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1013+26.687	Warning: for segment #1 (1000+00.000 to 1013+26.687), traffic volume (21,900 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:31:39 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBXMLK2
Highway Comment: Imported from RGPSBXMLK2.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:31:29 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1003+71.453

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1003+71.453
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

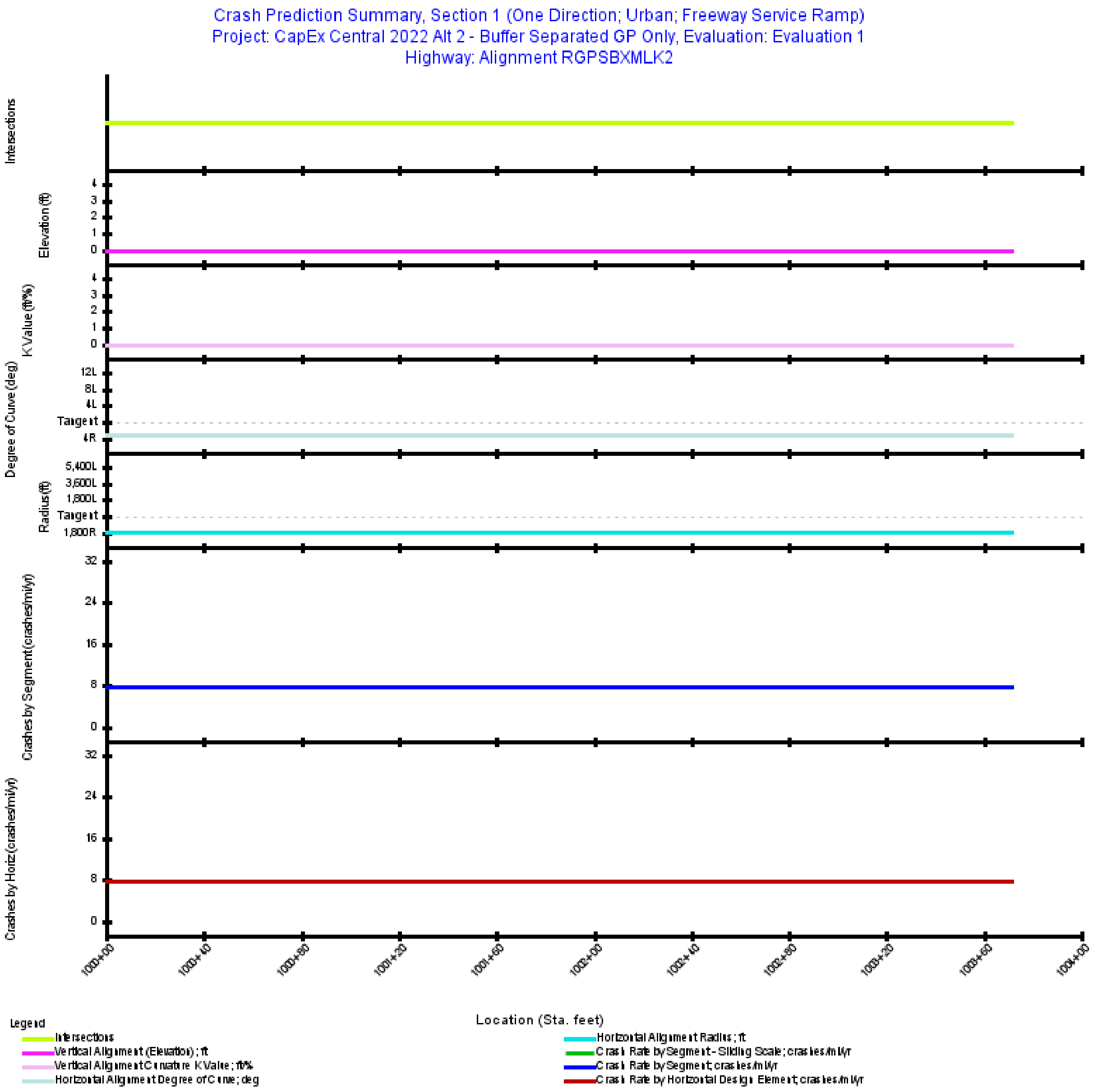

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1000+00.000	1003+71.453	371.45	0.0704	2030: 16,250

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0704**
Average Future Road AADT (vpd)	**16,250**
Predicted Crashes	
Total Crashes	**0.55**
Fatal and Injury Crashes	**0.22**
Property-Damage-Only Crashes	**0.33**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**40**
Percent Property-Damage-Only Crashes (%)	**60**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**7.8238**
FI Crash Rate (crashes/mi/yr)	**3.1622**
PDO Crash Rate (crashes/mi/yr)	**4.6615**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.42**
Travel Crash Rate (crashes/million veh-mi)	**1.32**
Travel FI Crash Rate (crashes/million veh-mi)	**0.53**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.79**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1003+71.453	0.0704	0.550	0.5504	0.2225	0.3279	7.8238	1.32
Total			0.0704	0.550	0.5504	0.2225	0.3279	7.8238	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1003+71.453	0.0704	0.550	0.5504	0.2225	0.3279	7.8238	1.32

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.55	0.22	40.418	0.33	59.582
Total	0.55	0.22	40.418	0.33	59.582
Average	0.55	0.22	40.418	0.33	59.582

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0053	0.0161	0.0564	0.1446	0.3279

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.15	26.5	0.19	34.0	0.33	60.5
Highway Segment	Collision with Other Object	0.01	1.9	0.04	6.6	0.05	8.5
Highway Segment	Other Single-vehicle Collision	0.04	7.6	0.03	5.1	0.07	12.7
Highway Segment	Collision with Parked Vehicle	0.00	0.6	0.00	0.8	0.01	1.3
Highway Segment	Total Single Vehicle Crashes	0.20	36.7	0.26	47.5	0.46	84.2
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.2	0.00	0.3
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.3	0.00	0.4
Highway Segment	Rear-end Collision	0.01	2.8	0.05	8.3	0.06	11.1
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.7	0.02	3.2	0.02	3.9
Highway Segment	Total Multiple Vehicle Crashes	0.02	3.7	0.07	12.1	0.09	15.8
Highway Segment	Total Highway Segment Crashes	0.22	40.4	0.33	59.6	0.55	100.0
	Total Crashes	0.22	40.4	0.33	59.6	0.55	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1003+71.453	Warning: for segment #1 (1000+00.000 to 1003+71.453), The ramp type for Ramp Alignment RGPSBXMLK2 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:30:51 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBX82
Highway Comment: Imported from RGPSBX82.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:30:41 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+79.140

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+79.140
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

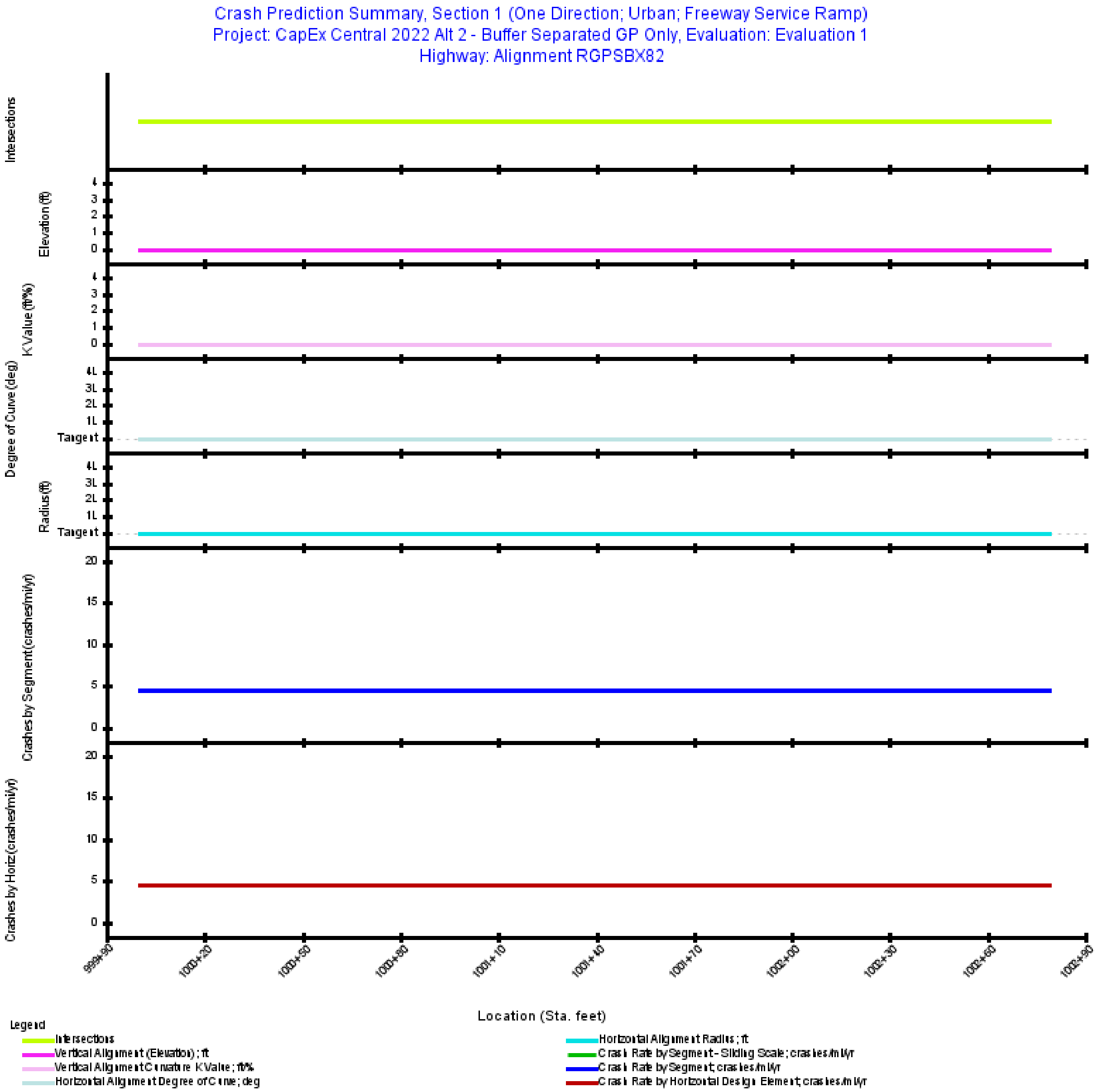

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1002+79.140	279.14	0.0529	2030: 17,650

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0529**
Average Future Road AADT (vpd)	**17,650**
Predicted Crashes	
Total Crashes	**0.24**
Fatal and Injury Crashes	**0.12**
Property-Damage-Only Crashes	**0.12**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**49**
Percent Property-Damage-Only Crashes (%)	**51**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**4.5535**
FI Crash Rate (crashes/mi/yr)	**2.2432**
PDO Crash Rate (crashes/mi/yr)	**2.3103**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.34**
Travel Crash Rate (crashes/million veh-mi)	**0.71**
Travel FI Crash Rate (crashes/million veh-mi)	**0.35**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.36**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1002+79.140	0.0529	0.241	0.2407	0.1186	0.1221	4.5535	0.71
Total			0.0529	0.241	0.2407	0.1186	0.1221	4.5535	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1002+79.140	0.0529	0.241	0.2407	0.1186	0.1221	4.5535	0.71

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.24	0.12	49.264	0.12	50.736
Total	0.24	0.12	49.264	0.12	50.736
Average	0.24	0.12	49.264	0.12	50.736

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0035	0.0107	0.0450	0.0593	0.1221

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.00	0.9	0.00	1.1
Highway Segment	Collision with Fixed Object	0.08	33.2	0.07	30.8	0.15	64.0
Highway Segment	Collision with Other Object	0.01	2.3	0.01	6.0	0.02	8.3
Highway Segment	Other Single-vehicle Collision	0.02	9.6	0.01	4.6	0.03	14.2
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.7	0.00	1.4
Highway Segment	Total Single Vehicle Crashes	0.11	46.0	0.10	43.0	0.21	89.0
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.2	0.00	0.3
Highway Segment	Rear-end Collision	0.01	2.4	0.01	5.3	0.02	7.8
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.6	0.01	2.1	0.01	2.6
Highway Segment	Total Multiple Vehicle Crashes	0.01	3.3	0.02	7.7	0.03	11.0
Highway Segment	Total Highway Segment Crashes	0.12	49.3	0.12	50.7	0.24	100.0
	Total Crashes	0.12	49.3	0.12	50.7	0.24	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1002+79.140	Warning: for segment #1 (1000+00.000 to 1002+79.140), The ramp type for Ramp Alignment RGPSBX82 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Evaluation Date: Thu Jun 23 10:28:01 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBN152
Highway Comment: Imported from RGPSBN152.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:27:51 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1010+98.693

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1010+98.693
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

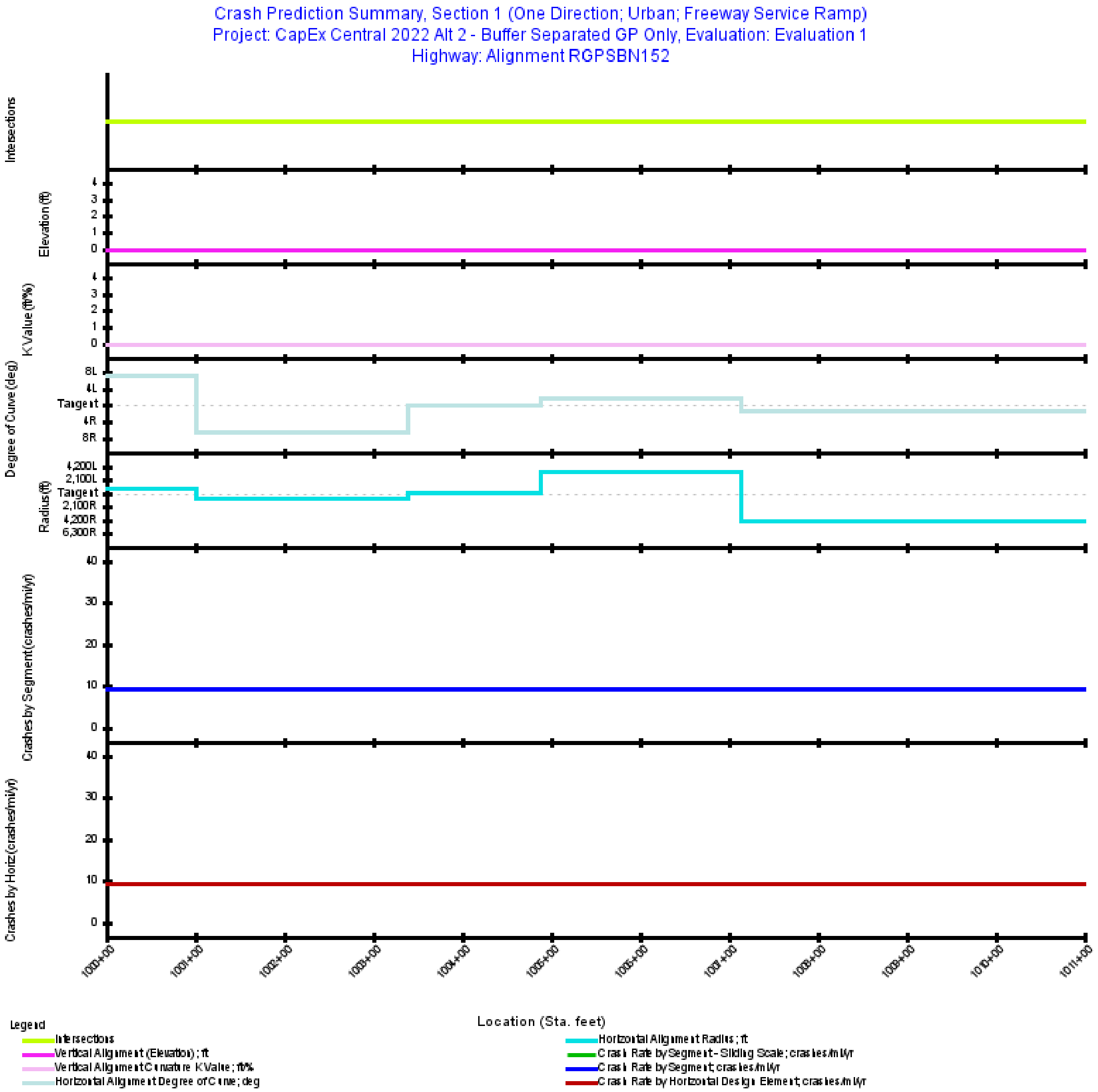

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1010+98.693	1,098.69	0.2081	2030: 19,950

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2081**
Average Future Road AADT (vpd)	**19,950**
Predicted Crashes	
Total Crashes	**1.94**
Fatal and Injury Crashes	**0.93**
Property-Damage-Only Crashes	**1.01**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**9.3179**
FI Crash Rate (crashes/mi/yr)	**4.4540**
PDO Crash Rate (crashes/mi/yr)	**4.8640**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.52**
Travel Crash Rate (crashes/million veh-mi)	**1.28**
Travel FI Crash Rate (crashes/million veh-mi)	**0.61**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.67**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1010+98.693	0.2081	1.939	1.9389	0.9268	1.0121	9.3179	1.28
Total			0.2081	1.939	1.9389	0.9268	1.0121	9.3179	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+00.827	0.0191	0.178	0.1779	0.0851	0.0929	9.3179	1.28
Simple Curve 2	1001+00.827	1003+38.817	0.0451	0.420	0.4200	0.2008	0.2192	9.3179	1.28
Tangent	1003+38.817	1004+87.637	0.0282	0.263	0.2626	0.1255	0.1371	9.3179	1.28
Simple Curve 3	1004+87.637	1007+12.956	0.0427	0.398	0.3976	0.1901	0.2076	9.3179	1.28
Simple Curve 4	1007+12.956	1010+98.693	0.0731	0.681	0.6807	0.3254	0.3553	9.3179	1.28

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.94	0.93	47.800	1.01	52.200
Total	1.94	0.93	47.800	1.01	52.200
Average	1.94	0.93	47.800	1.01	52.200

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0157	0.0477	0.3165	0.5468	1.0121

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.7	0.02	0.9
Highway Segment	Collision with Fixed Object	0.47	24.1	0.46	23.9	0.93	48.0
Highway Segment	Collision with Other Object	0.03	1.7	0.09	4.6	0.12	6.3
Highway Segment	Other Single-vehicle Collision	0.13	6.9	0.07	3.6	0.20	10.5
Highway Segment	Collision with Parked Vehicle	0.01	0.5	0.01	0.5	0.02	1.0
Highway Segment	Total Single Vehicle Crashes	0.65	33.3	0.65	33.4	1.29	66.7
Highway Segment	Right-Angle Collision	0.01	0.4	0.01	0.3	0.01	0.8
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.2
Highway Segment	Other Multi-vehicle Collision	0.01	0.4	0.01	0.5	0.02	0.9
Highway Segment	Rear-end Collision	0.21	10.9	0.25	13.0	0.46	23.8
Highway Segment	Sideswipe, Same Direction Collision	0.05	2.6	0.10	5.0	0.15	7.6
Highway Segment	Total Multiple Vehicle Crashes	0.28	14.5	0.36	18.8	0.65	33.3
Highway Segment	Total Highway Segment Crashes	0.93	47.8	1.01	52.2	1.94	100.0
	Total Crashes	0.93	47.8	1.01	52.2	1.94	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1010+98.693	Warning: for segment #1 (1000+00.000 to 1010+98.693), The ramp type for Ramp Alignment RGPSBN152 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1010+98.693	Warning: for segment #1 (1000+00.000 to 1010+98.693), traffic volume (19,950 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Evaluation Date: Thu Jun 23 10:31:15 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBXHLY2
Highway Comment: Imported from RGPSBXHLY2.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:31:05 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1006+95.123

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

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- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1006+95.123
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

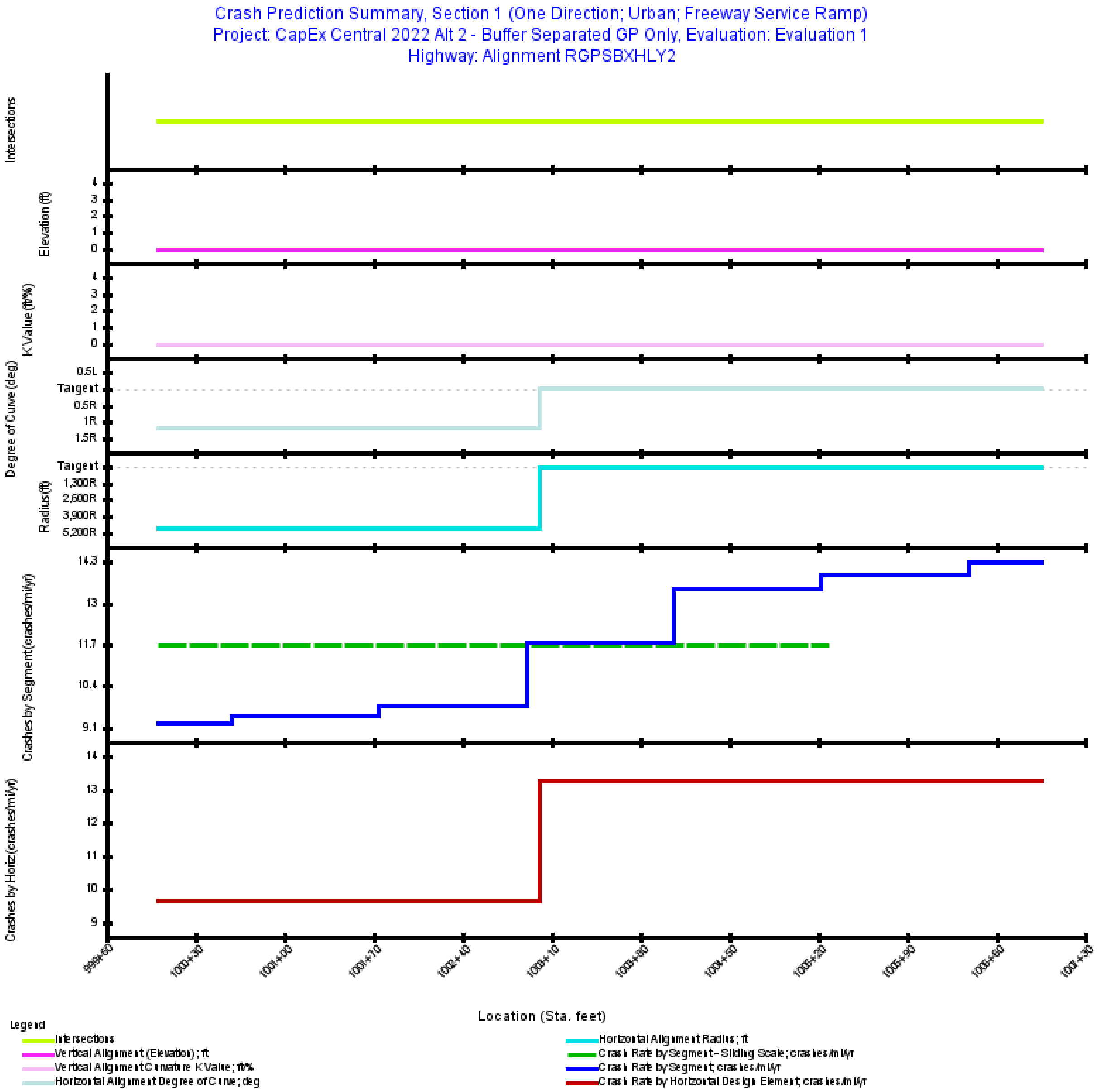

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1000+00.000	1000+58.000	58.00	0.0110	2030: 32,400
2	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1000+58.000	1001+74.000	116.00	0.0220	2030: 32,400
3	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1001+74.000	1002+90.000	116.00	0.0220	2030: 32,400
4	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1002+90.000	1004+06.000	116.00	0.0220	2030: 32,400
5	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1004+06.000	1005+22.000	116.00	0.0220	2030: 32,400
6	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1005+22.000	1006+38.000	116.00	0.0220	2030: 32,400
7	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1006+38.000	1006+95.123	57.12	0.0108	2030: 32,400

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1317**
Average Future Road AADT (vpd)	**32,400**
Predicted Crashes	
Total Crashes	**1.54**
Fatal and Injury Crashes	**0.57**
Property-Damage-Only Crashes	**0.97**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**37**
Percent Property-Damage-Only Crashes (%)	**63**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**11.6847**
FI Crash Rate (crashes/mi/yr)	**4.3328**
PDO Crash Rate (crashes/mi/yr)	**7.3519**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.56**
Travel Crash Rate (crashes/million veh-mi)	**0.99**
Travel FI Crash Rate (crashes/million veh-mi)	**0.37**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.62**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+58.000	0.0110	0.102	0.1015	0.0358	0.0657	9.2423	0.78
2	1000+58.000	1001+74.000	0.0220	0.208	0.2082	0.0742	0.1339	9.4751	0.80
3	1001+74.000	1002+90.000	0.0220	0.215	0.2152	0.0777	0.1375	9.7955	0.83
4	1002+90.000	1004+06.000	0.0220	0.258	0.2584	0.0956	0.1628	11.7625	0.99
5	1004+06.000	1005+22.000	0.0220	0.295	0.2953	0.1112	0.1841	13.4424	1.14
6	1005+22.000	1006+38.000	0.0220	0.305	0.3054	0.1165	0.1890	13.9026	1.18
7	1006+38.000	1006+95.123	0.0108	0.154	0.1542	0.0594	0.0949	14.2571	1.21
Total			0.1317	1.538	1.5383	0.5704	0.9679	11.6847	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1003+00.968	0.0570	0.549	0.5493	0.1968	0.3525	9.6371	0.81
Tangent	1003+00.968	1006+95.123	0.0747	0.989	0.9890	0.3736	0.6154	13.2483	1.12

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.54	0.57	37.081	0.97	62.919
Total	1.54	0.57	37.081	0.97	62.919
Average	1.54	0.57	37.081	0.97	62.919

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0009	0.0028	0.0096	0.0225	0.0657
2	0.0019	0.0058	0.0199	0.0466	0.1339
3	0.0020	0.0060	0.0209	0.0488	0.1375
4	0.0022	0.0067	0.0237	0.0629	0.1628
5	0.0024	0.0073	0.0260	0.0755	0.1841
6	0.0025	0.0077	0.0272	0.0790	0.1890
7	0.0013	0.0039	0.0139	0.0403	0.0949
Total	0.0133	0.0402	0.1413	0.3757	0.9679

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	1.0	0.02	1.1
Highway Segment	Collision with Fixed Object	0.32	20.7	0.49	31.6	0.81	52.3
Highway Segment	Collision with Other Object	0.02	1.5	0.09	6.1	0.12	7.6
Highway Segment	Other Single-vehicle Collision	0.09	6.0	0.07	4.7	0.16	10.7
Highway Segment	Collision with Parked Vehicle	0.01	0.4	0.01	0.7	0.02	1.1
Highway Segment	Total Single Vehicle Crashes	0.44	28.7	0.68	44.2	1.12	72.8
Highway Segment	Right-Angle Collision	0.00	0.3	0.01	0.3	0.01	0.6
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.3	0.01	0.5	0.01	0.7
Highway Segment	Rear-end Collision	0.10	6.3	0.20	12.9	0.30	19.3
Highway Segment	Sideswipe, Same Direction Collision	0.02	1.5	0.08	5.0	0.10	6.5
Highway Segment	Total Multiple Vehicle Crashes	0.13	8.4	0.29	18.8	0.42	27.2
Highway Segment	Total Highway Segment Crashes	0.57	37.1	0.97	62.9	1.54	100.0
	Total Crashes	0.57	37.1	0.97	62.9	1.54	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+58.000	Warning: for segment #1 (1000+00.000 to 1000+58.000), The ramp type for Ramp Alignment RGPSBXHLY2 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+58.000	1001+74.000	Warning: for segment #2 (1000+58.000 to 1001+74.000), The ramp type for Ramp Alignment RGPSBXHLY2 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1001+74.000	1002+90.000	Warning: for segment #3 (1001+74.000 to 1002+90.000), The ramp type for Ramp Alignment RGPSBXHLY2 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1002+90.000	1004+06.000	Warning: for segment #4 (1002+90.000 to 1004+06.000), The ramp type for Ramp Alignment RGPSBXHLY2 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1004+06.000	1005+22.000	Warning: for segment #5 (1004+06.000 to 1005+22.000), The ramp type for Ramp Alignment RGPSBXHLY2 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+22.000	1006+38.000	Warning: for segment #6 (1005+22.000 to 1006+38.000), The ramp type for Ramp Alignment RGPSBXHLY2 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1006+38.000	1006+95.123	Warning: for segment #7 (1006+38.000 to 1006+95.123), The ramp type for Ramp Alignment RGPSBXHLY2 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1000+58.000	Warning: for segment #1 (1000+00.000 to 1000+58.000), traffic volume (32,400 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 2EX
1000+58.000	1001+74.000	Warning: for segment #2 (1000+58.000 to 1001+74.000), traffic volume (32,400 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 2EX
1001+74.000	1002+90.000	Warning: for segment #3 (1001+74.000 to 1002+90.000), traffic volume (32,400 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 2EX
1002+90.000	1004+06.000	Warning: for segment #4 (1002+90.000 to 1004+06.000), traffic volume (32,400 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 2EX
1004+06.000	1005+22.000	Warning: for segment #5 (1004+06.000 to 1005+22.000), traffic volume (32,400 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 2EX
1005+22.000	1006+38.000	Warning: for segment #6 (1005+22.000 to 1006+38.000), traffic volume (32,400 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 2EX
1006+38.000	1006+95.123	Warning: for segment #7 (1006+38.000 to 1006+95.123), traffic volume (32,400 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 2EX

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 8:43 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:29:38 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBNRVS2
Highway Comment: Imported from RGPSBNRVS2.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:29:28 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1017+35.175

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

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Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
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Freeway Ramp Evaluation

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Evaluation End Location: 1017+35.175
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Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

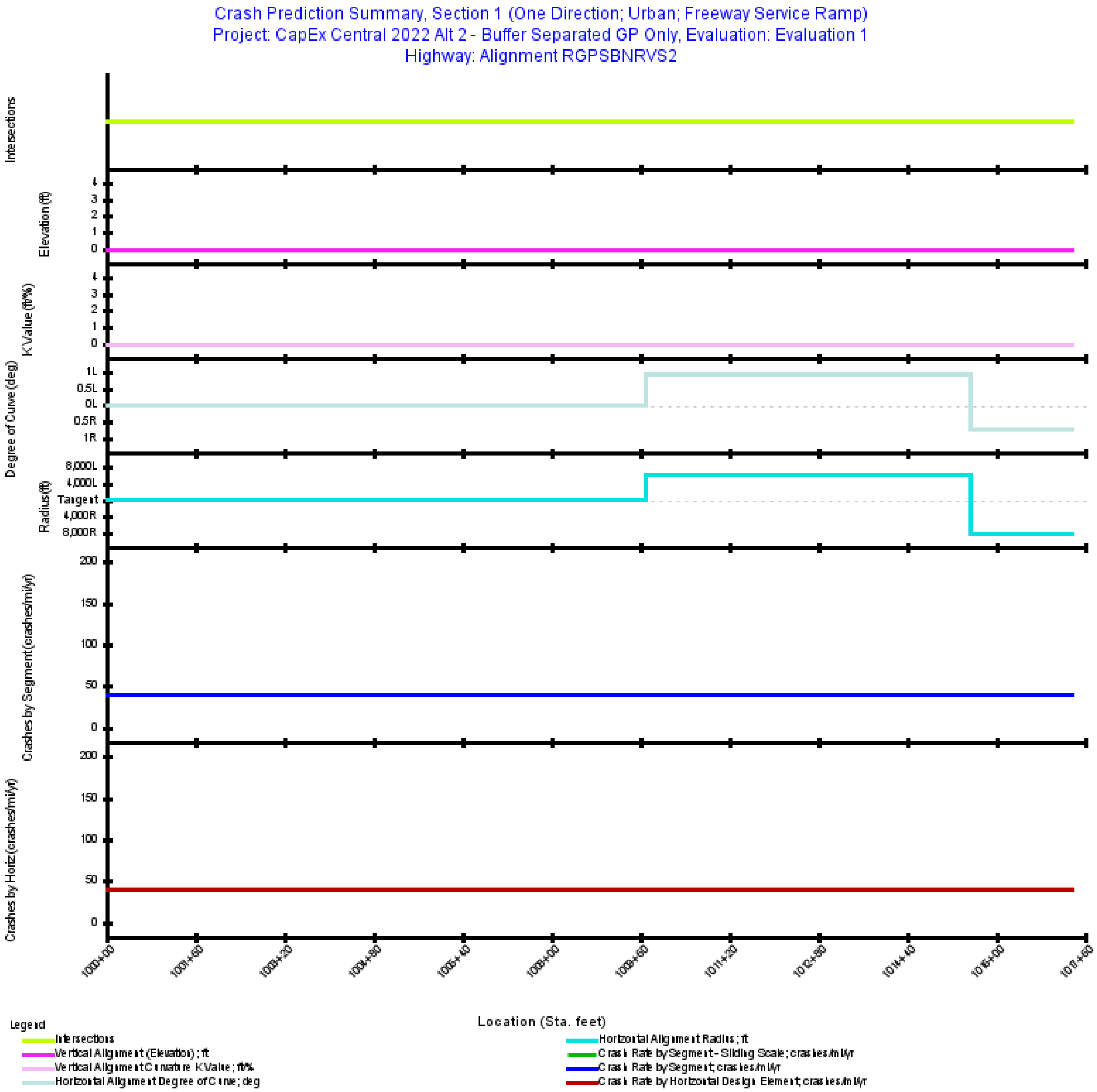

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane Ramp Entrance	Urban	1000+00.000	1017+35.175	1,735.17	0.3286	2030: 46,650

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.3286**
Average Future Road AADT (vpd)	**46,650**
Predicted Crashes	
Total Crashes	**13.28**
Fatal and Injury Crashes	**7.96**
Property-Damage-Only Crashes	**5.31**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**60**
Percent Property-Damage-Only Crashes (%)	**40**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**40.4019**
FI Crash Rate (crashes/mi/yr)	**24.2338**
PDO Crash Rate (crashes/mi/yr)	**16.1681**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**5.60**
Travel Crash Rate (crashes/million veh-mi)	**2.37**
Travel FI Crash Rate (crashes/million veh-mi)	**1.42**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.95**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1017+35.175	0.3286	13.277	13.2774	7.9640	5.3134	40.4019	2.37
Total			0.3286	13.277	13.2774	7.9640	5.3134	40.4019	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1009+69.802	0.1837	7.421	7.4208	4.4511	2.9697	40.4019	2.37
Simple Curve 1	1009+69.802	1015+54.240	0.1107	4.472	4.4720	2.6824	1.7896	40.4019	2.37
Simple Curve 2	1015+54.240	1017+35.175	0.0343	1.385	1.3845	0.8304	0.5540	40.4019	2.37

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	13.28	7.96	59.982	5.31	40.018
Total	13.28	7.96	59.982	5.31	40.018
Average	13.28	7.96	59.982	5.31	40.018

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.1226	0.3717	2.0074	5.4624	5.3134

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.0	0.04	0.3	0.05	0.4
Highway Segment	Collision with Fixed Object	1.06	8.0	1.36	10.2	2.42	18.2
Highway Segment	Collision with Other Object	0.07	0.6	0.26	2.0	0.34	2.5
Highway Segment	Other Single-vehicle Collision	0.30	2.3	0.20	1.5	0.51	3.8
Highway Segment	Collision with Parked Vehicle	0.02	0.2	0.03	0.2	0.05	0.4
Highway Segment	Total Single Vehicle Crashes	1.47	11.0	1.89	14.3	3.36	25.3
Highway Segment	Right-Angle Collision	0.20	1.5	0.06	0.5	0.26	2.0
Highway Segment	Head-on Collision	0.05	0.4	0.01	0.1	0.06	0.4
Highway Segment	Other Multi-vehicle Collision	0.20	1.5	0.08	0.6	0.28	2.1
Highway Segment	Rear-end Collision	4.87	36.7	2.36	17.8	7.23	54.5
Highway Segment	Sideswipe, Same Direction Collision	1.17	8.8	0.91	6.9	2.08	15.7
Highway Segment	Total Multiple Vehicle Crashes	6.50	48.9	3.42	25.8	9.92	74.7
Highway Segment	Total Highway Segment Crashes	7.96	60.0	5.31	40.0	13.28	100.0
	Total Crashes	7.96	60.0	5.31	40.0	13.28	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1017+35.175	Warning: for segment #1 (1000+00.000 to 1017+35.175), The ramp type for Ramp Alignment RGPSBNRVS2 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1017+35.175	Warning: for segment #1 (1000+00.000 to 1017+35.175), traffic volume (46,650 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2EN

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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This software product is provided "as-is," without warranty of any kind-either expressed or implied (but not limited to the implied warranties of merchantability and fitness for a particular purpose). The FHWA do not warrant that the functions contained in the software will meet the end-user's requirements or that the operation of the software will be uninterrupted and error-free.

Under no circumstances will the FHWA be liable to the end-user for any damages or claimed lost profits, lost savings, or other incidental or consequential damages rising out of the use or inability to use the software (even if these organizations have been advised of the possibility of such damages), or for any claim by any other party.

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The use of the IHSDM software is being done strictly on a voluntary basis. In exchange for provision of IHSDM, the user agrees that the Federal Highway Administration (FHWA), U.S. Department of Transportation and any other agency of the Federal Government shall not be responsible for any errors, damage or other liability that may result from any and all use of the software, including installation and testing of the software. The user further agrees to hold the FHWA and the Federal Government harmless from any resulting liability. The user agrees that this hold harmless provision shall flow to any person to whom or any entity to which the user provides the IHSDM software. It is the user's full responsibility to inform any person to whom or any entity to which it provides the IHSDM software of this hold harmless provision.

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Report Overview

Report Generated: Aug 25, 2022 8:43 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:32:02 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBXWODW2
Highway Comment: Imported from RGPSBXWODW2.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:31:53 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1006+58.926

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1006+58.926
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

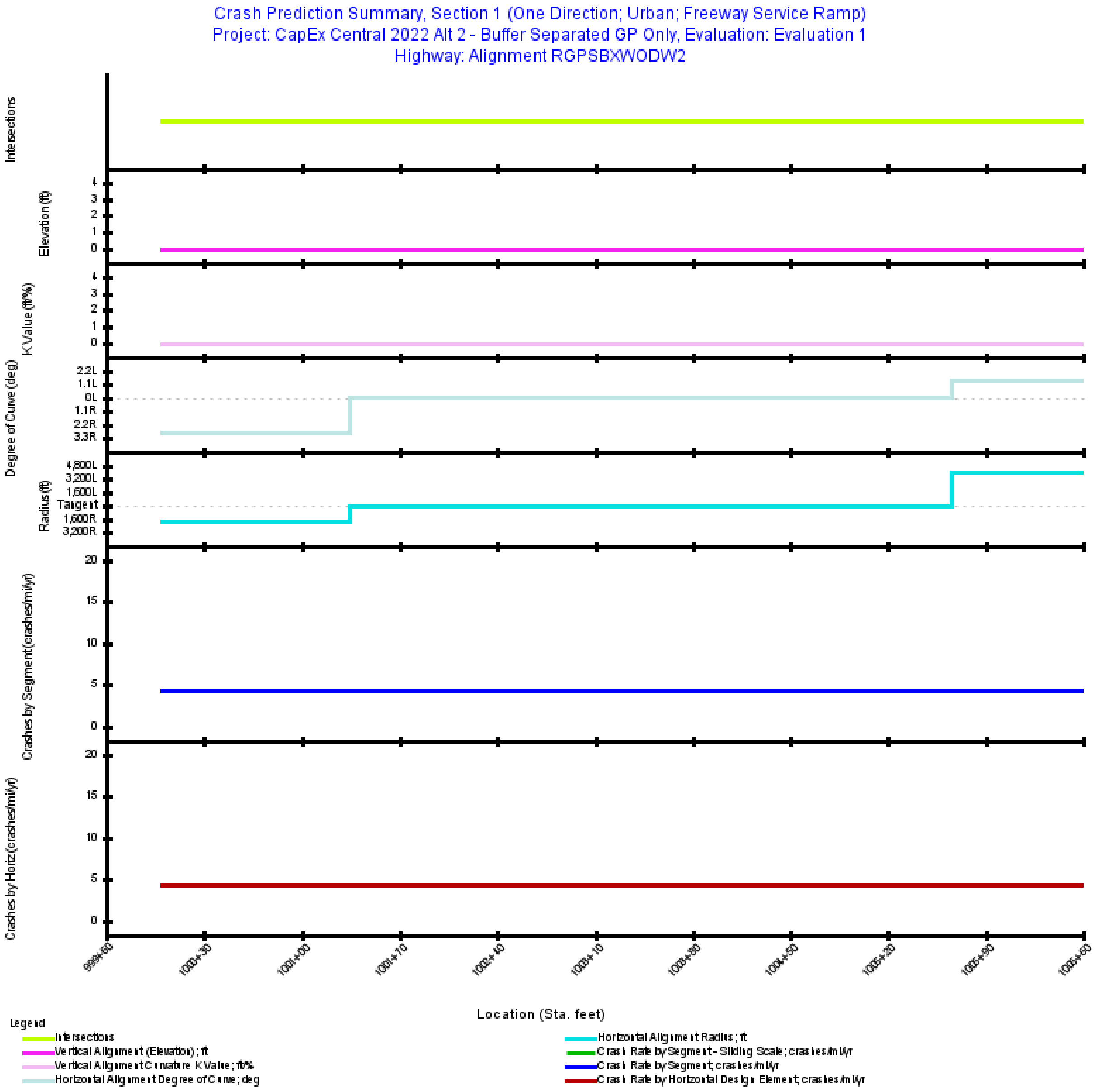

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1006+58.926	658.93	0.1248	2030: 12,400

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1248**
Average Future Road AADT (vpd)	**12,400**
Predicted Crashes	
Total Crashes	**0.55**
Fatal and Injury Crashes	**0.27**
Property-Damage-Only Crashes	**0.28**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**4.4052**
FI Crash Rate (crashes/mi/yr)	**2.1316**
PDO Crash Rate (crashes/mi/yr)	**2.2736**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.56**
Travel Crash Rate (crashes/million veh-mi)	**0.97**
Travel FI Crash Rate (crashes/million veh-mi)	**0.47**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.50**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1006+58.926	0.1248	0.550	0.5498	0.2660	0.2837	4.4052	0.97
Total			0.1248	0.550	0.5498	0.2660	0.2837	4.4052	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+33.927	0.0254	0.112	0.1117	0.0541	0.0577	4.4052	0.97
Tangent	1001+33.927	1005+65.459	0.0817	0.360	0.3600	0.1742	0.1858	4.4052	0.97
Simple Curve 2	1005+65.459	1006+58.926	0.0177	0.078	0.0780	0.0377	0.0402	4.4052	0.97

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.55	0.27	48.389	0.28	51.611
Total	0.55	0.27	48.389	0.28	51.611
Average	0.55	0.27	48.389	0.28	51.611

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0069	0.0208	0.0897	0.1487	0.2837

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.18	33.2	0.18	32.3	0.36	65.5
Highway Segment	Collision with Other Object	0.01	2.3	0.03	6.3	0.05	8.6
Highway Segment	Other Single-vehicle Collision	0.05	9.6	0.03	4.8	0.08	14.4
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.7	0.01	1.4
Highway Segment	Total Single Vehicle Crashes	0.25	46.0	0.25	45.1	0.50	91.1
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.2	0.00	0.2
Highway Segment	Rear-end Collision	0.01	1.8	0.03	4.5	0.03	6.3
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.4	0.01	1.7	0.01	2.2
Highway Segment	Total Multiple Vehicle Crashes	0.01	2.4	0.04	6.5	0.05	8.9
Highway Segment	Total Highway Segment Crashes	0.27	48.4	0.28	51.6	0.55	100.0
	Total Crashes	0.27	48.4	0.28	51.6	0.55	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1006+58.926	Warning: for segment #1 (1000+00.000 to 1006+58.926), The ramp type for Ramp Alignment RGPSBXWODW2 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 8:44 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:29:14 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBNOLF2
Highway Comment: Imported from RGPSBNOLF2.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:29:03 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1020+90.521

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1020+90.521
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

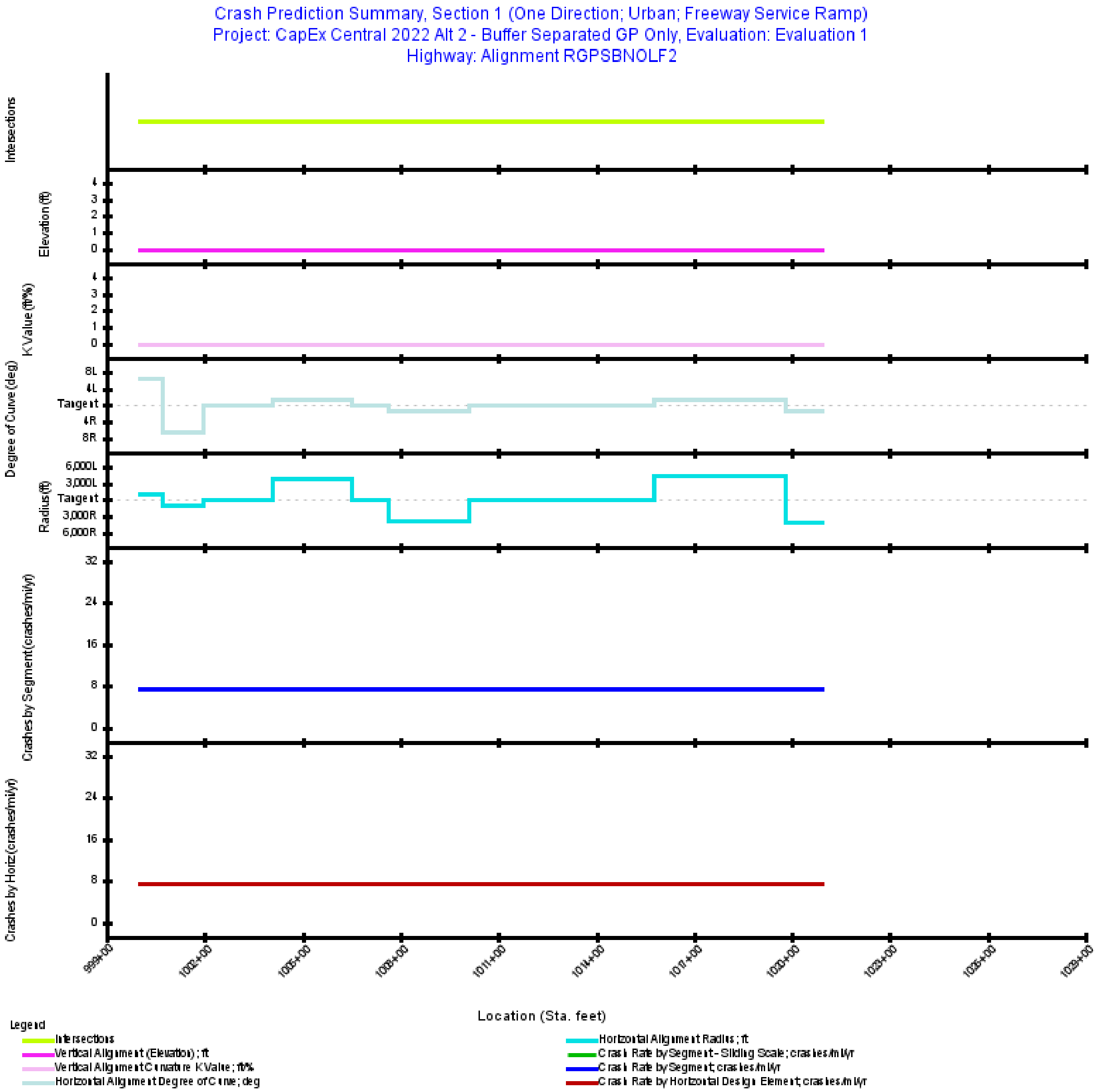

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1020+90.521	2,090.52	0.3959	2030: 20,100

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.3959**
Average Future Road AADT (vpd)	**20,100**
Predicted Crashes	
Total Crashes	**2.97**
Fatal and Injury Crashes	**1.35**
Property-Damage-Only Crashes	**1.62**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**45**
Percent Property-Damage-Only Crashes (%)	**55**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**7.5091**
FI Crash Rate (crashes/mi/yr)	**3.4038**
PDO Crash Rate (crashes/mi/yr)	**4.1053**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.90**
Travel Crash Rate (crashes/million veh-mi)	**1.02**
Travel FI Crash Rate (crashes/million veh-mi)	**0.46**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.56**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1020+90.521	0.3959	2.973	2.9731	1.3477	1.6254	7.5091	1.02
Total			0.3959	2.973	2.9731	1.3477	1.6254	7.5091	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1000+70.286	0.0133	0.100	0.1000	0.0453	0.0546	7.5091	1.02
Simple Curve 2	1000+70.286	1001+96.805	0.0240	0.180	0.1799	0.0816	0.0984	7.5091	1.02
Tangent	1001+96.805	1004+08.616	0.0401	0.301	0.3012	0.1365	0.1647	7.5091	1.02
Simple Curve 3	1004+08.616	1005+30.870	0.0232	0.174	0.1739	0.0788	0.0951	7.5091	1.02
Simple Curve 4	1005+30.870	1006+53.123	0.0232	0.174	0.1739	0.0788	0.0951	7.5091	1.02
Tangent	1006+53.123	1007+65.415	0.0213	0.160	0.1597	0.0724	0.0873	7.5091	1.02
Simple Curve 5	1007+65.415	1010+11.078	0.0465	0.349	0.3494	0.1584	0.1910	7.5091	1.02
Tangent	1010+11.078	1015+78.431	0.1075	0.807	0.8069	0.3658	0.4411	7.5091	1.02
Simple Curve 6	1015+78.431	1019+80.707	0.0762	0.572	0.5721	0.2593	0.3128	7.5091	1.02
Simple Curve 7	1019+80.707	1020+90.521	0.0208	0.156	0.1562	0.0708	0.0854	7.5091	1.02

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.97	1.35	45.329	1.62	54.671
Total	2.97	1.35	45.329	1.62	54.671
Average	2.97	1.35	45.329	1.62	54.671

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0226	0.0685	0.4550	0.8016	1.6254

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.02	0.7	0.03	0.9
Highway Segment	Collision with Fixed Object	0.66	22.3	0.71	24.0	1.38	46.3
Highway Segment	Collision with Other Object	0.05	1.6	0.14	4.7	0.18	6.2
Highway Segment	Other Single-vehicle Collision	0.19	6.4	0.11	3.6	0.30	10.0
Highway Segment	Collision with Parked Vehicle	0.01	0.5	0.02	0.5	0.03	1.0
Highway Segment	Total Single Vehicle Crashes	0.92	30.8	1.00	33.6	1.91	64.4
Highway Segment	Right-Angle Collision	0.01	0.4	0.01	0.4	0.03	0.8
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.01	0.2
Highway Segment	Other Multi-vehicle Collision	0.01	0.4	0.01	0.5	0.03	1.0
Highway Segment	Rear-end Collision	0.32	10.9	0.43	14.6	0.76	25.4
Highway Segment	Sideswipe, Same Direction Collision	0.08	2.6	0.17	5.6	0.24	8.2
Highway Segment	Total Multiple Vehicle Crashes	0.43	14.5	0.63	21.1	1.06	35.6
Highway Segment	Total Highway Segment Crashes	1.35	45.3	1.62	54.7	2.97	100.0
	Total Crashes	1.35	45.3	1.62	54.7	2.97	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1020+90.521	Warning: for segment #1 (1000+00.000 to 1020+90.521), The ramp type for Ramp Alignment RGPSBNOLF2 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1020+90.521	Warning: for segment #1 (1000+00.000 to 1020+90.521), traffic volume (20,100 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 8:44 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:30:27 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBX712
Highway Comment: Imported from RGPSBX712.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:30:16 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1017+36.522

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1017+36.522
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

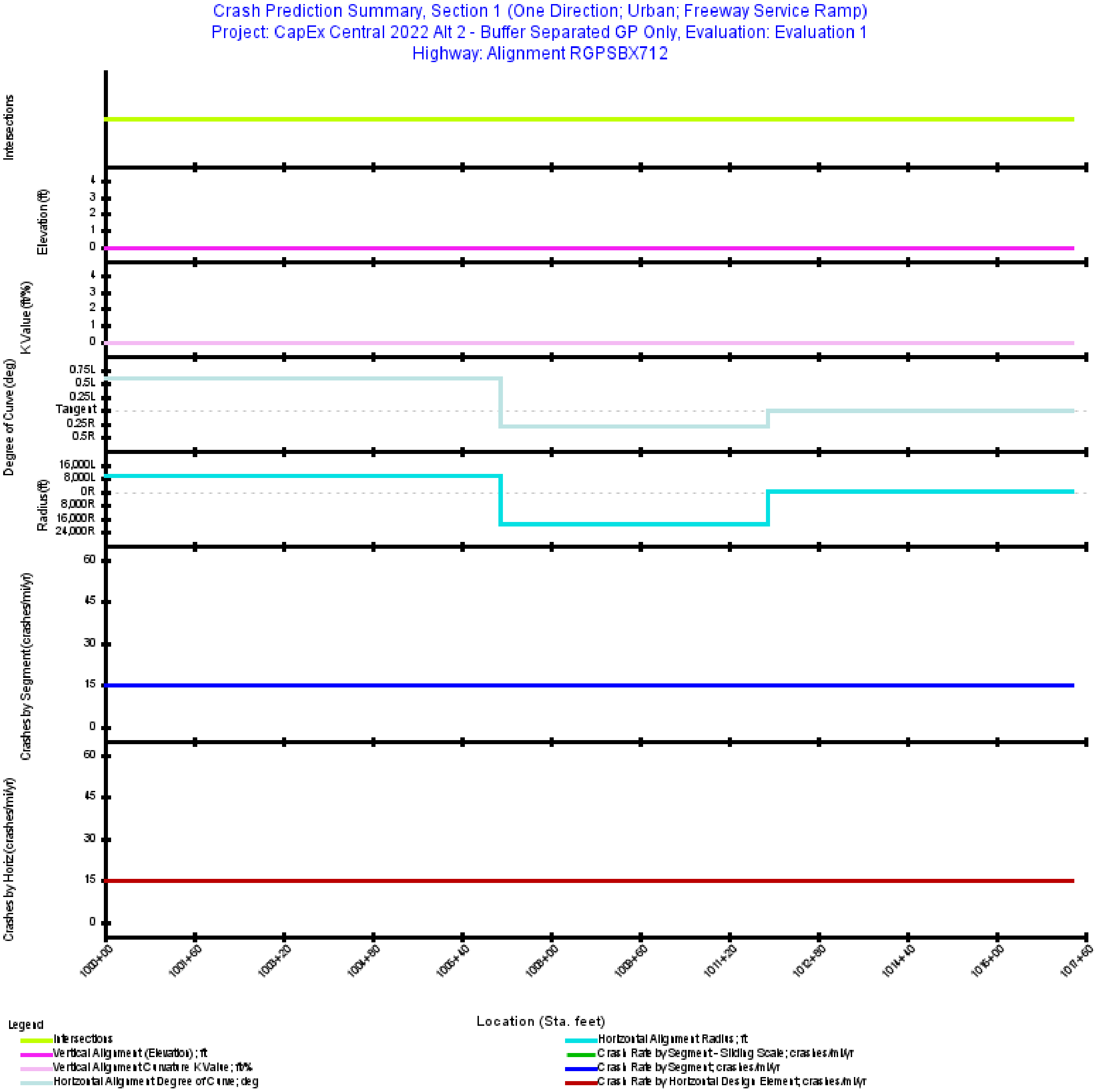
Crash Prediction Summary, Section 1 (One Direction; Urban; Freeway Service Ramp)
Project: CapEx Central 2022 Alt 2 - Buffer Separated GP Only, Evaluation: Evaluation 1
Highway: Alignment RGPSBX712

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1000+00.000	1017+36.522	1,736.52	0.3289	2030: 34,450

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.3289**
Average Future Road AADT (vpd)	**34,450**
Predicted Crashes	
Total Crashes	**4.92**
Fatal and Injury Crashes	**2.13**
Property-Damage-Only Crashes	**2.79**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**43**
Percent Property-Damage-Only Crashes (%)	**57**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**14.9626**
FI Crash Rate (crashes/mi/yr)	**6.4790**
PDO Crash Rate (crashes/mi/yr)	**8.4836**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**4.14**
Travel Crash Rate (crashes/million veh-mi)	**1.19**
Travel FI Crash Rate (crashes/million veh-mi)	**0.52**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.68**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1017+36.522	0.3289	4.921	4.9210	2.1308	2.7901	14.9626	1.19
Total			0.3289	4.921	4.9210	2.1308	2.7901	14.9626	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1007+09.610	0.1344	2.011	2.0109	0.8707	1.1402	14.9626	1.19
Simple Curve 2	1007+09.610	1011+90.546	0.0911	1.363	1.3629	0.5901	0.7727	14.9626	1.19
Tangent	1011+90.546	1017+36.522	0.1034	1.547	1.5472	0.6700	0.8772	14.9626	1.19

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.92	2.13	43.301	2.79	56.699
Total	4.92	2.13	43.301	2.79	56.699
Average	4.92	2.13	43.301	2.79	56.699

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0477	0.1447	0.5117	1.4267	2.7901

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.1	0.04	0.9	0.05	1.0
Highway Segment	Collision with Fixed Object	1.15	23.4	1.39	28.2	2.54	51.6
Highway Segment	Collision with Other Object	0.08	1.7	0.27	5.5	0.35	7.1
Highway Segment	Other Single-vehicle Collision	0.33	6.7	0.21	4.2	0.54	11.0
Highway Segment	Collision with Parked Vehicle	0.02	0.5	0.03	0.6	0.06	1.1
Highway Segment	Total Single Vehicle Crashes	1.59	32.4	1.94	39.3	3.53	71.7
Highway Segment	Right-Angle Collision	0.02	0.3	0.01	0.3	0.03	0.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.01	0.1
Highway Segment	Other Multi-vehicle Collision	0.02	0.3	0.02	0.4	0.04	0.8
Highway Segment	Rear-end Collision	0.40	8.2	0.59	12.0	0.99	20.1
Highway Segment	Sideswipe, Same Direction Collision	0.10	2.0	0.23	4.6	0.32	6.6
Highway Segment	Total Multiple Vehicle Crashes	0.54	10.9	0.85	17.4	1.39	28.3
Highway Segment	Total Highway Segment Crashes	2.13	43.3	2.79	56.7	4.92	100.0
	Total Crashes	2.13	43.3	2.79	56.7	4.92	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1017+36.522	Warning: for segment #1 (1000+00.000 to 1017+36.522), The ramp type for Ramp Alignment RGPSBX712 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1017+36.522	Warning: for segment #1 (1000+00.000 to 1017+36.522), traffic volume (34,450 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2EX

I-35 Build Alternative 2 Model ML Ramps

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 8:54 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:53:09 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RMLNBX12
Highway Comment: Imported from RMLNBX12.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:52:59 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1008+10.827

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1008+10.827
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

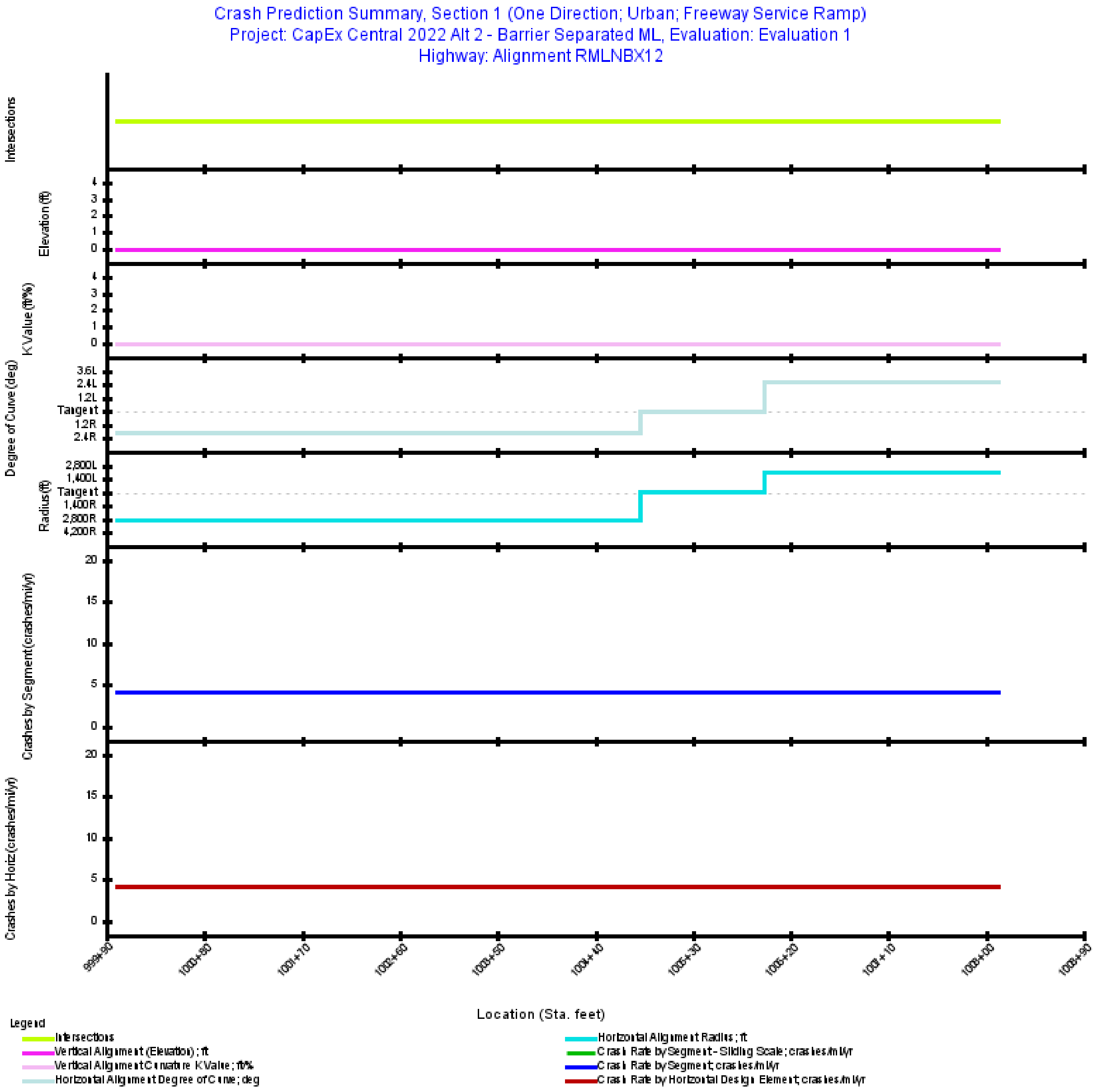

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1008+10.827	810.83	0.1536	2030: 10,850

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1536**
Average Future Road AADT (vpd)	**10,850**
Predicted Crashes	
Total Crashes	**0.64**
Fatal and Injury Crashes	**0.31**
Property-Damage-Only Crashes	**0.33**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**4.1641**
FI Crash Rate (crashes/mi/yr)	**2.0132**
PDO Crash Rate (crashes/mi/yr)	**2.1509**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.61**
Travel Crash Rate (crashes/million veh-mi)	**1.05**
Travel FI Crash Rate (crashes/million veh-mi)	**0.51**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.54**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1008+10.827	0.1536	0.639	0.6395	0.3092	0.3303	4.1641	1.05
Total			0.1536	0.639	0.6395	0.3092	0.3303	4.1641	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1004+81.529	0.0912	0.380	0.3798	0.1836	0.1962	4.1641	1.05
Tangent	1004+81.529	1005+95.423	0.0216	0.090	0.0898	0.0434	0.0464	4.1641	1.05
Simple Curve 2	1005+95.423	1008+10.827	0.0408	0.170	0.1699	0.0821	0.0878	4.1641	1.05

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.64	0.31	48.346	0.33	51.654
Total	0.64	0.31	48.346	0.33	51.654
Average	0.64	0.31	48.346	0.33	51.654

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0079	0.0239	0.1034	0.1740	0.3303

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.21	33.3	0.21	32.7	0.42	66.1
Highway Segment	Collision with Other Object	0.01	2.4	0.04	6.4	0.06	8.7
Highway Segment	Other Single-vehicle Collision	0.06	9.6	0.03	4.9	0.09	14.5
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.01	0.7	0.01	1.4
Highway Segment	Total Single Vehicle Crashes	0.29	46.2	0.29	45.7	0.59	91.9
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Rear-end Collision	0.01	1.6	0.03	4.1	0.04	5.7
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.4	0.01	1.6	0.01	2.0
Highway Segment	Total Multiple Vehicle Crashes	0.01	2.2	0.04	5.9	0.05	8.1
Highway Segment	Total Highway Segment Crashes	0.31	48.3	0.33	51.7	0.64	100.0
	Total Crashes	0.31	48.3	0.33	51.7	0.64	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1008+10.827	Warning: for segment #1 (1000+00.000 to 1008+10.827), The ramp type for Ramp Alignment RMLNBX12 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Notice

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Report Overview

Report Generated: Aug 25, 2022 8:56 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:51:58 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RMLNBN12
Highway Comment: Imported from RMLNBN12.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:51:47 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1009+18.411

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1009+18.411
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

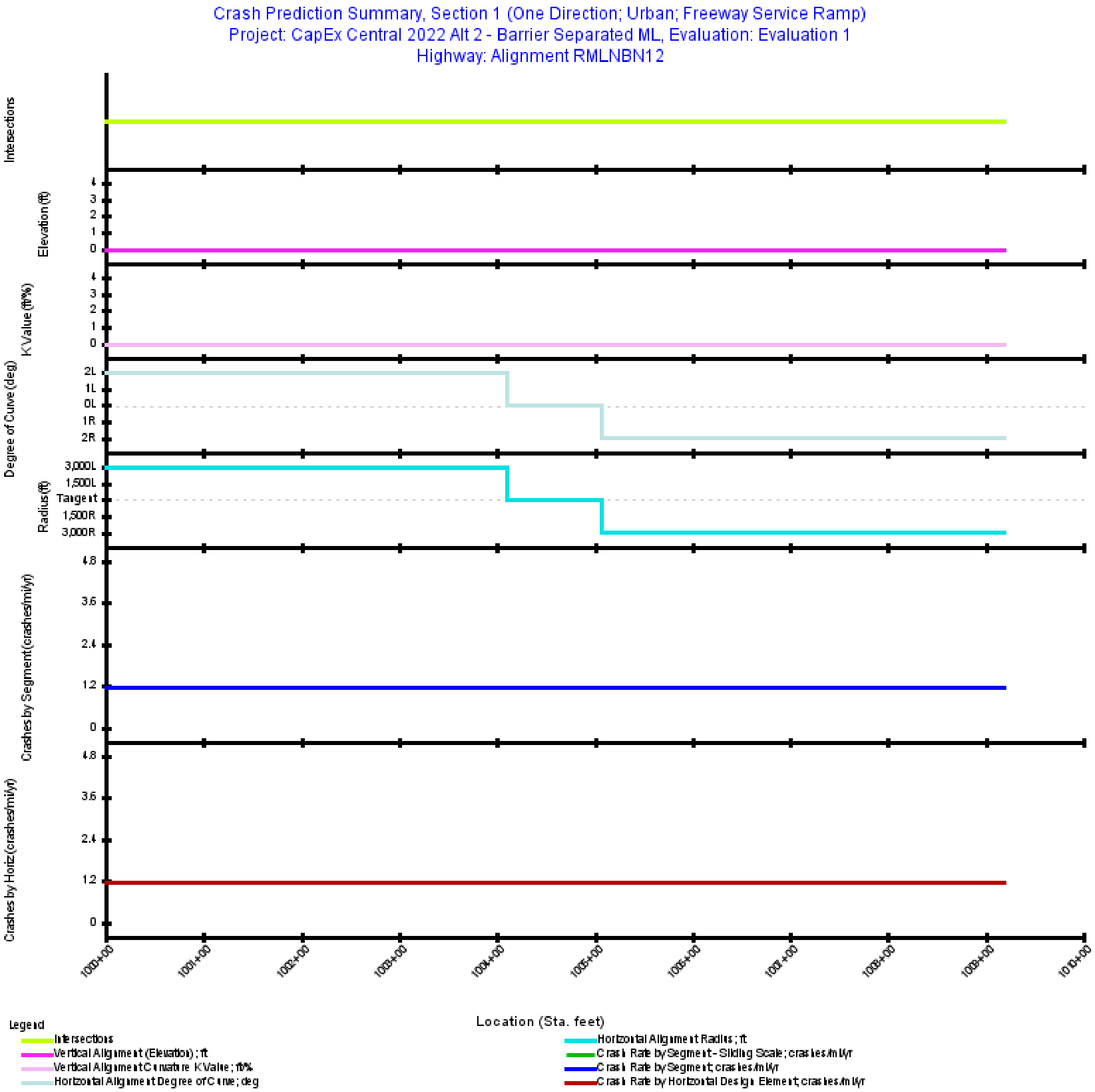

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1009+18.411	918.41	0.1739	2030: 2,250

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1739**
Average Future Road AADT (vpd)	**2,250**
Predicted Crashes	
Total Crashes	**0.20**
Fatal and Injury Crashes	**0.10**
Property-Damage-Only Crashes	**0.11**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**47**
Percent Property-Damage-Only Crashes (%)	**53**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**1.1713**
FI Crash Rate (crashes/mi/yr)	**0.5485**
PDO Crash Rate (crashes/mi/yr)	**0.6228**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.14**
Travel Crash Rate (crashes/million veh-mi)	**1.43**
Travel FI Crash Rate (crashes/million veh-mi)	**0.67**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.76**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1009+18.411	0.1739	0.204	0.2037	0.0954	0.1083	1.1713	1.43
Total			0.1739	0.204	0.2037	0.0954	0.1083	1.1713	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1004+10.647	0.0778	0.091	0.0911	0.0427	0.0484	1.1713	1.43
Tangent	1004+10.647	1005+07.534	0.0183	0.021	0.0215	0.0101	0.0114	1.1713	1.43
Simple Curve 2	1005+07.534	1009+18.411	0.0778	0.091	0.0911	0.0427	0.0485	1.1713	1.43

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.20	0.10	46.829	0.11	53.171
Total	0.20	0.10	46.829	0.11	53.171
Average	0.20	0.10	46.829	0.11	53.171

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0016	0.0050	0.0329	0.0559	0.1083

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.00	1.0	0.00	1.1
Highway Segment	Collision with Fixed Object	0.06	28.0	0.07	32.1	0.12	60.1
Highway Segment	Collision with Other Object	0.00	2.0	0.01	6.2	0.02	8.2
Highway Segment	Other Single-vehicle Collision	0.02	8.1	0.01	4.8	0.03	12.9
Highway Segment	Collision with Parked Vehicle	0.00	0.6	0.00	0.7	0.00	1.3
Highway Segment	Total Single Vehicle Crashes	0.08	38.7	0.09	44.9	0.17	83.6
Highway Segment	Right-Angle Collision	0.00	0.3	0.00	0.1	0.00	0.4
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.3	0.00	0.2	0.00	0.5
Highway Segment	Rear-end Collision	0.01	6.1	0.01	5.7	0.02	11.8
Highway Segment	Sideswipe, Same Direction Collision	0.00	1.5	0.00	2.2	0.01	3.7
Highway Segment	Total Multiple Vehicle Crashes	0.02	8.1	0.02	8.3	0.03	16.4
Highway Segment	Total Highway Segment Crashes	0.10	46.8	0.11	53.2	0.20	100.0
	Total Crashes	0.10	46.8	0.11	53.2	0.20	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1009+18.411	Warning: for segment #1 (1000+00.000 to 1009+18.411), The ramp type for Ramp Alignment RMLNBN12 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:52:38 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RMLNBN22
Highway Comment: Imported from RMLNBN22.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:52:30 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1007+82.150

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1007+82.150
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

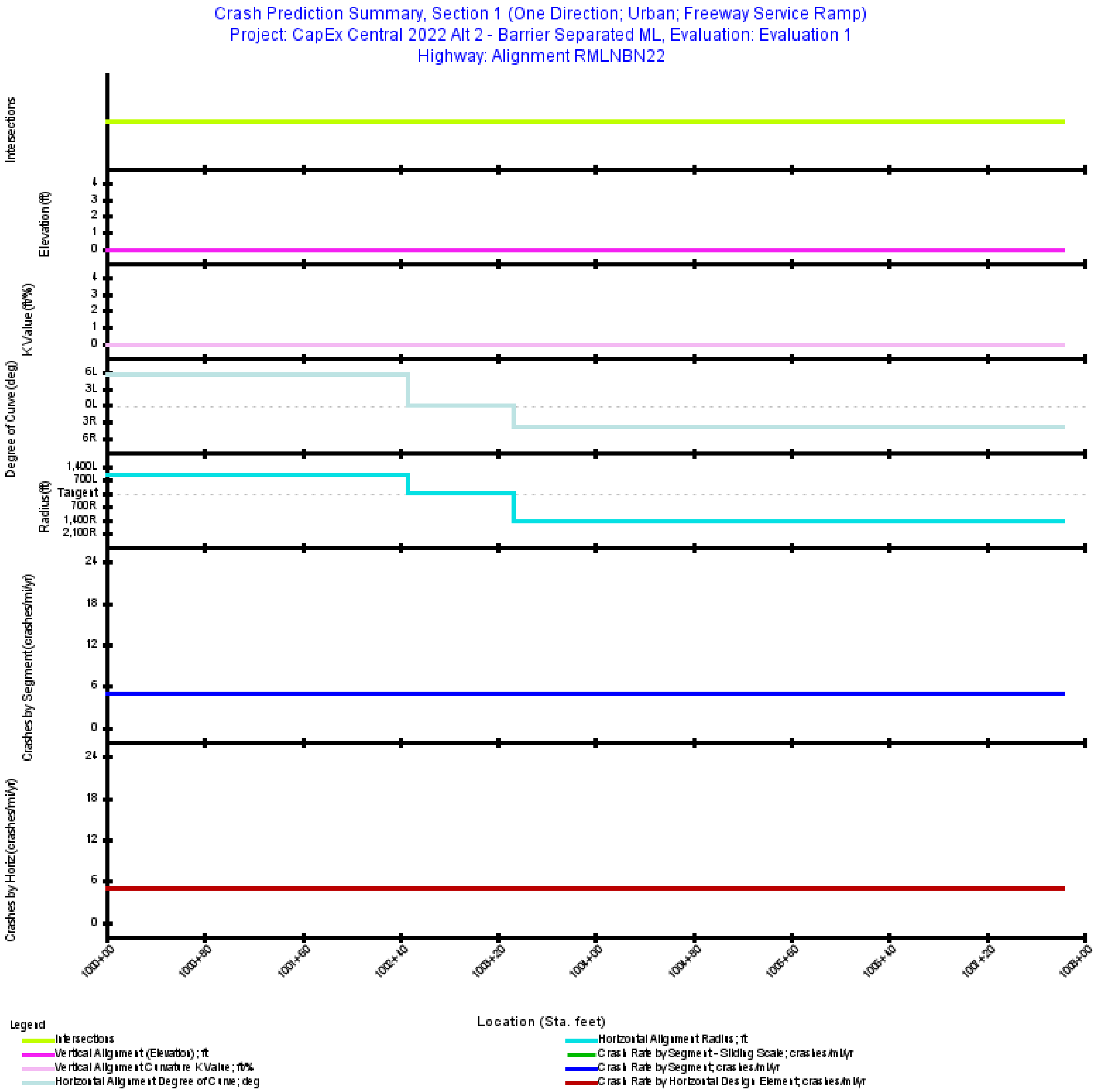

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1007+82.150	782.15	0.1481	2030: 11,100

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1481**
Average Future Road AADT (vpd)	**11,100**
Predicted Crashes	
Total Crashes	**0.75**
Fatal and Injury Crashes	**0.33**
Property-Damage-Only Crashes	**0.42**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**44**
Percent Property-Damage-Only Crashes (%)	**56**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.0435**
FI Crash Rate (crashes/mi/yr)	**2.2217**
PDO Crash Rate (crashes/mi/yr)	**2.8218**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.60**
Travel Crash Rate (crashes/million veh-mi)	**1.25**
Travel FI Crash Rate (crashes/million veh-mi)	**0.55**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.70**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1007+82.150	0.1481	0.747	0.7471	0.3291	0.4180	5.0435	1.25
Total			0.1481	0.747	0.7471	0.3291	0.4180	5.0435	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1002+46.345	0.0467	0.235	0.2353	0.1037	0.1317	5.0435	1.25
Tangent	1002+46.345	1003+33.015	0.0164	0.083	0.0828	0.0365	0.0463	5.0435	1.25
Simple Curve 2	1003+33.015	1007+82.150	0.0851	0.429	0.4290	0.1890	0.2400	5.0435	1.25

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.75	0.33	44.051	0.42	55.949
Total	0.75	0.33	44.051	0.42	55.949
Average	0.75	0.33	44.051	0.42	55.949

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0055	0.0166	0.1107	0.1963	0.4180

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.9	0.01	1.0
Highway Segment	Collision with Fixed Object	0.19	25.3	0.22	28.9	0.41	54.2
Highway Segment	Collision with Other Object	0.01	1.8	0.04	5.6	0.06	7.4
Highway Segment	Other Single-vehicle Collision	0.06	7.3	0.03	4.3	0.09	11.6
Highway Segment	Collision with Parked Vehicle	0.00	0.5	0.01	0.6	0.01	1.2
Highway Segment	Total Single Vehicle Crashes	0.26	35.1	0.30	40.3	0.56	75.4
Highway Segment	Right-Angle Collision	0.00	0.3	0.00	0.3	0.00	0.6
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.3	0.00	0.4	0.01	0.7
Highway Segment	Rear-end Collision	0.05	6.7	0.08	10.8	0.13	17.5
Highway Segment	Sideswipe, Same Direction Collision	0.01	1.6	0.03	4.2	0.04	5.8
Highway Segment	Total Multiple Vehicle Crashes	0.07	9.0	0.12	15.6	0.18	24.6
Highway Segment	Total Highway Segment Crashes	0.33	44.1	0.42	55.9	0.75	100.0
	Total Crashes	0.33	44.1	0.42	55.9	0.75	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1007+82.150	Warning: for segment #1 (1000+00.000 to 1007+82.150), The ramp type for Ramp Alignment RMLNBN22 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

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Report Overview

Report Generated: Aug 25, 2022 8:57 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:53:40 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RMLNBX22
Highway Comment: Imported from RMLNBX22.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:53:25 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1019+34.292

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

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- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
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- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1019+34.292
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

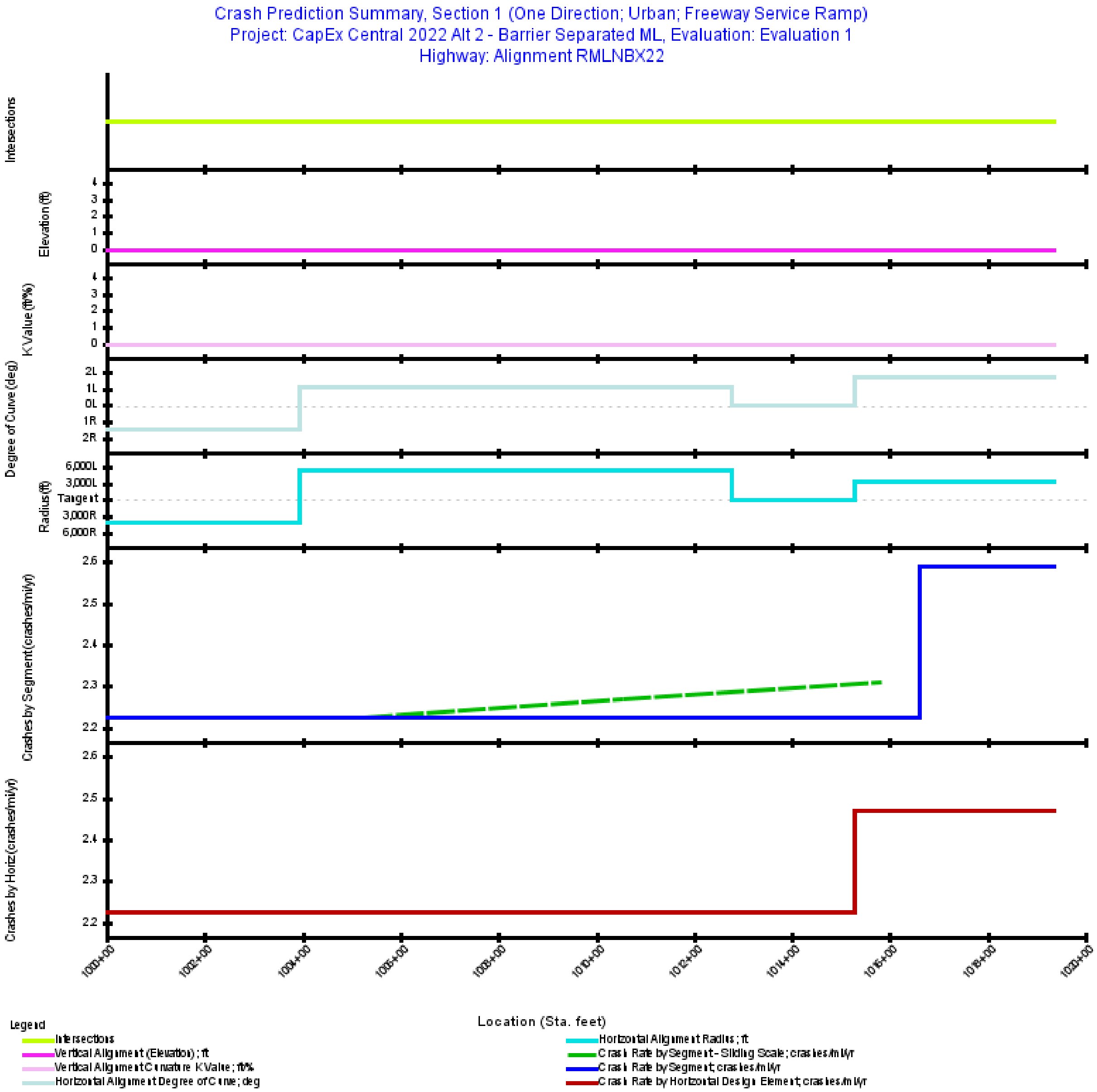

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1016+60.520	1,660.52	0.3145	2030: 4,250
2	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1016+60.520	1019+34.292	273.77	0.0519	2030: 4,250

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.3663**
Average Future Road AADT (vpd)	**4,250**
Predicted Crashes	
Total Crashes	**0.83**
Fatal and Injury Crashes	**0.39**
Property-Damage-Only Crashes	**0.45**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**47**
Percent Property-Damage-Only Crashes (%)	**53**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**2.2763**
FI Crash Rate (crashes/mi/yr)	**1.0612**
PDO Crash Rate (crashes/mi/yr)	**1.2150**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.57**
Travel Crash Rate (crashes/million veh-mi)	**1.47**
Travel FI Crash Rate (crashes/million veh-mi)	**0.68**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.78**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1016+60.520	0.3145	0.700	0.6998	0.3427	0.3570	2.2250	1.43
2	1016+60.520	1019+34.292	0.0519	0.134	0.1341	0.0461	0.0881	2.5872	1.67
Total			0.3663	0.834	0.8339	0.3888	0.4451	2.2763	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1003+93.979	0.0746	0.166	0.1660	0.0813	0.0847	2.2250	1.43
Simple Curve 2	1003+93.979	1012+76.295	0.1671	0.372	0.3718	0.1821	0.1897	2.2250	1.43
Tangent	1012+76.295	1015+28.140	0.0477	0.106	0.1061	0.0520	0.0542	2.2250	1.43
Simple Curve 3	1015+28.140	1019+34.292	0.0769	0.190	0.1899	0.0734	0.1165	2.4691	1.59

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.83	0.39	46.622	0.45	53.378
Total	0.83	0.39	46.622	0.45	53.378
Average	0.83	0.39	46.622	0.45	53.378

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0083	0.0251	0.1092	0.2002	0.3570
2	0.0010	0.0030	0.0108	0.0312	0.0881
Total	0.0093	0.0281	0.1200	0.2314	0.4451

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.1	0.01	1.3
Highway Segment	Collision with Fixed Object	0.27	32.4	0.29	35.1	0.56	67.5
Highway Segment	Collision with Other Object	0.02	2.3	0.06	6.8	0.08	9.1
Highway Segment	Other Single-vehicle Collision	0.08	9.3	0.04	5.2	0.12	14.6
Highway Segment	Collision with Parked Vehicle	0.01	0.7	0.01	0.8	0.01	1.5
Highway Segment	Total Single Vehicle Crashes	0.37	44.9	0.41	49.0	0.78	93.9
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Rear-end Collision	0.01	1.3	0.03	3.0	0.04	4.3
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.3	0.01	1.2	0.01	1.5
Highway Segment	Total Multiple Vehicle Crashes	0.01	1.7	0.04	4.3	0.05	6.1
Highway Segment	Total Highway Segment Crashes	0.39	46.6	0.45	53.4	0.83	100.0
	Total Crashes	0.39	46.6	0.45	53.4	0.83	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1016+60.520	Warning: for segment #1 (1000+00.000 to 1016+60.520), The ramp type for Ramp Alignment RMLNBX22 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1016+60.520	1019+34.292	Warning: for segment #2 (1016+60.520 to 1019+34.292), The ramp type for Ramp Alignment RMLNBX22 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Evaluation Date: Thu Jun 23 10:54:08 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RMLSBN12
Highway Comment: Imported from RMLSBN12.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:53:59 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1010+23.319

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1010+23.319
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

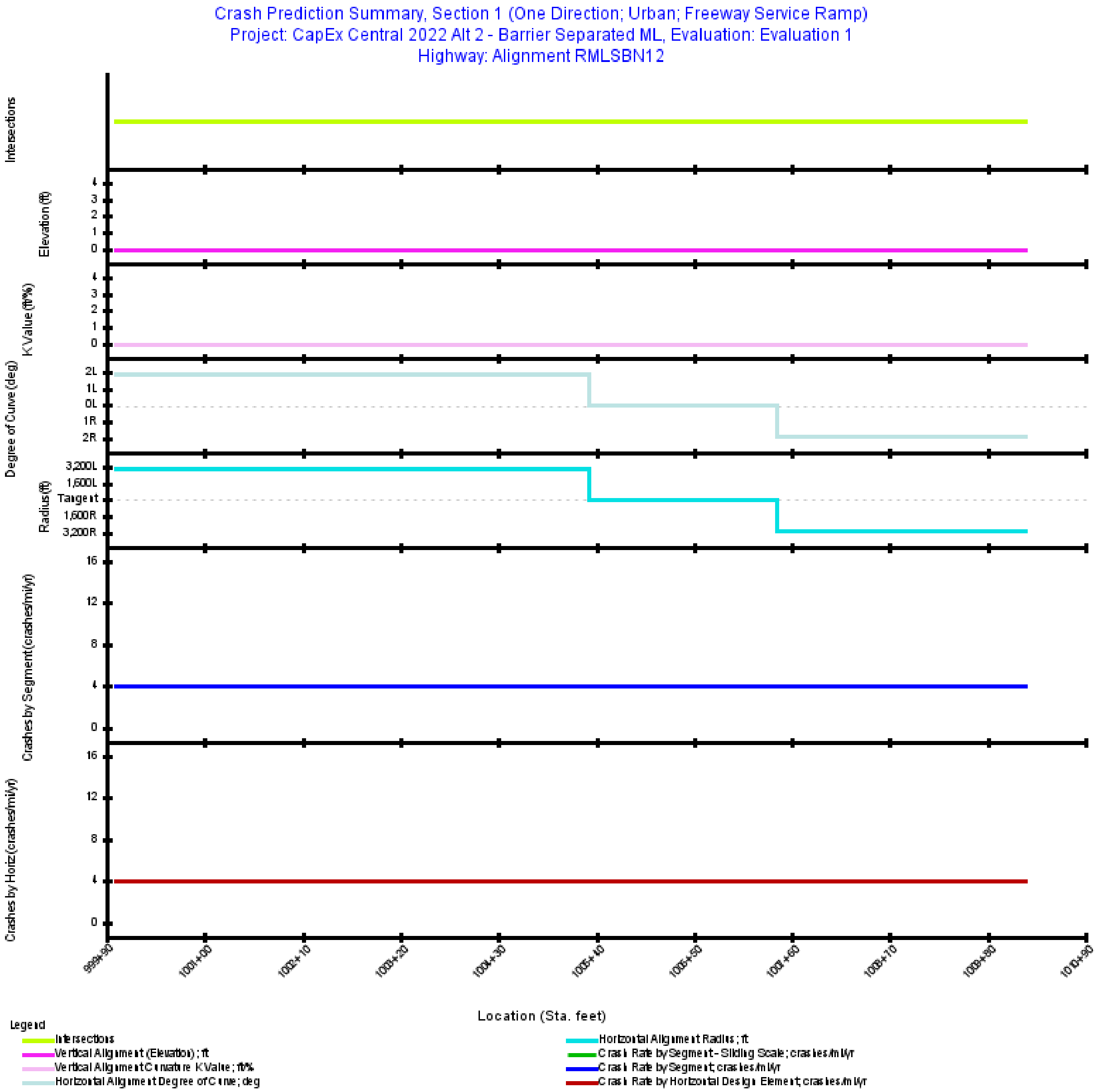

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1010+23.319	1,023.32	0.1938	2030: 10,550

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1938**
Average Future Road AADT (vpd)	**10,550**
Predicted Crashes	
Total Crashes	**0.76**
Fatal and Injury Crashes	**0.34**
Property-Damage-Only Crashes	**0.42**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**44**
Percent Property-Damage-Only Crashes (%)	**56**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**3.9416**
FI Crash Rate (crashes/mi/yr)	**1.7505**
PDO Crash Rate (crashes/mi/yr)	**2.1911**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.75**
Travel Crash Rate (crashes/million veh-mi)	**1.02**
Travel FI Crash Rate (crashes/million veh-mi)	**0.46**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.57**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1010+23.319	0.1938	0.764	0.7639	0.3393	0.4247	3.9416	1.02
Total			0.1938	0.764	0.7639	0.3393	0.4247	3.9416	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi /yr)	Predicted Travel Crash Rate (crashes/mi llion veh-mi)
Simple Curve 1	1000+00.000	1005+31.916	0.1007	0.397	0.3971	0.1763	0.2207	3.9416	1.02
Tangent	1005+31.916	1007+43.132	0.0400	0.158	0.1577	0.0700	0.0877	3.9416	1.02
Simple Curve 2	1007+43.132	1010+23.319	0.0531	0.209	0.2092	0.0929	0.1163	3.9416	1.02

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.76	0.34	44.410	0.42	55.590
Total	0.76	0.34	44.410	0.42	55.590
Average	0.76	0.34	44.410	0.42	55.590

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0058	0.0176	0.1168	0.1990	0.4247

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.8	0.01	1.0
Highway Segment	Collision with Fixed Object	0.19	25.1	0.21	27.5	0.40	52.6
Highway Segment	Collision with Other Object	0.01	1.8	0.04	5.3	0.05	7.1
Highway Segment	Other Single-vehicle Collision	0.06	7.2	0.03	4.1	0.09	11.3
Highway Segment	Collision with Parked Vehicle	0.00	0.5	0.01	0.6	0.01	1.1
Highway Segment	Total Single Vehicle Crashes	0.27	34.8	0.29	38.4	0.56	73.2
Highway Segment	Right-Angle Collision	0.00	0.3	0.00	0.3	0.01	0.6
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.3	0.00	0.4	0.01	0.7
Highway Segment	Rear-end Collision	0.06	7.2	0.09	11.8	0.15	19.1
Highway Segment	Sideswipe, Same Direction Collision	0.01	1.7	0.04	4.6	0.05	6.3
Highway Segment	Total Multiple Vehicle Crashes	0.07	9.6	0.13	17.2	0.20	26.8
Highway Segment	Total Highway Segment Crashes	0.34	44.4	0.42	55.6	0.76	100.0
	Total Crashes	0.34	44.4	0.42	55.6	0.76	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1010+23.319	Warning: for segment #1 (1000+00.000 to 1010+23.319), The ramp type for Ramp Alignment RMLSBN12 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:55:08 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RMLSBX12
Highway Comment: Imported from RMLSBX12.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:54:54 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1006+47.366

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1006+47.366
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

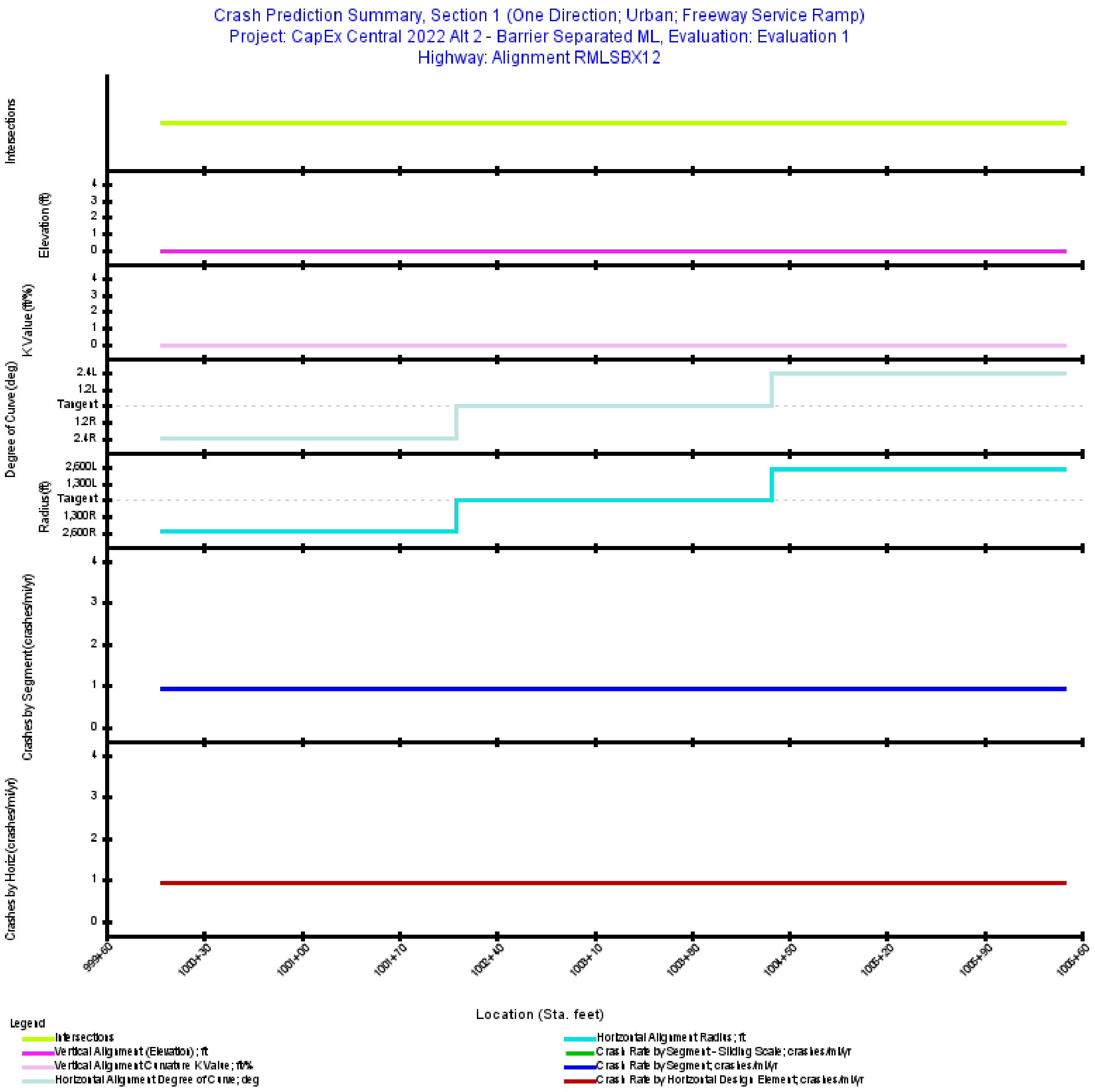

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1006+47.366	647.37	0.1226	2030: 1,450

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1226**
Average Future Road AADT (vpd)	**1,450**
Predicted Crashes	
Total Crashes	**0.11**
Fatal and Injury Crashes	**0.06**
Property-Damage-Only Crashes	**0.06**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**49**
Percent Property-Damage-Only Crashes (%)	**51**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**0.9301**
FI Crash Rate (crashes/mi/yr)	**0.4522**
PDO Crash Rate (crashes/mi/yr)	**0.4780**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.06**
Travel Crash Rate (crashes/million veh-mi)	**1.76**
Travel FI Crash Rate (crashes/million veh-mi)	**0.85**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.90**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1006+47.366	0.1226	0.114	0.1140	0.0554	0.0586	0.9301	1.76
Total			0.1226	0.114	0.1140	0.0554	0.0586	0.9301	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1002+10.698	0.0399	0.037	0.0371	0.0180	0.0191	0.9301	1.76
Tangent	1002+10.698	1004+36.845	0.0428	0.040	0.0398	0.0194	0.0205	0.9301	1.76
Simple Curve 2	1004+36.845	1006+47.366	0.0399	0.037	0.0371	0.0180	0.0191	0.9301	1.76

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.11	0.06	48.613	0.06	51.387
Total	0.11	0.06	48.613	0.06	51.387
Average	0.11	0.06	48.613	0.06	51.387

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0014	0.0044	0.0188	0.0308	0.0586

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.00	1.1	0.00	1.3
Highway Segment	Collision with Fixed Object	0.04	33.9	0.04	35.3	0.08	69.2
Highway Segment	Collision with Other Object	0.00	2.4	0.01	6.9	0.01	9.3
Highway Segment	Other Single-vehicle Collision	0.01	9.8	0.01	5.3	0.02	15.0
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.8	0.00	1.5
Highway Segment	Total Single Vehicle Crashes	0.05	46.9	0.06	49.3	0.11	96.3
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Rear-end Collision	0.00	1.3	0.00	1.4	0.00	2.7
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.3	0.00	0.5	0.00	0.8
Highway Segment	Total Multiple Vehicle Crashes	0.00	1.7	0.00	2.1	0.00	3.7
Highway Segment	Total Highway Segment Crashes	0.06	48.6	0.06	51.4	0.11	100.0
	Total Crashes	0.06	48.6	0.06	51.4	0.11	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1006+47.366	Warning: for segment #1 (1000+00.000 to 1006+47.366), The ramp type for Ramp Alignment RMLSBX12 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Evaluation Date: Thu Jun 23 10:55:35 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RMLSBX22
Highway Comment: Imported from RMLSBX22.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:55:25 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1007+99.527

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1007+99.527
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

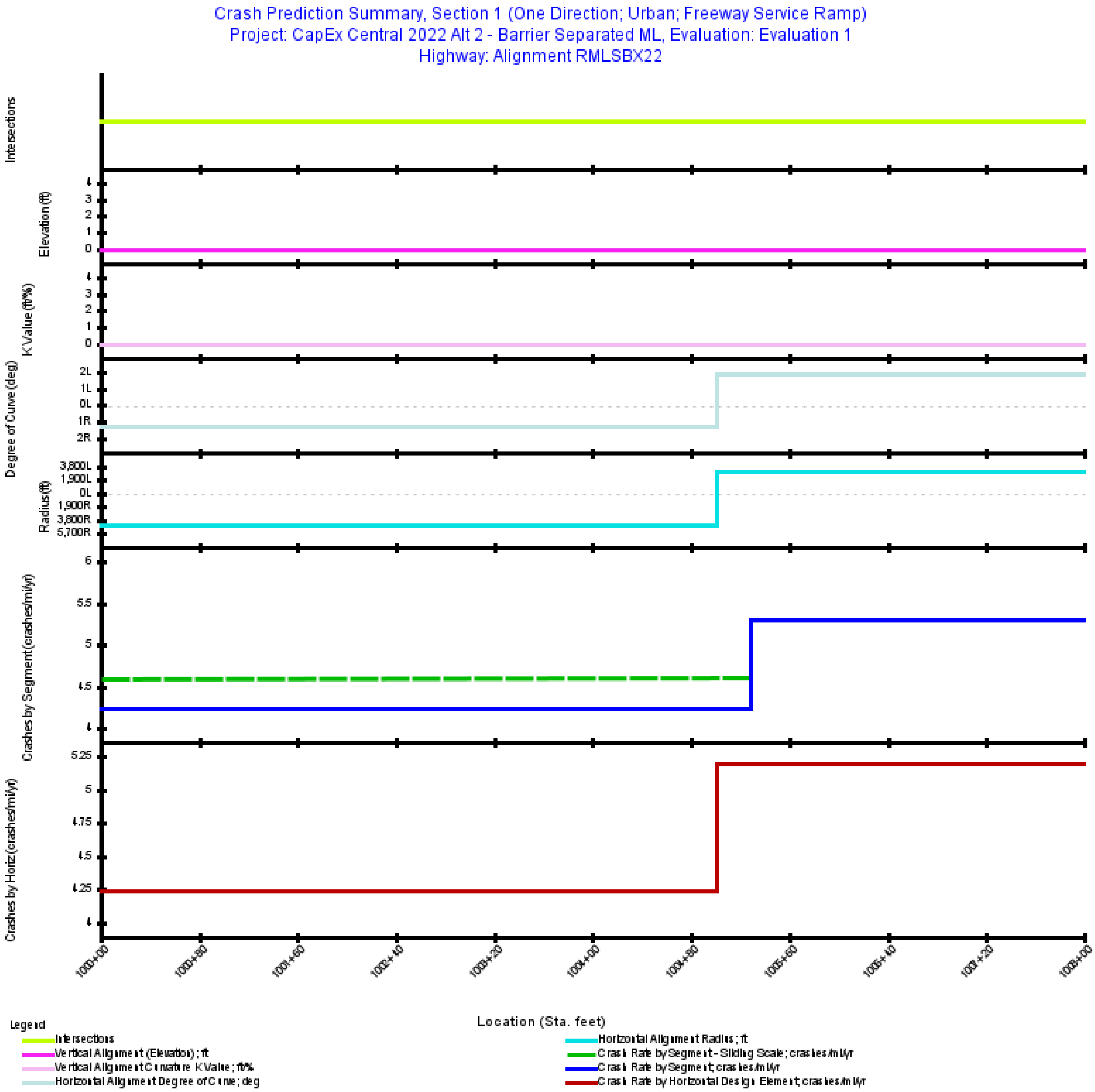

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1005+28.950	528.95	0.1002	2030: 10,650
2	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1005+28.950	1007+99.527	270.58	0.0512	2030: 10,650

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1514**
Average Future Road AADT (vpd)	**10,650**
Predicted Crashes	
Total Crashes	**0.70**
Fatal and Injury Crashes	**0.30**
Property-Damage-Only Crashes	**0.40**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**43**
Percent Property-Damage-Only Crashes (%)	**57**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**4.5933**
FI Crash Rate (crashes/mi/yr)	**1.9638**
PDO Crash Rate (crashes/mi/yr)	**2.6295**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.59**
Travel Crash Rate (crashes/million veh-mi)	**1.18**
Travel FI Crash Rate (crashes/million veh-mi)	**0.51**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.68**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1005+28.950	0.1002	0.424	0.4244	0.2062	0.2182	4.2363	1.09
2	1005+28.950	1007+99.527	0.0512	0.271	0.2712	0.0911	0.1800	5.2913	1.36
Total			0.1514	0.696	0.6955	0.2974	0.3982	4.5933	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1005+00.693	0.0948	0.402	0.4017	0.1952	0.2065	4.2363	1.09
Simple Curve 2	1005+00.693	1007+99.527	0.0566	0.294	0.2938	0.1022	0.1917	5.1915	1.34

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.70	0.30	42.754	0.40	57.246
Total	0.70	0.30	42.754	0.40	57.246
Average	0.70	0.30	42.754	0.40	57.246

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0051	0.0154	0.0669	0.1188	0.2182
2	0.0020	0.0060	0.0213	0.0618	0.1800
Total	0.0071	0.0214	0.0883	0.1806	0.3982

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.1	0.01	1.2
Highway Segment	Collision with Fixed Object	0.20	29.2	0.24	35.1	0.45	64.3
Highway Segment	Collision with Other Object	0.01	2.1	0.05	6.8	0.06	8.9
Highway Segment	Other Single-vehicle Collision	0.06	8.4	0.04	5.2	0.10	13.7
Highway Segment	Collision with Parked Vehicle	0.00	0.6	0.01	0.8	0.01	1.4
Highway Segment	Total Single Vehicle Crashes	0.28	40.5	0.34	49.0	0.62	89.4
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.2	0.00	0.3
Highway Segment	Rear-end Collision	0.01	1.7	0.04	5.7	0.05	7.4
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.4	0.01	2.2	0.02	2.6
Highway Segment	Total Multiple Vehicle Crashes	0.02	2.3	0.06	8.3	0.07	10.6
Highway Segment	Total Highway Segment Crashes	0.30	42.8	0.40	57.2	0.70	100.0
	Total Crashes	0.30	42.8	0.40	57.2	0.70	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1005+28.950	Warning: for segment #1 (1000+00.000 to 1005+28.950), The ramp type for Ramp Alignment RMLSBX22 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1005+28.950	1007+99.527	Warning: for segment #2 (1005+28.950 to 1007+99.527), The ramp type for Ramp Alignment RMLSBX22 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Evaluation Date: Thu Jun 23 10:54:40 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:24:11 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RMLSBN22
Highway Comment: Imported from RMLSBN22.xml
Highway Version: 1

Evaluation Title: Evaluation 2
Evaluation Comment: Created Thu Jun 23 10:54:25 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1020+42.798

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

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- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1020+42.798
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

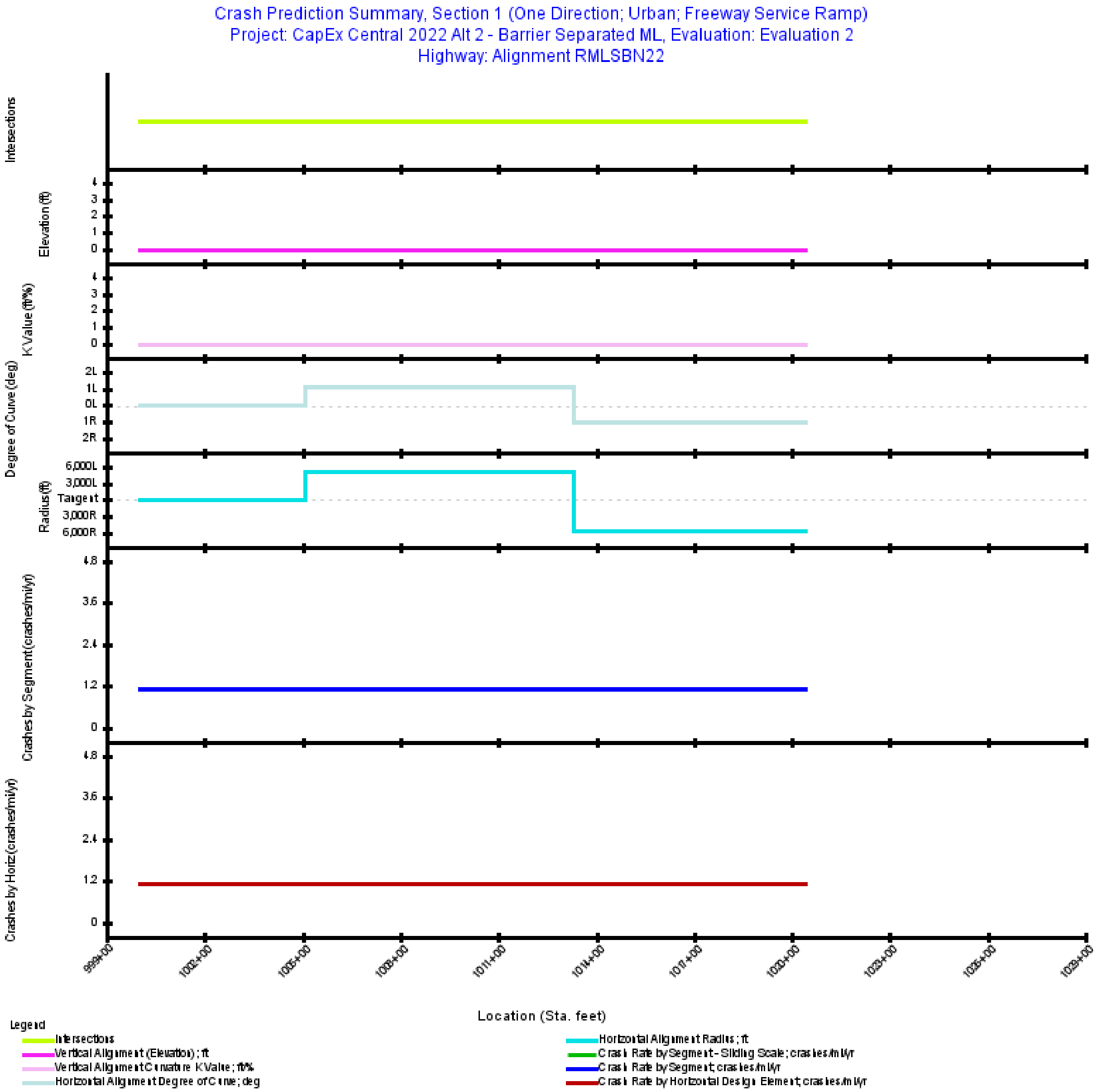

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1020+42.798	2,042.80	0.3869	2030: 2,050

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.3869**
Average Future Road AADT (vpd)	**2,050**
Predicted Crashes	
Total Crashes	**0.43**
Fatal and Injury Crashes	**0.20**
Property-Damage-Only Crashes	**0.23**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**47**
Percent Property-Damage-Only Crashes (%)	**53**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**1.1224**
FI Crash Rate (crashes/mi/yr)	**0.5308**
PDO Crash Rate (crashes/mi/yr)	**0.5916**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.29**
Travel Crash Rate (crashes/million veh-mi)	**1.50**
Travel FI Crash Rate (crashes/million veh-mi)	**0.71**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.79**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1020+42.798	0.3869	0.434	0.4343	0.2054	0.2289	1.1224	1.50
Total			0.3869	0.434	0.4343	0.2054	0.2289	1.1224	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1005+07.217	0.0961	0.108	0.1078	0.0510	0.0568	1.1224	1.50
Simple Curve 1	1005+07.217	1013+29.541	0.1557	0.175	0.1748	0.0827	0.0921	1.1224	1.50
Simple Curve 2	1013+29.541	1020+42.798	0.1351	0.152	0.1516	0.0717	0.0799	1.1224	1.50

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.43	0.20	47.289	0.23	52.711
Total	0.43	0.20	47.289	0.23	52.711
Average	0.43	0.20	47.289	0.23	52.711

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0034	0.0103	0.0687	0.1230	0.2289

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.00	1.0	0.01	1.1
Highway Segment	Collision with Fixed Object	0.12	28.1	0.14	31.9	0.26	60.1
Highway Segment	Collision with Other Object	0.01	2.0	0.03	6.2	0.04	8.2
Highway Segment	Other Single-vehicle Collision	0.04	8.1	0.02	4.8	0.06	12.9
Highway Segment	Collision with Parked Vehicle	0.00	0.6	0.00	0.7	0.01	1.3
Highway Segment	Total Single Vehicle Crashes	0.17	39.0	0.19	44.6	0.36	83.6
Highway Segment	Right-Angle Collision	0.00	0.3	0.00	0.1	0.00	0.4
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.3	0.00	0.2	0.00	0.5
Highway Segment	Rear-end Collision	0.03	6.3	0.02	5.6	0.05	11.8
Highway Segment	Sideswipe, Same Direction Collision	0.01	1.5	0.01	2.2	0.02	3.7
Highway Segment	Total Multiple Vehicle Crashes	0.04	8.3	0.04	8.1	0.07	16.4
Highway Segment	Total Highway Segment Crashes	0.20	47.3	0.23	52.7	0.43	100.0
	Total Crashes	0.20	47.3	0.23	52.7	0.43	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1020+42.798	Warning: for segment #1 (1000+00.000 to 1020+42.798), The ramp type for Ramp Alignment RMLSBN22 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

I-35 Build Alternative 2 Model Frontage Road Intersections

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 9:02 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Fri Jul 23 10:10:42 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - Build Alt 2
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: 51st Street @ Cameron Road
Intersection Comment: Created Mon Mar 01 15:42:16 CST 2021
Intersection Version: v1

Evaluation Title: Evaluation 5
Evaluation Comment: Created Fri Jul 23 10:10:28 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1010+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

51st Street @ Cameron Road Evaluation

Intersection: 51st Street @ Cameron Road
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1010+00.000
Calibration Factor: 3SG=1.0;

Table 1. Evaluation Intersection (51st Street @ Cameron Road)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	51st Street @ Cameron Road (v1)	Urban/Suburban Arterial Intersection Three-Legged Signalized	1009+00.000	2030: 38,100	2030: 26,450	3	Signalized	2	2	0	0	true	false	false	3	0	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (51st Street @ Cameron Road)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**6.68**
Fatal and Injury Crashes	**1.96**
Property-Damage-Only Crashes	**4.72**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**29**
Percent Property-Damage-Only Crashes (%)	**71**

Table 3. Predicted Crash Frequencies by Year (51st Street @ Cameron Road)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	6.68	1.96	29.327	4.72	70.673
Total	6.68	1.96	29.327	4.72	70.673
Average	6.68	1.96	29.327	4.72	70.673

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (51st Street @ Cameron Road)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Collision with Animal	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Bicycle	0.07	1.1	0.00	0.0	0.07	1.1
Intersection	Collision with Fixed Object	0.09	1.3	0.24	3.6	0.33	4.9
Intersection	Non-Collision	0.03	0.4	0.00	0.1	0.03	0.5
Intersection	Collision with Other Object	0.01	0.2	0.02	0.3	0.03	0.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.01	0.1	0.01	0.2
Intersection	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Total Intersection Single Vehicle Crashes	0.20	3.0	0.27	4.0	0.47	7.1
Intersection	Angle Collision	0.49	7.4	0.91	13.6	1.40	21.0
Intersection	Head-on Collision	0.07	1.0	0.09	1.3	0.16	2.3
Intersection	Other Multi-vehicle Collision	0.10	1.5	0.88	13.2	0.98	14.7
Intersection	Rear-end Collision	0.96	14.4	2.43	36.4	3.40	50.8
Intersection	Sideswipe	0.13	2.0	0.14	2.1	0.28	4.1
Intersection	Total Intersection Multiple Vehicle Crashes	1.76	26.3	4.45	66.6	6.21	92.9
Intersection	Total Intersection Crashes	1.96	29.3	4.72	70.7	6.68	100.0
	Total Crashes	1.96	29.3	4.72	70.7	6.68	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1009+00.000	1009+00.000	for intersection #1 (1009+00.000 to 1009+00.000), minor road traffic volume (26,450 vpd) for 2030 is not within the model limit (16,400 vpd) for reliable results for intersection type 3SG

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 9:02 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 07:47:23 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Airport Blvd EAST
Intersection Comment: Created Tue Jun 29 09:20:12 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 07:47:14 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & Airport Blvd EAST Evaluation

Intersection: I-35 & Airport Blvd EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Airport Blvd EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Airport Blvd EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 19,900	2030: 47,050	4	Signalized	2	1	2	0	true	false	true	3	0	10

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Airport Blvd EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**20.13**
Fatal and Injury Crashes	**4.11**
Property-Damage-Only Crashes	**16.03**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Airport Blvd EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	20.13	4.11	20.389	16.03	79.612
Total	20.13	4.11	20.389	16.03	79.612
Average	20.13	4.11	20.389	16.03	79.612

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Airport Blvd EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	3.24	16.1	11.75	58.3	14.98	74.4
Intersection	Collision with Bicycle	0.24	1.2	0.00	0.0	0.24	1.2
Intersection	Head-on Collision	0.15	0.7	0.48	2.4	0.63	3.1
Intersection	Other Multi-vehicle Collision	0.12	0.6	0.19	1.0	0.31	1.5
Intersection	Other Single-vehicle Collision	0.02	0.1	0.34	1.7	0.36	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.12	0.6	0.95	4.7	1.06	5.3
Intersection	Sideswipe	0.23	1.1	2.32	11.5	2.55	12.7
Intersection	Total Intersection Total Vehicle Crashes	4.11	20.4	16.03	79.6	20.14	100.0
Intersection	Total Intersection Crashes	4.11	20.4	16.03	79.6	20.14	100.0
	Total Crashes	4.11	20.4	16.03	79.6	20.14	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	Information: for intersection #1 (1001+00.000 to 1001+00.000), For I-35 & Airport Blvd EAST, minor leg E Airport Blvd at 1006+00.000 has higher average traffic volume (44225.0) than major leg N I-35 NBFR @ Airport Blvd at 1001+00.000 average traffic volume (19900.0). For I-35 & Airport Blvd EAST, minor leg W Airport Blvd at 1006+00.000 has higher average traffic volume (44225.0) than major leg N I-35 NBFR @ Airport Blvd at 1001+00.000 average traffic volume (19900.0). For I-35 & Airport Blvd EAST, minor leg E Airport Blvd at 1006+00.000 has higher average traffic volume (44225.0) than major leg S I-35 NBFR @ Airport Blvd at 1001+00.000 average traffic volume (19900.0). For I-35 & Airport Blvd EAST, minor leg W Airport Blvd at 1006+00.000 has higher average traffic volume (44225.0) than major leg S I-35 NBFR @ Airport Blvd at 1001+00.000 average traffic volume (19900.0).

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 07:48:09 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 38 1/2 St EAST
Intersection Comment: Created Tue Jun 29 09:47:45 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 07:48:02 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & 38 1/2 St EAST Evaluation

Intersection: I-35 & 38 1/2 St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 38 1/2 St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 38 1/2 St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 36,400	2030: 12,600	4	Signalized	2	0	2	0	true	false	false	3	1	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 38 1/2 St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**5.41**
Fatal and Injury Crashes	**0.99**
Property-Damage-Only Crashes	**4.41**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**18**
Percent Property-Damage-Only Crashes (%)	**82**

Table 3. Predicted Crash Frequencies by Year (I-35 & 38 1/2 St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.41	0.99	18.401	4.41	81.599
Total	5.41	0.99	18.401	4.41	81.599
Average	5.41	0.99	18.401	4.41	81.599

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 38 1/2 St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.78	14.4	3.23	59.8	4.01	74.2
Intersection	Collision with Bicycle	0.06	1.2	0.00	0.0	0.06	1.2
Intersection	Head-on Collision	0.04	0.7	0.13	2.4	0.17	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.5	0.05	1.0	0.08	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.09	1.7	0.10	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.5	0.26	4.8	0.29	5.3
Intersection	Sideswipe	0.06	1.0	0.64	11.8	0.69	12.8
Intersection	Total Intersection Total Vehicle Crashes	1.00	18.4	4.41	81.6	5.41	100.0
Intersection	Total Intersection Crashes	1.00	18.4	4.41	81.6	5.41	100.0
	Total Crashes	1.00	18.4	4.41	81.6	5.41	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Evaluation Date: Thu Jul 21 14:38:54 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 32nd St EAST
Intersection Comment: Created Tue Jun 29 09:59:14 CDT 2021
Intersection Version: v1

Evaluation Title: 20220721
Evaluation Comment: Created Thu Jul 21 14:38:31 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & 32nd St EAST Evaluation

Intersection: I-35 & 32nd St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 3SG=1.0;

Table 1. Evaluation Intersection (I-35 & 32nd St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 32nd St EAST (v1)	Urban/Suburban Arterial Intersection Three-Legged Signalized	1001+00.000	2030: 29,800	2030: 5,950	3	Signalized	2	0	3	0	true	false	false	0	0	3

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 32nd St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**3.65**
Fatal and Injury Crashes	**0.84**
Property-Damage-Only Crashes	**2.81**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**23**
Percent Property-Damage-Only Crashes (%)	**77**

Table 3. Predicted Crash Frequencies by Year (I-35 & 32nd St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	3.65	0.84	22.910	2.81	77.090
Total	3.65	0.84	22.910	2.81	77.090
Average	3.65	0.84	22.910	2.81	77.090

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 32nd St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.69	19.0	1.61	44.1	2.30	63.0
Intersection	Collision with Bicycle	0.06	1.6	0.00	0.0	0.06	1.6
Intersection	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Other Multi-vehicle Collision	0.00	0.0	0.20	5.5	0.20	5.5
Intersection	Other Single-vehicle Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.09	2.4	0.40	11.0	0.49	13.4
Intersection	Sideswipe	0.00	0.0	0.60	16.5	0.60	16.5
Intersection	Total Intersection Total Vehicle Crashes	0.84	22.9	2.81	77.1	3.65	100.0
Intersection	Total Intersection Crashes	0.84	22.9	2.81	77.1	3.65	100.0
	Total Crashes	0.84	22.9	2.81	77.1	3.65	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

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Evaluation Date: Thu Jul 21 14:37:24 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Manor Rd
Intersection Comment: Created Tue Jun 29 10:10:06 CDT 2021
Intersection Version: v1

Evaluation Title: 20220721
Evaluation Comment: Created Thu Jul 21 14:37:12 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & Manor Rd Evaluation

Intersection: I-35 & Manor Rd
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Manor Rd)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Manor Rd (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 54,100	2030: 9,300	4	Signalized	4	0	2	0	true	false	true	5	0	6

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Manor Rd)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**9.80**
Fatal and Injury Crashes	**3.59**
Property-Damage-Only Crashes	**6.21**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**37**
Percent Property-Damage-Only Crashes (%)	**63**

Table 3. Predicted Crash Frequencies by Year (I-35 & Manor Rd)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	9.80	3.59	36.645	6.21	63.355
Total	9.80	3.59	36.645	6.21	63.355
Average	9.80	3.59	36.645	6.21	63.355

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Manor Rd)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Collision with Animal	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Bicycle	0.14	1.5	0.00	0.0	0.14	1.5
Intersection	Collision with Fixed Object	0.06	0.6	0.29	2.9	0.35	3.6
Intersection	Non-Collision	0.01	0.1	0.01	0.1	0.02	0.2
Intersection	Collision with Other Object	0.01	0.1	0.02	0.2	0.03	0.3
Intersection	Other Single-vehicle Collision	0.00	0.0	0.01	0.1	0.01	0.1
Intersection	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Total Intersection Single Vehicle Crashes	0.23	2.3	0.33	3.4	0.56	5.7
Intersection	Angle Collision	1.17	11.9	1.44	14.6	2.60	26.5
Intersection	Head-on Collision	0.17	1.7	0.18	1.8	0.34	3.5
Intersection	Other Multi-vehicle Collision	0.18	1.9	1.24	12.7	1.43	14.5
Intersection	Rear-end Collision	1.51	15.4	2.84	29.0	4.35	44.4
Intersection	Sideswipe	0.33	3.4	0.19	1.9	0.52	5.3
Intersection	Total Intersection Multiple Vehicle Crashes	3.36	34.3	5.88	60.0	9.24	94.3
Intersection	Total Intersection Crashes	3.59	36.6	6.21	63.4	9.80	100.0
	Total Crashes	3.59	36.6	6.21	63.4	9.80	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 21 14:36:35 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & MLK Jr Blvd EAST
Intersection Comment: Created Tue Jun 29 10:24:34 CDT 2021
Intersection Version: v1

Evaluation Title: 20220721
Evaluation Comment: Created Thu Jul 21 14:36:21 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

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- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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Section Types

I-35 & MLK Jr Blvd EAST Evaluation

Intersection: I-35 & MLK Jr Blvd EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & MLK Jr Blvd EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & MLK Jr Blvd EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 14,750	2030: 21,900	4	Signalized	2	0	2	0	true	false	true	4	0	6

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & MLK Jr Blvd EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**7.60**
Fatal and Injury Crashes	**1.61**
Property-Damage-Only Crashes	**5.99**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**21**
Percent Property-Damage-Only Crashes (%)	**79**

Table 3. Predicted Crash Frequencies by Year (I-35 & MLK Jr Blvd EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	7.60	1.61	21.210	5.99	78.790
Total	7.60	1.61	21.210	5.99	78.790
Average	7.60	1.61	21.210	5.99	78.790

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & MLK Jr Blvd EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.27	16.8	4.39	57.7	5.66	74.5
Intersection	Collision with Bicycle	0.09	1.2	0.00	0.0	0.09	1.2
Intersection	Head-on Collision	0.06	0.8	0.18	2.4	0.24	3.1
Intersection	Other Multi-vehicle Collision	0.05	0.6	0.07	0.9	0.12	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.13	1.7	0.14	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.05	0.6	0.35	4.6	0.40	5.2
Intersection	Sideswipe	0.09	1.2	0.87	11.4	0.96	12.6
Intersection	Total Intersection Total Vehicle Crashes	1.61	21.2	5.99	78.8	7.60	100.0
Intersection	Total Intersection Crashes	1.61	21.2	5.99	78.8	7.60	100.0
	Total Crashes	1.61	21.2	5.99	78.8	7.60	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	Information: for intersection #1 (1001+00.000 to 1001+00.000), For I-35 & MLK Jr Blvd EAST, minor leg E MLK Jr Blvd at 1005+50.000 has higher average traffic volume (21600.0) than major leg N I-35 NBFR @ MLK Jr Blvd at 1001+00.000 average traffic volume (14525.0). For I-35 & MLK Jr Blvd EAST, minor leg W MLK Jr Blvd at 1005+50.000 has higher average traffic volume (21600.0) than major leg N I-35 NBFR @ MLK Jr Blvd at 1001+00.000 average traffic volume (14525.0). For I-35 & MLK Jr Blvd EAST, minor leg E MLK Jr Blvd at 1005+50.000 has higher average traffic volume (21600.0) than major leg S I-35 NBFR @ MLK Jr Blvd at 1001+00.000 average traffic volume (14525.0). For I-35 & MLK Jr Blvd EAST, minor leg W MLK Jr Blvd at 1005+50.000 has higher average traffic volume (21600.0) than major leg S I-35 NBFR @ MLK Jr Blvd at 1001+00.000 average traffic volume (14525.0).

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 07:49:32 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 15th St EAST
Intersection Comment: Created Tue Jun 29 10:37:20 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 07:49:21 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & 15th St EAST Evaluation

Intersection: I-35 & 15th St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 3SG=1.0;

Table 1. Evaluation Intersection (I-35 & 15th St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 15th St EAST (v1)	Urban/Suburban Arterial Intersection Three-Legged Signalized	1001+00.000	2030: 35,350	2030: 18,200	3	Signalized	2	0	3	0	true	false	true	1	0	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 15th St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**6.89**
Fatal and Injury Crashes	**1.89**
Property-Damage-Only Crashes	**5.00**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**27**
Percent Property-Damage-Only Crashes (%)	**73**

Table 3. Predicted Crash Frequencies by Year (I-35 & 15th St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	6.89	1.89	27.416	5.00	72.584
Total	6.89	1.89	27.416	5.00	72.584
Average	6.89	1.89	27.416	5.00	72.584

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 15th St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.58	23.0	2.85	41.5	4.44	64.5
Intersection	Collision with Bicycle	0.11	1.6	0.00	0.0	0.11	1.6
Intersection	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Other Multi-vehicle Collision	0.00	0.0	0.35	5.2	0.35	5.2
Intersection	Other Single-vehicle Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.20	2.9	0.71	10.4	0.91	13.3
Intersection	Sideswipe	0.00	0.0	1.07	15.5	1.07	15.5
Intersection	Total Intersection Total Vehicle Crashes	1.89	27.4	4.99	72.6	6.88	100.0
Intersection	Total Intersection Crashes	1.89	27.4	4.99	72.6	6.88	100.0
	Total Crashes	1.89	27.4	4.99	72.6	6.88	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 07:49:56 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 12th St EAST
Intersection Comment: Created Tue Jun 29 10:43:54 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 5
Evaluation Comment: Created Thu Jun 23 07:49:49 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & 12th St EAST Evaluation

Intersection: I-35 & 12th St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 12th St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 12th St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 20,150	2030: 11,150	4	Signalized	2	1	2	0	true	false	false	5	0	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 12th St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**4.70**
Fatal and Injury Crashes	**0.95**
Property-Damage-Only Crashes	**3.75**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & 12th St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.70	0.95	20.128	3.75	79.871
Total	4.70	0.95	20.128	3.75	79.871
Average	4.70	0.95	20.128	3.75	79.871

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 12th St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.74	15.9	2.75	58.5	3.50	74.4
Intersection	Collision with Bicycle	0.06	1.2	0.00	0.0	0.06	1.2
Intersection	Head-on Collision	0.04	0.7	0.11	2.4	0.15	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.6	0.04	1.0	0.07	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.08	1.7	0.08	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.6	0.22	4.7	0.25	5.3
Intersection	Sideswipe	0.05	1.1	0.54	11.6	0.60	12.7
Intersection	Total Intersection Total Vehicle Crashes	0.95	20.1	3.75	79.9	4.70	100.0
Intersection	Total Intersection Crashes	0.95	20.1	3.75	79.9	4.70	100.0
	Total Crashes	0.95	20.1	3.75	79.9	4.70	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Generated: Aug 25, 2022 9:06 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 30 15:08:55 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 11th St EAST
Intersection Comment: Created Tue Jun 29 10:51:52 CDT 2021
Intersection Version: v1

Evaluation Title: Posted Speed Added
Evaluation Comment: Created Thu Jun 30 15:08:41 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

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The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

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Section Types

I-35 & 11th St EAST Evaluation

Intersection: I-35 & 11th St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 11th St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 11th St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 20,500	2030: 15,850	4	Signalized	2	0	2	0	true	false	false	6	1	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 11th St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**4.80**
Fatal and Injury Crashes	**0.97**
Property-Damage-Only Crashes	**3.83**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & 11th St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.80	0.97	20.130	3.83	79.870
Total	4.80	0.97	20.130	3.83	79.870
Average	4.80	0.97	20.130	3.83	79.870

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 11th St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.76	15.9	2.81	58.5	3.57	74.4
Intersection	Collision with Bicycle	0.06	1.2	0.00	0.0	0.06	1.2
Intersection	Head-on Collision	0.04	0.7	0.12	2.4	0.15	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.6	0.05	1.0	0.07	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.08	1.7	0.09	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.6	0.23	4.7	0.25	5.3
Intersection	Sideswipe	0.05	1.1	0.56	11.6	0.61	12.7
Intersection	Total Intersection Total Vehicle Crashes	0.97	20.1	3.83	79.9	4.80	100.0
Intersection	Total Intersection Crashes	0.97	20.1	3.83	79.9	4.80	100.0
	Total Crashes	0.97	20.1	3.83	79.9	4.80	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 07:54:58 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 8th St EAST
Intersection Comment: Created Tue Jun 29 11:01:56 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 5
Evaluation Comment: Created Thu Jun 23 07:54:49 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & 8th St EAST Evaluation

Intersection: I-35 & 8th St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 8th St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 8th St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 57,250	2030: 6,300	4	Signalized	1	0	2	20	true	false	false	3	9	3

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 8th St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**5.39**
Fatal and Injury Crashes	**1.00**
Property-Damage-Only Crashes	**4.39**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**19**
Percent Property-Damage-Only Crashes (%)	**81**

Table 3. Predicted Crash Frequencies by Year (I-35 & 8th St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.39	1.00	18.535	4.39	81.465
Total	5.39	1.00	18.535	4.39	81.465
Average	5.39	1.00	18.535	4.39	81.465

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 8th St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.70	13.0	3.22	59.7	3.92	72.8
Intersection	Collision with Bicycle	0.06	1.2	0.00	0.0	0.06	1.2
Intersection	Head-on Collision	0.03	0.6	0.13	2.4	0.16	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.5	0.05	1.0	0.08	1.4
Intersection	Other Single-vehicle Collision	0.01	0.1	0.09	1.7	0.10	1.8
Intersection	Collision with Pedestrian	0.10	1.8	0.00	0.0	0.10	1.8
Intersection	Rear-end Collision	0.03	0.5	0.26	4.8	0.28	5.3
Intersection	Sideswipe	0.05	0.9	0.64	11.8	0.69	12.7
Intersection	Total Intersection Total Vehicle Crashes	1.00	18.5	4.39	81.5	5.39	100.0
Intersection	Total Intersection Crashes	1.00	18.5	4.39	81.5	5.39	100.0
	Total Crashes	1.00	18.5	4.39	81.5	5.39	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 08:02:42 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 7th St EAST
Intersection Comment: Created Tue Jun 29 13:04:21 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 5
Evaluation Comment: Created Thu Jun 23 08:02:32 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & 7th St EAST Evaluation

Intersection: I-35 & 7th St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 7th St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 7th St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 57,250	2030: 21,500	4	Signalized	1	1	2	20	true	false	true	3	11	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 7th St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**9.49**
Fatal and Injury Crashes	**1.81**
Property-Damage-Only Crashes	**7.68**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**19**
Percent Property-Damage-Only Crashes (%)	**81**

Table 3. Predicted Crash Frequencies by Year (I-35 & 7th St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	9.49	1.81	19.057	7.68	80.943
Total	9.49	1.81	19.057	7.68	80.943
Average	9.49	1.81	19.057	7.68	80.943

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 7th St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.25	13.1	5.63	59.3	6.88	72.4
Intersection	Collision with Bicycle	0.11	1.2	0.00	0.0	0.11	1.2
Intersection	Head-on Collision	0.06	0.6	0.23	2.4	0.29	3.0
Intersection	Other Multi-vehicle Collision	0.04	0.5	0.09	1.0	0.14	1.4
Intersection	Other Single-vehicle Collision	0.01	0.1	0.16	1.7	0.17	1.8
Intersection	Collision with Pedestrian	0.21	2.2	0.00	0.0	0.21	2.2
Intersection	Rear-end Collision	0.04	0.5	0.45	4.8	0.50	5.2
Intersection	Sideswipe	0.09	0.9	1.11	11.7	1.20	12.7
Intersection	Total Intersection Total Vehicle Crashes	1.81	19.1	7.68	80.9	9.49	100.0
Intersection	Total Intersection Crashes	1.81	19.1	7.68	80.9	9.49	100.0
	Total Crashes	1.81	19.1	7.68	80.9	9.49	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Evaluation Date: Thu Jun 23 07:58:19 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 6th St EAST
Intersection Comment: Created Tue Jun 29 11:45:41 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 5
Evaluation Comment: Created Thu Jun 23 07:58:11 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
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Section Types

I-35 & 6th St EAST Evaluation

Intersection: I-35 & 6th St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 6th St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 6th St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 42,350	2030: 14,350	4	Signalized	2	0	2	20	true	false	true	3	11	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 6th St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**6.80**
Fatal and Injury Crashes	**1.36**
Property-Damage-Only Crashes	**5.44**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & 6th St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	6.80	1.36	20.072	5.44	79.928
Total	6.80	1.36	20.072	5.44	79.928
Average	6.80	1.36	20.072	5.44	79.928

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 6th St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.93	13.7	3.99	58.6	4.92	72.3
Intersection	Collision with Bicycle	0.08	1.2	0.00	0.0	0.08	1.2
Intersection	Head-on Collision	0.04	0.6	0.16	2.4	0.21	3.0
Intersection	Other Multi-vehicle Collision	0.03	0.5	0.07	1.0	0.10	1.4
Intersection	Other Single-vehicle Collision	0.01	0.1	0.11	1.7	0.12	1.8
Intersection	Collision with Pedestrian	0.17	2.5	0.00	0.0	0.17	2.5
Intersection	Rear-end Collision	0.03	0.5	0.32	4.7	0.35	5.2
Intersection	Sideswipe	0.07	1.0	0.79	11.6	0.85	12.6
Intersection	Total Intersection Total Vehicle Crashes	1.37	20.1	5.44	79.9	6.80	100.0
Intersection	Total Intersection Crashes	1.37	20.1	5.44	79.9	6.80	100.0
	Total Crashes	1.37	20.1	5.44	79.9	6.80	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

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Report Overview

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 07:59:08 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Cesar Chavez St EAST
Intersection Comment: Created Tue Jun 29 12:05:44 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 07:58:47 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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Section Types

I-35 & Cesar Chavez St EAST Evaluation

Intersection: I-35 & Cesar Chavez St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Cesar Chavez St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Cesar Chavez St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 15,150	2030: 24,250	4	Signalized	2	0	2	0	true	false	false	5	8	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Cesar Chavez St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**5.11**
Fatal and Injury Crashes	**1.08**
Property-Damage-Only Crashes	**4.03**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**21**
Percent Property-Damage-Only Crashes (%)	**79**

Table 3. Predicted Crash Frequencies by Year (I-35 & Cesar Chavez St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.11	1.08	21.141	4.03	78.859
Total	5.11	1.08	21.141	4.03	78.859
Average	5.11	1.08	21.141	4.03	78.859

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Cesar Chavez St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.85	16.7	2.96	57.8	3.81	74.5
Intersection	Collision with Bicycle	0.06	1.2	0.00	0.0	0.06	1.2
Intersection	Head-on Collision	0.04	0.8	0.12	2.4	0.16	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.6	0.05	0.9	0.08	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.09	1.7	0.09	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.6	0.24	4.7	0.27	5.2
Intersection	Sideswipe	0.06	1.2	0.58	11.4	0.65	12.6
Intersection	Total Intersection Total Vehicle Crashes	1.08	21.2	4.03	78.8	5.11	100.0
Intersection	Total Intersection Crashes	1.08	21.2	4.03	78.8	5.11	100.0
	Total Crashes	1.08	21.2	4.03	78.8	5.11	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	Information: for intersection #1 (1001+00.000 to 1001+00.000), For I-35 & Cesar Chavez St EAST, minor leg E Cesar Chavez St at 1004+00.000 has higher average traffic volume (20425.0) than major leg N I-35 NBFR @ Cesar Chavez St at 1001+00.000 average traffic volume (10450.0). For I-35 & Cesar Chavez St EAST, minor leg W Cesar Chavez St at 1004+00.000 has higher average traffic volume (20425.0) than major leg N I-35 NBFR @ Cesar Chavez St at 1001+00.000 average traffic volume (10450.0). For I-35 & Cesar Chavez St EAST, minor leg E Cesar Chavez St at 1004+00.000 has higher average traffic volume (20425.0) than major leg S I-35 NBFR @ Cesar Chavez St at 1001+00.000 average traffic volume (10450.0). For I-35 & Cesar Chavez St EAST, minor leg W Cesar Chavez St at 1004+00.000 has higher average traffic volume (20425.0) than major leg S I-35 NBFR @ Cesar Chavez St at 1001+00.000 average traffic volume (10450.0).

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

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IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Holly St EAST
Intersection Comment: Created Tue Jun 29 12:15:36 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 5
Evaluation Comment: Created Thu Jun 23 07:59:13 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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Section Types

I-35 & Holly St EAST Evaluation

Intersection: I-35 & Holly St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Holly St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Holly St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 19,200	2030: 8,000	4	Signalized	1	0	2	0	true	false	true	3	11	2

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Holly St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**2.69**
Fatal and Injury Crashes	**0.55**
Property-Damage-Only Crashes	**2.15**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Holly St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.69	0.55	20.226	2.15	79.774
Total	2.69	0.55	20.226	2.15	79.774
Average	2.69	0.55	20.226	2.15	79.774

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Holly St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.43	15.9	1.57	58.5	2.00	74.4
Intersection	Collision with Bicycle	0.03	1.2	0.00	0.0	0.03	1.2
Intersection	Head-on Collision	0.02	0.7	0.06	2.4	0.08	3.1
Intersection	Other Multi-vehicle Collision	0.01	0.6	0.03	1.0	0.04	1.5
Intersection	Other Single-vehicle Collision	0.00	0.1	0.04	1.7	0.05	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.01	0.6	0.13	4.7	0.14	5.3
Intersection	Sideswipe	0.03	1.1	0.31	11.6	0.34	12.7
Intersection	Total Intersection Total Vehicle Crashes	0.55	20.2	2.15	79.8	2.69	100.0
Intersection	Total Intersection Crashes	0.55	20.2	2.15	79.8	2.69	100.0
	Total Crashes	0.55	20.2	2.15	79.8	2.69	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 07:59:46 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Riverside Dr EAST
Intersection Comment: Created Tue Jun 29 12:38:59 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 07:59:39 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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Section Types

I-35 & Riverside Dr EAST Evaluation

Intersection: I-35 & Riverside Dr EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Riverside Dr EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Riverside Dr EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 30,050	2030: 61,350	4	Signalized	2	2	2	0	true	false	false	2	0	6

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Riverside Dr EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**12.34**
Fatal and Injury Crashes	**2.37**
Property-Damage-Only Crashes	**9.97**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**19**
Percent Property-Damage-Only Crashes (%)	**81**

Table 3. Predicted Crash Frequencies by Year (I-35 & Riverside Dr EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	12.34	2.37	19.184	9.97	80.816
Total	12.34	2.37	19.184	9.97	80.816
Average	12.34	2.37	19.184	9.97	80.816

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Riverside Dr EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.86	15.1	7.31	59.2	9.17	74.3
Intersection	Collision with Bicycle	0.15	1.2	0.00	0.0	0.15	1.2
Intersection	Head-on Collision	0.09	0.7	0.30	2.4	0.39	3.1
Intersection	Other Multi-vehicle Collision	0.07	0.5	0.12	1.0	0.19	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.21	1.7	0.22	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.07	0.5	0.59	4.8	0.66	5.3
Intersection	Sideswipe	0.13	1.1	1.45	11.7	1.58	12.8
Intersection	Total Intersection Total Vehicle Crashes	2.37	19.2	9.97	80.8	12.34	100.0
Intersection	Total Intersection Crashes	2.37	19.2	9.97	80.8	12.34	100.0
	Total Crashes	2.37	19.2	9.97	80.8	12.34	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	Information: for intersection #1 (1001+00.000 to 1001+00.000), For I-35 & Riverside Dr EAST, minor leg E Riverside Dr at 1004+00.000 has higher average traffic volume (68475.0) than major leg NW I-35 NBFR @ Riverside Dr at 1001+00.000 average traffic volume (30050.0). For I-35 & Riverside Dr EAST, minor leg W Riverside Dr at 1004+00.000 has higher average traffic volume (68475.0) than major leg NW I-35 NBFR @ Riverside Dr at 1001+00.000 average traffic volume (30050.0). For I-35 & Riverside Dr EAST, minor leg E Riverside Dr at 1004+00.000 has higher average traffic volume (68475.0) than major leg SE I-35 NBFR @ Riverside Dr at 1001+00.000 average traffic volume (30050.0). For I-35 & Riverside Dr EAST, minor leg W Riverside Dr at 1004+00.000 has higher average traffic volume (68475.0) than major leg SE I-35 NBFR @ Riverside Dr at 1001+00.000 average traffic volume (30050.0).

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Woodland Ave EAST
Intersection Comment: Created Tue Jun 29 12:46:07 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 08:00:04 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & Woodland Ave EAST Evaluation

Intersection: I-35 & Woodland Ave EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Woodland Ave EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Woodland Ave EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 18,000	2030: 8,900	4	Signalized	2	1	2	0	true	false	false	0	0	3

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Woodland Ave EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**3.23**
Fatal and Injury Crashes	**0.66**
Property-Damage-Only Crashes	**2.57**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Woodland Ave EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	3.23	0.66	20.441	2.57	79.559
Total	3.23	0.66	20.441	2.57	79.559
Average	3.23	0.66	20.441	2.57	79.559

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Woodland Ave EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.52	16.1	1.88	58.3	2.40	74.4
Intersection	Collision with Bicycle	0.04	1.2	0.00	0.0	0.04	1.2
Intersection	Head-on Collision	0.02	0.8	0.08	2.4	0.10	3.1
Intersection	Other Multi-vehicle Collision	0.02	0.6	0.03	1.0	0.05	1.5
Intersection	Other Single-vehicle Collision	0.00	0.1	0.05	1.7	0.06	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.02	0.6	0.15	4.7	0.17	5.3
Intersection	Sideswipe	0.04	1.1	0.37	11.5	0.41	12.7
Intersection	Total Intersection Total Vehicle Crashes	0.66	20.5	2.57	79.5	3.23	100.0
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Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

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IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Oltorf St EAST
Intersection Comment: Created Tue Jun 29 12:52:34 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 08:00:29 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

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Section Types

I-35 & Oltorf St EAST Evaluation

Intersection: I-35 & Oltorf St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Oltorf St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Oltorf St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 23,950	2030: 31,450	4	Signalized	1	1	2	0	true	false	true	5	0	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Oltorf St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**7.61**
Fatal and Injury Crashes	**1.50**
Property-Damage-Only Crashes	**6.10**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Oltorf St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	7.61	1.50	19.761	6.10	80.239
Total	7.61	1.50	19.761	6.10	80.239
Average	7.61	1.50	19.761	6.10	80.239

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Oltorf St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.18	15.5	4.47	58.8	5.66	74.3
Intersection	Collision with Bicycle	0.09	1.2	0.00	0.0	0.09	1.2
Intersection	Head-on Collision	0.06	0.7	0.18	2.4	0.24	3.1
Intersection	Other Multi-vehicle Collision	0.04	0.6	0.07	1.0	0.12	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.13	1.7	0.14	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.04	0.6	0.36	4.7	0.40	5.3
Intersection	Sideswipe	0.08	1.1	0.89	11.6	0.97	12.7
Intersection	Total Intersection Total Vehicle Crashes	1.50	19.8	6.10	80.2	7.61	100.0
Intersection	Total Intersection Crashes	1.50	19.8	6.10	80.2	7.61	100.0
	Total Crashes	1.50	19.8	6.10	80.2	7.61	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	Information: for intersection #1 (1001+00.000 to 1001+00.000), For I-35 & Oltorf St EAST, minor leg E Oltorf St at 1004+80.000 has higher average traffic volume (35425.0) than major leg N I-35 NBFR @ Oltorf St at 1001+00.000 average traffic volume (19675.0). For I-35 & Oltorf St EAST, minor leg W Oltorf St at 1004+80.000 has higher average traffic volume (35425.0) than major leg N I-35 NBFR @ Oltorf St at 1001+00.000 average traffic volume (19675.0). For I-35 & Oltorf St EAST, minor leg E Oltorf St at 1004+80.000 has higher average traffic volume (35425.0) than major leg S I-35 NBFR @ Oltorf St at 1001+00.000 average traffic volume (19675.0). For I-35 & Oltorf St EAST, minor leg W Oltorf St at 1004+80.000 has higher average traffic volume (35425.0) than major leg S I-35 NBFR @ Oltorf St at 1001+00.000 average traffic volume (19675.0).

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 9:09 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Fri Jul 22 16:31:26 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Woodward St EAST
Intersection Comment: Created Tue Jun 29 13:01:03 CDT 2021
Intersection Version: v1

Evaluation Title: 20220722
Evaluation Comment: Created Fri Jul 22 16:31:14 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & Woodward St EAST Evaluation

Intersection: I-35 & Woodward St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Woodward St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Woodward St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 17,550	2030: 15,700	4	Signalized	2	0	2	0	true	false	false	0	0	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Woodward St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**5.82**
Fatal and Injury Crashes	**1.20**
Property-Damage-Only Crashes	**4.62**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**21**
Percent Property-Damage-Only Crashes (%)	**79**

Table 3. Predicted Crash Frequencies by Year (I-35 & Woodward St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.82	1.20	20.608	4.62	79.391
Total	5.82	1.20	20.608	4.62	79.391
Average	5.82	1.20	20.608	4.62	79.391

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Woodward St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.95	16.3	3.39	58.2	4.33	74.4
Intersection	Collision with Bicycle	0.07	1.2	0.00	0.0	0.07	1.2
Intersection	Head-on Collision	0.04	0.8	0.14	2.4	0.18	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.6	0.06	1.0	0.09	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.10	1.7	0.10	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.6	0.27	4.7	0.31	5.3
Intersection	Sideswipe	0.07	1.1	0.67	11.5	0.74	12.7
Intersection	Total Intersection Total Vehicle Crashes	1.20	20.6	4.62	79.4	5.82	100.0
Intersection	Total Intersection Crashes	1.20	20.6	4.62	79.4	5.82	100.0
	Total Crashes	1.20	20.6	4.62	79.4	5.82	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Generated: Aug 25, 2022 9:10 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Fri Jul 23 10:20:36 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - Build Alt 2
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 51st Street
Intersection Comment: Created Wed Mar 03 10:40:11 CST 2021
Intersection Version: v1

Evaluation Title: Evaluation 6
Evaluation Comment: Created Fri Jul 23 10:20:26 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1010+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & 51st Street Evaluation

Intersection: I-35 & 51st Street
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1010+00.000
Calibration Factor: USA 42R=1.0;

Table 1. Evaluation Roundabout - Site (I-35 & 51st Street)

Inter. No.	Title	Type	Area Type	Legs	Location (Sta. ft)	Entering AADT
1	I-35 & 51st Street (v1)	Roundabout 42R - Roundabout with 4 legs and two circulating lanes	Urban	4	1005+00.000	Leg 1: 2030: 20,100; Leg 2: 2030: 19,812; Leg 3: 2030: 0; Leg 4: 2030: 7,618

Table 2. Predicted Roundabout Crash Rates and Frequencies Summary (I-35 & 51st Street)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**16.36**
Fatal and Injury Crashes	**1.27**
Property-Damage-Only Crashes	**15.09**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**8**
Percent Property-Damage-Only Crashes (%)	**92**

Table 3. Predicted Crash Frequencies and Rates by Roundabout (I-35 & 51st Street)

Segment Number/Intersection Name/Cross Road	Location (Sta. ft)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Travel Crash Rate (crashes/million veh)
I-35 & 51st Street (v1)	1005+00.000	16.364	16.3637	1.2712	15.0925	0.95

Table 4. Predicted Crash Severity by Roundabout (I-35 & 51st Street)

Seg. No.	Type	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	Roundabout	0.0082	0.0816	0.3242	0.8571	15.0925

Table 5. Predicted Crash Frequencies by Year (I-35 & 51st Street)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	16.36	1.27	7.768	15.09	92.232
Total	16.36	1.27	7.768	15.09	92.232
Average	16.36	1.27	7.768	15.09	92.232

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Roundabout Crash Type Distribution (I-35 & 51st Street)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Collision with Animal	0.00	0.0	0.04	0.3	0.04	0.3
Intersection	Collision with Fixed Object	0.16	1.0	2.08	12.7	2.24	13.7
Intersection	Collision with Other Object	0.00	0.0	0.03	0.2	0.03	0.2
Intersection	Other Single-vehicle Collision	0.16	1.0	0.56	3.4	0.72	4.4
Intersection	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Total Single Vehicle Crashes	0.32	2.0	2.72	16.6	3.04	18.6
Intersection	Angle Collision	0.18	1.1	2.63	16.0	2.81	17.1
Intersection	Head-on Collision	0.01	0.1	0.07	0.5	0.09	0.5
Intersection	Other Multiple-vehicle Collision	0.19	1.2	3.00	18.3	3.20	19.5
Intersection	Rear-end Collision	0.34	2.1	2.69	16.4	3.03	18.5
Intersection	Sideswipe	0.23	1.4	4.00	24.4	4.22	25.8
Intersection	Total Multiple Vehicle Crashes	0.95	5.8	12.39	75.7	13.34	81.5
Intersection	Total Intersection Crashes	1.27	7.8	15.11	92.2	16.38	100.0
	Total Crashes	1.27	7.8	15.11	92.2	16.38	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 7. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1005+00.000	1005+00.000	for intersection #1 (1005+00.000 to 1005+00.000), minor road traffic volume (38,100 vpd) for 2030 is not within the model limit (19,371 vpd) for reliable results for intersection type 42R

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 9:10 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 07:47:09 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Airport Blvd WEST
Intersection Comment: Created Mon Jun 28 14:07:32 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 07:46:57 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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Section Types

I-35 & Airport Blvd WEST Evaluation

Intersection: I-35 & Airport Blvd WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Airport Blvd WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Airport Blvd WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 23,350	2030: 51,250	4	Signalized	2	1	2	0	true	false	false	3	0	10

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Airport Blvd WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**21.59**
Fatal and Injury Crashes	**4.30**
Property-Damage-Only Crashes	**17.29**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Airport Blvd WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	21.59	4.30	19.912	17.29	80.088
Total	21.59	4.30	19.912	17.29	80.088
Average	21.59	4.30	19.912	17.29	80.088

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Airport Blvd WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	3.38	15.7	12.67	58.7	16.06	74.4
Intersection	Collision with Bicycle	0.26	1.2	0.00	0.0	0.26	1.2
Intersection	Head-on Collision	0.16	0.7	0.52	2.4	0.68	3.1
Intersection	Other Multi-vehicle Collision	0.12	0.6	0.21	1.0	0.33	1.5
Intersection	Other Single-vehicle Collision	0.02	0.1	0.36	1.7	0.39	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.12	0.6	1.02	4.7	1.14	5.3
Intersection	Sideswipe	0.24	1.1	2.51	11.6	2.75	12.7
Intersection	Total Intersection Total Vehicle Crashes	4.30	19.9	17.29	80.1	21.59	100.0
Intersection	Total Intersection Crashes	4.30	19.9	17.29	80.1	21.59	100.0
	Total Crashes	4.30	19.9	17.29	80.1	21.59	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	Information: for intersection #1 (1001+00.000 to 1001+00.000), For I-35 & Airport Blvd WEST, minor leg E Airport Blvd at 1001+00.000 has higher average traffic volume (52575.0) than major leg N I-35 SBFR @ Airport Blvd at 1001+00.000 average traffic volume (20650.0). For I-35 & Airport Blvd WEST, minor leg W Airport Blvd at 1001+00.000 has higher average traffic volume (52575.0) than major leg N I-35 SBFR @ Airport Blvd at 1001+00.000 average traffic volume (20650.0). For I-35 & Airport Blvd WEST, minor leg E Airport Blvd at 1001+00.000 has higher average traffic volume (52575.0) than major leg S I-35 SBFR @ Airport Blvd at 1001+00.000 average traffic volume (20650.0). For I-35 & Airport Blvd WEST, minor leg W Airport Blvd at 1001+00.000 has higher average traffic volume (52575.0) than major leg S I-35 SBFR @ Airport Blvd at 1001+00.000 average traffic volume (20650.0).

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Evaluation Date: Thu Jun 23 07:47:57 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 38 1/2 St WEST
Intersection Comment: Created Tue Jun 29 09:42:04 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 07:47:49 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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Section Types

I-35 & 38 1/2 St WEST Evaluation

Intersection: I-35 & 38 1/2 St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 38 1/2 St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 38 1/2 St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 25,000	2030: 11,100	4	Signalized	2	0	2	0	true	false	false	3	1	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 38 1/2 St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**4.66**
Fatal and Injury Crashes	**0.91**
Property-Damage-Only Crashes	**3.75**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**19**
Percent Property-Damage-Only Crashes (%)	**81**

Table 3. Predicted Crash Frequencies by Year (I-35 & 38 1/2 St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.66	0.91	19.476	3.75	80.524
Total	4.66	0.91	19.476	3.75	80.524
Average	4.66	0.91	19.476	3.75	80.524

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 38 1/2 St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.71	15.3	2.75	59.0	3.46	74.3
Intersection	Collision with Bicycle	0.06	1.2	0.00	0.0	0.06	1.2
Intersection	Head-on Collision	0.03	0.7	0.11	2.4	0.15	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.5	0.04	1.0	0.07	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.08	1.7	0.08	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.5	0.22	4.8	0.25	5.3
Intersection	Sideswipe	0.05	1.1	0.54	11.7	0.59	12.8
Intersection	Total Intersection Total Vehicle Crashes	0.91	19.5	3.75	80.5	4.66	100.0
Intersection	Total Intersection Crashes	0.91	19.5	3.75	80.5	4.66	100.0
	Total Crashes	0.91	19.5	3.75	80.5	4.66	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 21 14:38:24 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 32nd St WEST
Intersection Comment: Created Tue Jun 29 09:50:34 CDT 2021
Intersection Version: v1

Evaluation Title: 20220721
Evaluation Comment: Created Thu Jul 21 14:37:34 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & 32nd St WEST Evaluation

Intersection: I-35 & 32nd St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 32nd St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 32nd St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 26,150	2030: 10,350	4	Signalized	0	0	2	0	true	false	false	0	0	3

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 32nd St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**4.63**
Fatal and Injury Crashes	**0.90**
Property-Damage-Only Crashes	**3.74**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**19**
Percent Property-Damage-Only Crashes (%)	**81**

Table 3. Predicted Crash Frequencies by Year (I-35 & 32nd St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.63	0.90	19.332	3.74	80.668
Total	4.63	0.90	19.332	3.74	80.668
Average	4.63	0.90	19.332	3.74	80.668

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 32nd St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.70	15.2	2.74	59.1	3.44	74.3
Intersection	Collision with Bicycle	0.06	1.2	0.00	0.0	0.06	1.2
Intersection	Head-on Collision	0.03	0.7	0.11	2.4	0.14	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.5	0.04	1.0	0.07	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.08	1.7	0.08	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.5	0.22	4.8	0.25	5.3
Intersection	Sideswipe	0.05	1.1	0.54	11.7	0.59	12.8
Intersection	Total Intersection Total Vehicle Crashes	0.90	19.3	3.74	80.7	4.63	100.0
Intersection	Total Intersection Crashes	0.90	19.3	3.74	80.7	4.63	100.0
	Total Crashes	0.90	19.3	3.74	80.7	4.63	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 9:12 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 21 14:36:14 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & MLK Jr Blvd WEST
Intersection Comment: Created Tue Jun 29 10:14:37 CDT 2021
Intersection Version: v1

Evaluation Title: 20220721
Evaluation Comment: Created Thu Jul 21 14:35:56 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & MLK Jr Blvd WEST Evaluation

Intersection: I-35 & MLK Jr Blvd WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & MLK Jr Blvd WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & MLK Jr Blvd WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 28,150	2030: 30,850	4	Signalized	2	1	2	0	true	false	true	4	0	6

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & MLK Jr Blvd WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**12.36**
Fatal and Injury Crashes	**2.38**
Property-Damage-Only Crashes	**9.98**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**19**
Percent Property-Damage-Only Crashes (%)	**81**

Table 3. Predicted Crash Frequencies by Year (I-35 & MLK Jr Blvd WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	12.36	2.38	19.276	9.98	80.724
Total	12.36	2.38	19.276	9.98	80.724
Average	12.36	2.38	19.276	9.98	80.724

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & MLK Jr Blvd WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.87	15.1	7.32	59.2	9.19	74.3
Intersection	Collision with Bicycle	0.15	1.2	0.00	0.0	0.15	1.2
Intersection	Head-on Collision	0.09	0.7	0.30	2.4	0.39	3.1
Intersection	Other Multi-vehicle Collision	0.07	0.5	0.12	1.0	0.19	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.21	1.7	0.22	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.07	0.5	0.59	4.8	0.66	5.3
Intersection	Sideswipe	0.13	1.1	1.45	11.7	1.58	12.8
Intersection	Total Intersection Total Vehicle Crashes	2.38	19.3	9.98	80.7	12.36	100.0
Intersection	Total Intersection Crashes	2.38	19.3	9.98	80.7	12.36	100.0
	Total Crashes	2.38	19.3	9.98	80.7	12.36	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 9:12 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 07:49:17 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 15th St WEST
Intersection Comment: Created Tue Jun 29 10:33:31 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 07:49:09 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & 15th St WEST Evaluation

Intersection: I-35 & 15th St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 15th St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 15th St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 52,500	2030: 31,000	4	Signalized	2	2	2	0	true	false	true	1	0	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 15th St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**9.46**
Fatal and Injury Crashes	**1.66**
Property-Damage-Only Crashes	**7.80**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**18**
Percent Property-Damage-Only Crashes (%)	**82**

Table 3. Predicted Crash Frequencies by Year (I-35 & 15th St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	9.46	1.66	17.506	7.80	82.494
Total	9.46	1.66	17.506	7.80	82.494
Average	9.46	1.66	17.506	7.80	82.494

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 15th St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.29	13.7	5.72	60.5	7.01	74.1
Intersection	Collision with Bicycle	0.11	1.2	0.00	0.0	0.11	1.2
Intersection	Head-on Collision	0.06	0.6	0.23	2.5	0.29	3.1
Intersection	Other Multi-vehicle Collision	0.05	0.5	0.09	1.0	0.14	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.16	1.7	0.17	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.05	0.5	0.46	4.9	0.51	5.4
Intersection	Sideswipe	0.09	1.0	1.13	12.0	1.22	12.9
Intersection	Total Intersection Total Vehicle Crashes	1.66	17.5	7.80	82.5	9.46	100.0
Intersection	Total Intersection Crashes	1.66	17.5	7.80	82.5	9.46	100.0
	Total Crashes	1.66	17.5	7.80	82.5	9.46	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 07:49:44 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 12th St WEST
Intersection Comment: Created Tue Jun 29 10:39:20 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 5
Evaluation Comment: Created Thu Jun 23 07:49:36 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & 12th St WEST Evaluation

Intersection: I-35 & 12th St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 12th St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 12th St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 26,500	2030: 9,800	4	Signalized	2	0	2	0	true	false	false	5	0	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 12th St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**5.35**
Fatal and Injury Crashes	**1.03**
Property-Damage-Only Crashes	**4.32**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**19**
Percent Property-Damage-Only Crashes (%)	**81**

Table 3. Predicted Crash Frequencies by Year (I-35 & 12th St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.35	1.03	19.285	4.32	80.715
Total	5.35	1.03	19.285	4.32	80.715
Average	5.35	1.03	19.285	4.32	80.715

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 12th St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.81	15.1	3.16	59.2	3.97	74.3
Intersection	Collision with Bicycle	0.06	1.2	0.00	0.0	0.06	1.2
Intersection	Head-on Collision	0.04	0.7	0.13	2.4	0.17	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.5	0.05	1.0	0.08	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.09	1.7	0.10	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.5	0.26	4.8	0.28	5.3
Intersection	Sideswipe	0.06	1.1	0.63	11.7	0.68	12.8
Intersection	Total Intersection Total Vehicle Crashes	1.03	19.3	4.32	80.7	5.35	100.0
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	Total Crashes	1.03	19.3	4.32	80.7	5.35	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

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Report Overview

Report Generated: Aug 25, 2022 9:13 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 30 15:08:32 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 11th St WEST
Intersection Comment: Created Tue Jun 29 10:46:27 CDT 2021
Intersection Version: v1

Evaluation Title: Posted Speed Added
Evaluation Comment: Created Thu Jun 30 15:08:09 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

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The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & 11th St WEST Evaluation

Intersection: I-35 & 11th St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 11th St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 11th St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 26,850	2030: 15,850	4	Signalized	2	0	2	0	true	false	false	5	1	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 11th St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**6.58**
Fatal and Injury Crashes	**1.27**
Property-Damage-Only Crashes	**5.31**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**19**
Percent Property-Damage-Only Crashes (%)	**81**

Table 3. Predicted Crash Frequencies by Year (I-35 & 11th St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	6.58	1.27	19.317	5.31	80.683
Total	6.58	1.27	19.317	5.31	80.683
Average	6.58	1.27	19.317	5.31	80.683

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 11th St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.00	15.2	3.89	59.1	4.89	74.3
Intersection	Collision with Bicycle	0.08	1.2	0.00	0.0	0.08	1.2
Intersection	Head-on Collision	0.05	0.7	0.16	2.4	0.21	3.1
Intersection	Other Multi-vehicle Collision	0.04	0.5	0.06	1.0	0.10	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.11	1.7	0.12	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.04	0.5	0.31	4.8	0.35	5.3
Intersection	Sideswipe	0.07	1.1	0.77	11.7	0.84	12.8
Intersection	Total Intersection Total Vehicle Crashes	1.27	19.3	5.31	80.7	6.58	100.0
Intersection	Total Intersection Crashes	1.27	19.3	5.31	80.7	6.58	100.0
	Total Crashes	1.27	19.3	5.31	80.7	6.58	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 07:50:08 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 8th St WEST
Intersection Comment: Created Tue Jun 29 10:53:53 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 07:50:01 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & 8th St WEST Evaluation

Intersection: I-35 & 8th St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 8th St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 8th St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 39,500	2030: 12,550	4	Signalized	1	1	2	20	true	false	false	3	15	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 8th St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**5.50**
Fatal and Injury Crashes	**1.34**
Property-Damage-Only Crashes	**4.16**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**24**
Percent Property-Damage-Only Crashes (%)	**76**

Table 3. Predicted Crash Frequencies by Year (I-35 & 8th St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.50	1.34	24.349	4.16	75.651
Total	5.50	1.34	24.349	4.16	75.651
Average	5.50	1.34	24.349	4.16	75.651

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 8th St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.97	17.6	3.05	55.4	4.02	73.0
Intersection	Collision with Bicycle	0.06	1.2	0.00	0.0	0.06	1.2
Intersection	Head-on Collision	0.04	0.8	0.12	2.3	0.17	3.1
Intersection	Other Multi-vehicle Collision	0.04	0.6	0.05	0.9	0.09	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.09	1.6	0.09	1.7
Intersection	Collision with Pedestrian	0.12	2.2	0.00	0.0	0.12	2.2
Intersection	Rear-end Collision	0.04	0.6	0.25	4.5	0.28	5.1
Intersection	Sideswipe	0.07	1.2	0.60	11.0	0.67	12.2
Intersection	Total Intersection Total Vehicle Crashes	1.34	24.4	4.16	75.6	5.50	100.0
Intersection	Total Intersection Crashes	1.34	24.4	4.16	75.6	5.50	100.0
	Total Crashes	1.34	24.4	4.16	75.6	5.50	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	Warning: for intersection #1 (1001+00.000 to 1001+00.000), major road traffic volume (39,500 vpd) for 2030 is not within the model limit (24,300 vpd) for reliable results for intersection type 4SG

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 07:55:47 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 7th St WEST
Intersection Comment: Created Tue Jun 29 11:18:30 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 07:55:03 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & 7th St WEST Evaluation

Intersection: I-35 & 7th St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 7th St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 7th St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 33,250	2030: 21,500	4	Signalized	1	0	2	20	true	false	true	3	14	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 7th St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**6.95**
Fatal and Injury Crashes	**1.77**
Property-Damage-Only Crashes	**5.17**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**26**
Percent Property-Damage-Only Crashes (%)	**74**

Table 3. Predicted Crash Frequencies by Year (I-35 & 7th St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	6.95	1.77	25.540	5.17	74.460
Total	6.95	1.77	25.540	5.17	74.460
Average	6.95	1.77	25.540	5.17	74.460

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 7th St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.25	18.0	3.79	54.6	5.04	72.6
Intersection	Collision with Bicycle	0.08	1.2	0.00	0.0	0.08	1.2
Intersection	Head-on Collision	0.06	0.8	0.15	2.2	0.21	3.1
Intersection	Other Multi-vehicle Collision	0.04	0.6	0.06	0.9	0.11	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.11	1.6	0.12	1.7
Intersection	Collision with Pedestrian	0.20	2.9	0.00	0.0	0.20	2.9
Intersection	Rear-end Collision	0.04	0.6	0.30	4.4	0.35	5.0
Intersection	Sideswipe	0.09	1.3	0.75	10.8	0.84	12.1
Intersection	Total Intersection Total Vehicle Crashes	1.77	25.6	5.17	74.4	6.95	100.0
Intersection	Total Intersection Crashes	1.77	25.6	5.17	74.4	6.95	100.0
	Total Crashes	1.77	25.6	5.17	74.4	6.95	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	Warning: for intersection #1 (1001+00.000 to 1001+00.000), major road traffic volume (33,250 vpd) for 2030 is not within the model limit (24,300 vpd) for reliable results for intersection type 4SG

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

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Report Overview

Report Generated: Aug 25, 2022 9:14 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 07:57:59 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 6th St WEST
Intersection Comment: Created Tue Jun 29 11:26:20 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 5
Evaluation Comment: Created Thu Jun 23 07:57:51 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

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- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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Section Types

I-35 & 6th St WEST Evaluation

Intersection: I-35 & 6th St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 6th St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 6th St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 30,150	2030: 13,550	4	Signalized	2	1	2	20	true	false	true	3	11	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 6th St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**5.03**
Fatal and Injury Crashes	**1.09**
Property-Damage-Only Crashes	**3.94**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**22**
Percent Property-Damage-Only Crashes (%)	**78**

Table 3. Predicted Crash Frequencies by Year (I-35 & 6th St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.03	1.09	21.648	3.94	78.352
Total	5.03	1.09	21.648	3.94	78.352
Average	5.03	1.09	21.648	3.94	78.352

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 6th St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.72	14.4	2.89	57.4	3.61	71.8
Intersection	Collision with Bicycle	0.06	1.1	0.00	0.0	0.06	1.1
Intersection	Head-on Collision	0.03	0.7	0.12	2.4	0.15	3.0
Intersection	Other Multi-vehicle Collision	0.03	0.5	0.05	0.9	0.07	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.08	1.6	0.09	1.7
Intersection	Collision with Pedestrian	0.17	3.3	0.00	0.0	0.17	3.3
Intersection	Rear-end Collision	0.03	0.5	0.23	4.6	0.26	5.1
Intersection	Sideswipe	0.05	1.0	0.57	11.4	0.62	12.4
Intersection	Total Intersection Total Vehicle Crashes	1.09	21.7	3.94	78.3	5.03	100.0
Intersection	Total Intersection Crashes	1.09	21.7	3.94	78.3	5.03	100.0
	Total Crashes	1.09	21.7	3.94	78.3	5.03	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Tue Jul 19 12:45:15 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Cesar Chavez St WEST
Intersection Comment: Created Tue Jun 29 12:00:34 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 5
Evaluation Comment: Created Tue Jul 19 12:44:28 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & Cesar Chavez St WEST Evaluation

Intersection: I-35 & Cesar Chavez St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Cesar Chavez St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Cesar Chavez St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 20,450	2030: 32,650	4	Signalized	2	1	2	0	true	false	false	4	8	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Cesar Chavez St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**7.46**
Fatal and Injury Crashes	**1.51**
Property-Damage-Only Crashes	**5.95**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Cesar Chavez St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	7.46	1.51	20.248	5.95	79.752
Total	7.46	1.51	20.248	5.95	79.752
Average	7.46	1.51	20.248	5.95	79.752

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Cesar Chavez St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.19	16.0	4.36	58.4	5.55	74.4
Intersection	Collision with Bicycle	0.09	1.2	0.00	0.0	0.09	1.2
Intersection	Head-on Collision	0.06	0.7	0.18	2.4	0.23	3.1
Intersection	Other Multi-vehicle Collision	0.04	0.6	0.07	1.0	0.11	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.12	1.7	0.13	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.04	0.6	0.35	4.7	0.39	5.3
Intersection	Sideswipe	0.08	1.1	0.86	11.6	0.95	12.7
Intersection	Total Intersection Total Vehicle Crashes	1.51	20.3	5.95	79.7	7.46	100.0
Intersection	Total Intersection Crashes	1.51	20.3	5.95	79.7	7.46	100.0
	Total Crashes	1.51	20.3	5.95	79.7	7.46	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	Information: for intersection #1 (1001+00.000 to 1001+00.000), For I-35 & Cesar Chavez St WEST, minor leg E Cesar Chavez St at 1001+00.000 has higher average traffic volume (27550.0) than major leg N I-35 SBFR @ Cesar Chavez St at 1001+00.000 average traffic volume (22850.0). For I-35 & Cesar Chavez St WEST, minor leg W Cesar Chavez St at 1001+00.000 has higher average traffic volume (27550.0) than major leg N I-35 SBFR @ Cesar Chavez St at 1001+00.000 average traffic volume (22850.0). For I-35 & Cesar Chavez St WEST, minor leg E Cesar Chavez St at 1001+00.000 has higher average traffic volume (27550.0) than major leg S I-35 SBFR @ Cesar Chavez St at 1001+00.000 average traffic volume (22850.0). For I-35 & Cesar Chavez St WEST, minor leg W Cesar Chavez St at 1001+00.000 has higher average traffic volume (27550.0) than major leg S I-35 SBFR @ Cesar Chavez St at 1001+00.000 average traffic volume (22850.0).

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Riverside Dr WEST
Intersection Comment: Created Tue Jun 29 12:18:32 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 07:59:26 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & Riverside Dr WEST Evaluation

Intersection: I-35 & Riverside Dr WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Riverside Dr WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Riverside Dr WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 21,500	2030: 52,100	4	Signalized	2	1	2	0	true	false	false	2	0	6

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Riverside Dr WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**14.02**
Fatal and Injury Crashes	**2.83**
Property-Damage-Only Crashes	**11.19**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Riverside Dr WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	14.02	2.83	20.166	11.19	79.834
Total	14.02	2.83	20.166	11.19	79.834
Average	14.02	2.83	20.166	11.19	79.834

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Riverside Dr WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	2.23	15.9	8.20	58.5	10.43	74.4
Intersection	Collision with Bicycle	0.17	1.2	0.00	0.0	0.17	1.2
Intersection	Head-on Collision	0.10	0.7	0.34	2.4	0.44	3.1
Intersection	Other Multi-vehicle Collision	0.08	0.6	0.13	1.0	0.21	1.5
Intersection	Other Single-vehicle Collision	0.02	0.1	0.23	1.7	0.25	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.08	0.6	0.66	4.7	0.74	5.3
Intersection	Sideswipe	0.16	1.1	1.62	11.6	1.78	12.7
Intersection	Total Intersection Total Vehicle Crashes	2.83	20.2	11.19	79.8	14.02	100.0
Intersection	Total Intersection Crashes	2.83	20.2	11.19	79.8	14.02	100.0
	Total Crashes	2.83	20.2	11.19	79.8	14.02	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	Information: for intersection #1 (1001+00.000 to 1001+00.000), For I-35 & Riverside Dr WEST, minor leg E Riverside Dr at 1001+00.000 has higher average traffic volume (59325.0) than major leg N I-35 SBFR @ Riverside Dr at 1001+00.000 average traffic volume (13650.0). For I-35 & Riverside Dr WEST, minor leg W Riverside Dr at 1001+00.000 has higher average traffic volume (59325.0) than major leg N I-35 SBFR @ Riverside Dr at 1001+00.000 average traffic volume (13650.0). For I-35 & Riverside Dr WEST, minor leg E Riverside Dr at 1001+00.000 has higher average traffic volume (59325.0) than major leg S I-35 SBFR @ Riverside Dr at 1001+00.000 average traffic volume (13650.0). For I-35 & Riverside Dr WEST, minor leg W Riverside Dr at 1001+00.000 has higher average traffic volume (59325.0) than major leg S I-35 SBFR @ Riverside Dr at 1001+00.000 average traffic volume (13650.0).

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Evaluation Date: Thu Jun 23 08:00:00 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Woodland Ave WEST
Intersection Comment: Created Tue Jun 29 12:43:38 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 07:59:52 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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Section Types

I-35 & Woodland Ave WEST Evaluation

Intersection: I-35 & Woodland Ave WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Woodland Ave WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Woodland Ave WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 13,350	2030: 8,650	4	Signalized	2	1	2	0	true	false	false	0	0	3

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Woodland Ave WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**2.89**
Fatal and Injury Crashes	**0.62**
Property-Damage-Only Crashes	**2.27**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**21**
Percent Property-Damage-Only Crashes (%)	**79**

Table 3. Predicted Crash Frequencies by Year (I-35 & Woodland Ave WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.89	0.62	21.381	2.27	78.620
Total	2.89	0.62	21.381	2.27	78.620
Average	2.89	0.62	21.381	2.27	78.620

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Woodland Ave WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.49	16.9	1.66	57.6	2.15	74.5
Intersection	Collision with Bicycle	0.03	1.2	0.00	0.0	0.03	1.2
Intersection	Head-on Collision	0.02	0.8	0.07	2.4	0.09	3.1
Intersection	Other Multi-vehicle Collision	0.02	0.6	0.03	0.9	0.04	1.5
Intersection	Other Single-vehicle Collision	0.00	0.1	0.05	1.7	0.05	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.02	0.6	0.13	4.6	0.15	5.2
Intersection	Sideswipe	0.03	1.2	0.33	11.4	0.36	12.6
Intersection	Total Intersection Total Vehicle Crashes	0.62	21.4	2.27	78.6	2.89	100.0
Intersection	Total Intersection Crashes	0.62	21.4	2.27	78.6	2.89	100.0
	Total Crashes	0.62	21.4	2.27	78.6	2.89	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Oltorf St WEST
Intersection Comment: Created Tue Jun 29 12:47:15 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 08:00:16 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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Section Types

I-35 & Oltorf St WEST Evaluation

Intersection: I-35 & Oltorf St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Oltorf St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Oltorf St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 24,950	2030: 26,400	4	Signalized	2	1	2	0	true	false	true	4	0	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Oltorf St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**7.06**
Fatal and Injury Crashes	**1.39**
Property-Damage-Only Crashes	**5.68**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Oltorf St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	7.06	1.39	19.612	5.68	80.388
Total	7.06	1.39	19.612	5.68	80.388
Average	7.06	1.39	19.612	5.68	80.388

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Oltorf St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.09	15.4	4.16	58.9	5.25	74.3
Intersection	Collision with Bicycle	0.08	1.2	0.00	0.0	0.08	1.2
Intersection	Head-on Collision	0.05	0.7	0.17	2.4	0.22	3.1
Intersection	Other Multi-vehicle Collision	0.04	0.6	0.07	1.0	0.11	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.12	1.7	0.13	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.04	0.6	0.34	4.7	0.37	5.3
Intersection	Sideswipe	0.08	1.1	0.82	11.7	0.90	12.7
Intersection	Total Intersection Total Vehicle Crashes	1.39	19.6	5.68	80.4	7.06	100.0
Intersection	Total Intersection Crashes	1.39	19.6	5.68	80.4	7.06	100.0
	Total Crashes	1.39	19.6	5.68	80.4	7.06	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	Information: for intersection #1 (1001+00.000 to 1001+00.000), For I-35 & Oltorf St WEST, minor leg E Oltorf St at 1001+00.000 has higher average traffic volume (29350.0) than major leg N I-35 SBFR @ Oltorf St at 1001+00.000 average traffic volume (28000.0). For I-35 & Oltorf St WEST, minor leg W Oltorf St at 1001+00.000 has higher average traffic volume (29350.0) than major leg N I-35 SBFR @ Oltorf St at 1001+00.000 average traffic volume (28000.0). For I-35 & Oltorf St WEST, minor leg E Oltorf St at 1001+00.000 has higher average traffic volume (29350.0) than major leg S I-35 SBFR @ Oltorf St at 1001+00.000 average traffic volume (28000.0). For I-35 & Oltorf St WEST, minor leg W Oltorf St at 1001+00.000 has higher average traffic volume (29350.0) than major leg S I-35 SBFR @ Oltorf St at 1001+00.000 average traffic volume (28000.0).

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 2 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Woodward St WEST
Intersection Comment: Created Tue Jun 29 12:55:39 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 08:00:41 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & Woodward St WEST Evaluation

Intersection: I-35 & Woodward St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Woodward St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Woodward St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 19,900	2030: 15,700	4	Signalized	2	1	2	0	true	false	false	0	0	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Woodward St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**4.60**
Fatal and Injury Crashes	**0.93**
Property-Damage-Only Crashes	**3.67**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Woodward St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.60	0.93	20.219	3.67	79.781
Total	4.60	0.93	20.219	3.67	79.781
Average	4.60	0.93	20.219	3.67	79.781

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Woodward St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.73	15.9	2.69	58.5	3.42	74.4
Intersection	Collision with Bicycle	0.06	1.2	0.00	0.0	0.06	1.2
Intersection	Head-on Collision	0.03	0.7	0.11	2.4	0.14	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.6	0.04	1.0	0.07	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.08	1.7	0.08	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.6	0.22	4.7	0.24	5.3
Intersection	Sideswipe	0.05	1.1	0.53	11.6	0.58	12.7
Intersection	Total Intersection Total Vehicle Crashes	0.93	20.2	3.67	79.8	4.60	100.0
Intersection	Total Intersection Crashes	0.93	20.2	3.67	79.8	4.60	100.0
	Total Crashes	0.93	20.2	3.67	79.8	4.60	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

I-35 Modified Build Alternative 3 Model Buffer-Separated GP Lanes

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 9:23 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 12:20:58 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL3
Highway Comment: Imported from CENTRAL3.xml
Highway Version: 1

Evaluation Title: Section 1
Evaluation Comment: Created Thu Jun 23 12:12:26 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1055+87.420

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1055+87.420
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_MV=1.0; FI_SV=1.0; PDO_MV=1.0; PDO_SV=1.0;

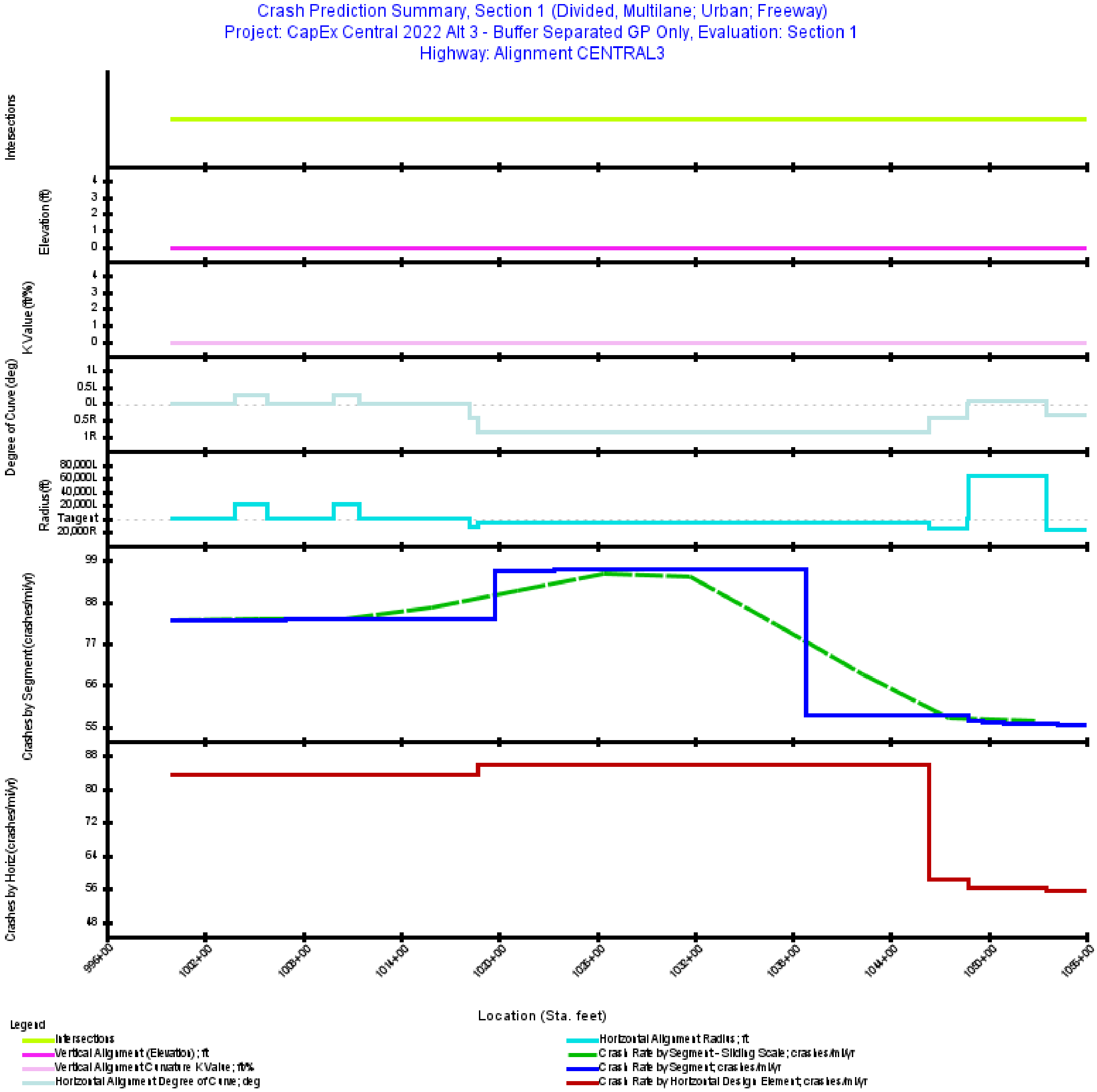

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Eight-lane Freeway	Urban	1000+00.000	1006+98.000	698.00	0.1322	2030: 203,650	50.00	Non-Traversable Median	51.49
2	Eight-lane Freeway	Urban	1006+98.000	1019+79.090	1,281.09	0.2426	2030: 203,650	38.00	Non-Traversable Median	45.49
3	Nine-lane Freeway	Urban	1019+79.090	1023+40.350	361.26	0.0684	2030: 216,500	38.00	Non-Traversable Median	42.00
4	Ten-lane Freeway	Urban	1023+40.350	1038+82.880	1,542.53	0.2921	2030: 234,500	38.00	Non-Traversable Median	42.00
5	Eight-lane Freeway	Urban	1038+82.880	1048+78.420	995.54	0.1885	2030: 156,650	38.00	Non-Traversable Median	42.00
6	Eight-lane Freeway	Urban	1048+78.420	1049+67.120	88.70	0.0168	2030: 156,650	38.00	Non-Traversable Median	42.13
7	Eight-lane Freeway	Urban	1049+67.120	1050+92.000	124.88	0.0237	2030: 156,650	38.00	Non-Traversable Median	42.63
8	Eight-lane Freeway	Urban	1050+92.000	1054+22.000	330.00	0.0625	2030: 156,650	38.00	Non-Traversable Median	44.00
9	Eight-lane Freeway	Urban	1054+22.000	1055+87.420	165.42	0.0313	2030: 156,650	38.00	Non-Traversable Median	45.50

Table 2. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**1.0582**
Average Future Road AADT (vpd)	**198,659**
Predicted Crashes	
Total Crashes	**84.60**
Fatal and Injury Crashes	**22.99**
Property-Damage-Only Crashes	**61.61**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**27**
Percent Property-Damage-Only Crashes (%)	**73**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**79.9489**
FI Crash Rate (crashes/mi/yr)	**21.7259**
PDO Crash Rate (crashes/mi/yr)	**58.2230**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**76.73**
Travel Crash Rate (crashes/million veh-mi)	**1.10**
Travel FI Crash Rate (crashes/million veh-mi)	**0.30**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.80**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 3. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1006+98.000	0.1322	11.010	11.0102	2.9300	8.0802	83.2864	1.12
2	1006+98.000	1019+79.090	0.2426	20.266	20.2659	5.3923	14.8736	83.5258	1.12
3	1019+79.090	1023+40.350	0.0684	6.576	6.5764	1.7658	4.8106	96.1172	1.22
4	1023+40.350	1038+82.880	0.2921	28.258	28.2578	7.6507	20.6071	96.7251	1.13
5	1038+82.880	1048+78.420	0.1885	10.972	10.9719	3.1145	7.8574	58.1913	1.02
6	1048+78.420	1049+67.120	0.0168	0.953	0.9528	0.2712	0.6816	56.7141	0.99
7	1049+67.120	1050+92.000	0.0237	1.336	1.3360	0.3801	0.9559	56.4859	0.99
8	1050+92.000	1054+22.000	0.0625	3.495	3.4949	0.9932	2.5018	55.9189	0.98
9	1054+22.000	1055+87.420	0.0313	1.738	1.7378	0.4931	1.2447	55.4698	0.97
Total			1.0582	84.604	84.6038	22.9909	61.6129	79.9489	1.10

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1003+79.564	0.0719	5.987	5.9872	1.5933	4.3939	83.2864	1.12
Simple Curve 1	1003+79.564	1005+82.145	0.0384	3.196	3.1955	0.8504	2.3451	83.2864	1.12
Tangent	1005+82.145	1009+85.344	0.0764	6.373	6.3731	1.6958	4.6773	83.4570	1.12
Simple Curve 2	1009+85.344	1011+41.697	0.0296	2.473	2.4734	0.6581	1.8153	83.5258	1.12
Tangent	1011+41.697	1018+22.837	0.1290	10.775	10.7751	2.8670	7.9081	83.5258	1.12
Simple Curve 3	1018+22.837	1018+69.126	0.0088	0.732	0.7323	0.1948	0.5374	83.5258	1.12
Simple Curve 4	1018+69.126	1046+33.680	0.5236	44.848	44.8484	12.2282	32.6202	85.6556	1.11
Simple Curve 5	1046+33.680	1048+65.895	0.0440	2.559	2.5593	0.7265	1.8328	58.1913	1.02
Tangent	1048+65.895	1048+78.600	0.0024	0.140	0.1400	0.0397	0.1002	58.1703	1.02
Simple Curve 6	1048+78.600	1053+54.829	0.0902	5.070	5.0703	1.4417	3.6286	56.2154	0.98
Simple Curve 7	1053+54.829	1055+87.420	0.0441	2.449	2.4492	0.6953	1.7540	55.5995	0.97

Table 5. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	84.60	22.99	27.175	61.61	72.825
Total	84.60	22.99	27.175	61.61	72.825
Average	84.60	22.99	27.175	61.61	72.825

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0619	0.1275	0.9405	1.8001	8.0802
2	0.1132	0.2326	1.7250	3.3216	14.8736
3	0.0415	0.0876	0.5965	1.0403	4.8106
4	0.1797	0.3793	2.5844	4.5073	20.6071
5	0.0730	0.1541	1.0512	1.8363	7.8574
6	0.0064	0.0134	0.0916	0.1598	0.6816
7	0.0089	0.0188	0.1284	0.2239	0.9559
8	0.0233	0.0492	0.3355	0.5851	2.5018
9	0.0116	0.0244	0.1666	0.2905	1.2447
Total	0.5196	1.0871	7.6195	13.7647	61.6129

Table 7. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.03	0.0	0.46	0.5	0.49	0.6
Highway Segment	Collision with Fixed Object	5.51	6.5	14.86	17.6	20.37	24.1
Highway Segment	Collision with Other Object	0.39	0.5	2.88	3.4	3.27	3.9
Highway Segment	Other Single-vehicle Collision	1.59	1.9	2.22	2.6	3.81	4.5
Highway Segment	Collision with Parked Vehicle	0.11	0.1	0.33	0.4	0.45	0.5
Highway Segment	Total Single Vehicle Crashes	7.63	9.0	20.75	24.5	28.38	33.5
Highway Segment	Right-Angle Collision	0.48	0.6	0.73	0.9	1.21	1.4
Highway Segment	Head-on Collision	0.12	0.1	0.08	0.1	0.20	0.2
Highway Segment	Other Multi-vehicle Collision	0.48	0.6	0.98	1.2	1.46	1.7
Highway Segment	Rear-end Collision	11.52	13.6	28.19	33.3	39.71	46.9
Highway Segment	Sideswipe, Same Direction Collision	2.77	3.3	10.87	12.8	13.63	16.1
Highway Segment	Total Multiple Vehicle Crashes	15.36	18.2	40.86	48.3	56.22	66.5
Highway Segment	Total Highway Segment Crashes	22.99	27.2	61.61	72.8	84.60	100.0
	Total Crashes	22.99	27.2	61.61	72.8	84.60	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1006+98.000	Information: for segment #1 (1000+00.000 to 1006+98.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1000+00.000	1006+98.000	Information: for segment #1 (1000+00.000 to 1006+98.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1000+00.000	1006+98.000	Information: for segment #1 (1000+00.000 to 1006+98.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1000+00.000	1006+98.000	Information: for segment #1 (1000+00.000 to 1006+98.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1006+98.000	1019+79.090	Information: for segment #2 (1006+98.000 to 1019+79.090), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1006+98.000	1019+79.090	Information: for segment #2 (1006+98.000 to 1019+79.090), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1006+98.000	1019+79.090	Information: for segment #2 (1006+98.000 to 1019+79.090), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1006+98.000	1019+79.090	Information: for segment #2 (1006+98.000 to 1019+79.090), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1019+79.090	1023+40.350	Information: for segment #3 (1019+79.090 to 1023+40.350), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1019+79.090	1023+40.350	Information: for segment #3 (1019+79.090 to 1023+40.350), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1019+79.090	1023+40.350	Information: for segment #3 (1019+79.090 to 1023+40.350), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1019+79.090	1023+40.350	Information: for segment #3 (1019+79.090 to 1023+40.350), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1023+40.350	1038+82.880	Information: for segment #4 (1023+40.350 to 1038+82.880), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1023+40.350	1038+82.880	Information: for segment #4 (1023+40.350 to 1038+82.880), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1023+40.350	1038+82.880	Information: for segment #4 (1023+40.350 to 1038+82.880), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1023+40.350	1038+82.880	Information: for segment #4 (1023+40.350 to 1038+82.880), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+82.880	1048+78.420	Information: for segment #5 (1038+82.880 to 1048+78.420), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+82.880	1048+78.420	Information: for segment #5 (1038+82.880 to 1048+78.420), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+82.880	1048+78.420	Information: for segment #5 (1038+82.880 to 1048+78.420), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+82.880	1048+78.420	Information: for segment #5 (1038+82.880 to 1048+78.420), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1048+78.420	1049+67.120	Information: for segment #6 (1048+78.420 to 1049+67.120), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1048+78.420	1049+67.120	Information: for segment #6 (1048+78.420 to 1049+67.120), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1048+78.420	1049+67.120	Information: for segment #6 (1048+78.420 to 1049+67.120), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1048+78.420	1049+67.120	Information: for segment #6 (1048+78.420 to 1049+67.120), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1049+67.120	1050+92.000	Information: for segment #7 (1049+67.120 to 1050+92.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1049+67.120	1050+92.000	Information: for segment #7 (1049+67.120 to 1050+92.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1049+67.120	1050+92.000	Information: for segment #7 (1049+67.120 to 1050+92.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1049+67.120	1050+92.000	Information: for segment #7 (1049+67.120 to 1050+92.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1050+92.000	1054+22.000	Information: for segment #8 (1050+92.000 to 1054+22.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1050+92.000	1054+22.000	Information: for segment #8 (1050+92.000 to 1054+22.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1050+92.000	1054+22.000	Information: for segment #8 (1050+92.000 to 1054+22.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1050+92.000	1054+22.000	Information: for segment #8 (1050+92.000 to 1054+22.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1054+22.000	1055+87.420	Information: for segment #9 (1054+22.000 to 1055+87.420), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1054+22.000	1055+87.420	Information: for segment #9 (1054+22.000 to 1055+87.420), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1054+22.000	1055+87.420	Information: for segment #9 (1054+22.000 to 1055+87.420), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1054+22.000	1055+87.420	Information: for segment #9 (1054+22.000 to 1055+87.420), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1019+79.090	1023+40.350	Information: for segment #3 (1019+79.090 to 1023+40.350), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 9:24 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 12:22:40 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL3
Highway Comment: Imported from CENTRAL3.xml
Highway Version: 1

Evaluation Title: Section 2
Evaluation Comment: Created Thu Jun 23 12:21:37 CDT 2022

Minimum Location: 1137+45.515
Maximum Location: 1161+05.035

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

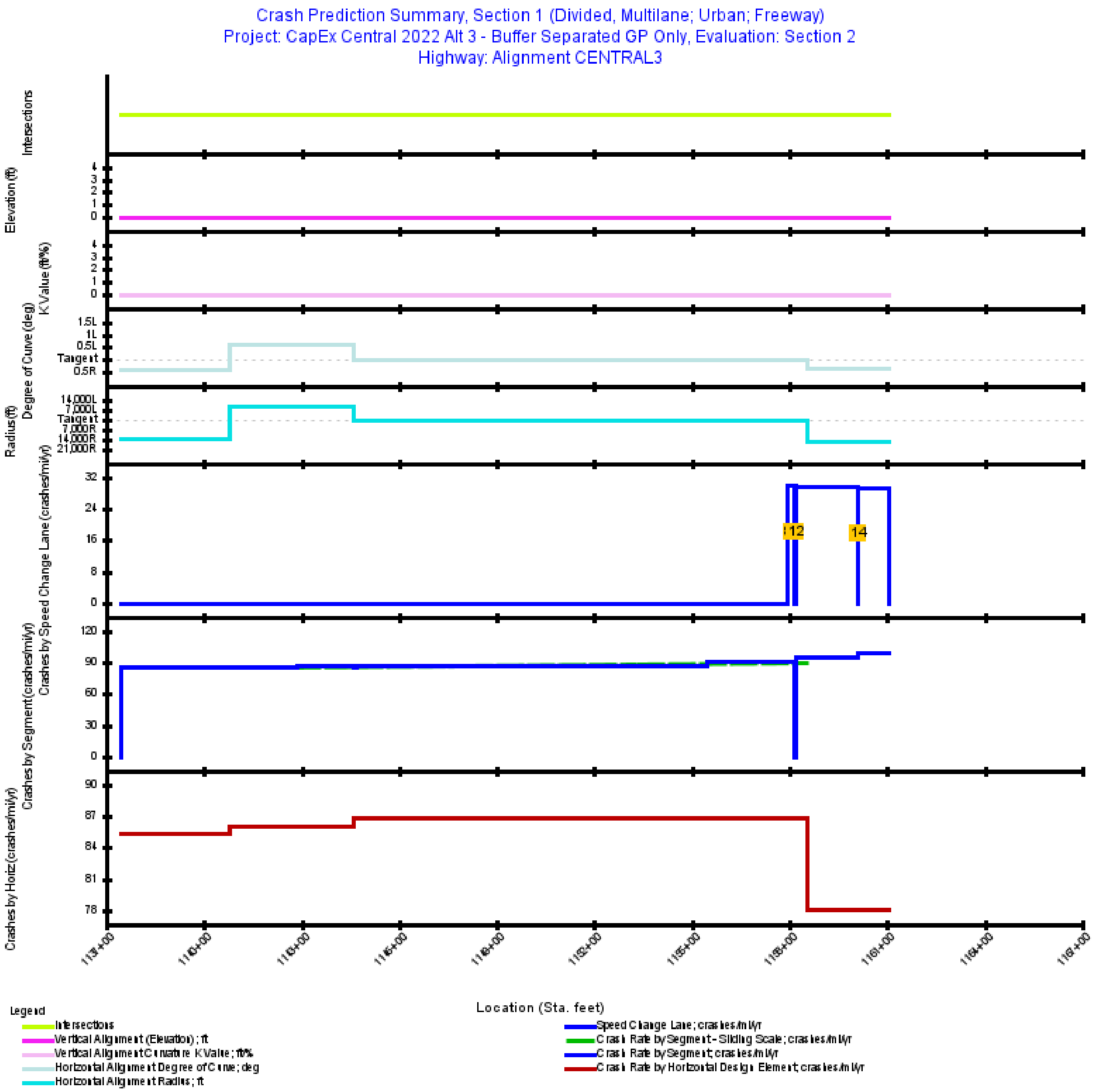
The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1137+45.515
Evaluation End Location: 1161+05.035
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_EX=1.0; FI_MV=1.0; FI_SV=1.0; PDO_EX=1.0; PDO_MV=1.0; PDO_SV=1.0;



Crash Prediction Summary, Section 1 (Divided, Multilane; Urban; Freeway)
Project: CapEx Central 2022 Alt 3 - Buffer Separated GP Only, Evaluation: Section 2
Highway: Alignment CENTRAL3

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Ten-lane Freeway	Urban	1137+45.515	1137+45.520	0.01	0.0000	2030: 231,000	66.00	Non-Traversable Median	74.00
2	Ten-lane Freeway	Urban	1137+45.520	1139+25.515	180.00	0.0341	2030: 231,000	66.00	Non-Traversable Median	73.50
3	Ten-lane Freeway	Urban	1139+25.515	1142+84.515	359.00	0.0680	2030: 231,000	66.00	Non-Traversable Median	72.00
4	Ten-lane Freeway	Urban	1142+84.515	1144+57.600	173.09	0.0328	2030: 231,000	66.00	Non-Traversable Median	70.52
5	Ten-lane Freeway	Urban	1144+57.600	1144+70.530	12.93	0.0024	2030: 231,000	66.00	Non-Traversable Median	70.02
6	Ten-lane Freeway	Urban	1144+70.530	1155+46.100	1,075.57	0.2037	2030: 231,000	66.00	Non-Traversable Median	70.00
7	Ten-lane Freeway	Urban	1155+46.100	1158+16.170	270.07	0.0511	2030: 231,000	66.00	Non-Traversable Median	70.48
9	Ten-lane Freeway	Urban	1158+16.170	1158+19.515	3.34	0.0006	2030: 231,000	66.00	Non-Traversable Median	70.98
11	Ten-lane Freeway	Urban	1158+19.515	1160+10.515	191.00	0.0362	2030: 231,000	66.00	Non-Traversable Median	72.00
13	Ten-lane Freeway	Urban	1160+10.515	1161+05.035	94.52	0.0179	2030: 231,000	66.00	Non-Traversable Median	73.50

Table 2. Evaluation Freeway - Speed Change Lanes (Speed Change)

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
8	Ten-lane Freeway Speed Change	Exit	1157+93.210	1158+16.170	22.96	0.0043	2030: 231,000	66.00	Non-Traversable Median	70.93
10	Ten-lane Freeway Speed Change	Exit	1158+16.170	1158+19.515	3.34	0.0006	2030: 231,000	66.00	Non-Traversable Median	70.98
12	Ten-lane Freeway Speed Change	Exit	1158+19.515	1160+10.515	191.00	0.0362	2030: 231,000	66.00	Non-Traversable Median	72.00
14	Ten-lane Freeway Speed Change	Exit	1160+10.515	1161+05.035	94.52	0.0179	2030: 231,000	66.00	Non-Traversable Median	73.50

Table 3. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**0.4170**
Average Future Road AADT (vpd)	**231,000**
Predicted Crashes	
Total Crashes	**36.47**
Fatal and Injury Crashes	**9.92**
Property-Damage-Only Crashes	**26.55**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**27**
Percent Property-Damage-Only Crashes (%)	**73**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**87.4466**
FI Crash Rate (crashes/mi/yr)	**23.7844**
PDO Crash Rate (crashes/mi/yr)	**63.6622**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**35.16**
Travel Crash Rate (crashes/million veh-mi)	**1.04**
Travel FI Crash Rate (crashes/million veh-mi)	**0.28**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.76**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Table 4. Predicted Freeway Speed Change Lane Crash Rates and Frequencies Summary (Speed Change)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Length (mi)	**0.0591**
Average Future Road AADT (vpd)	**115,500**
Predicted Crashes	
Total Crashes	**1.75**
Fatal and Injury Crashes	**0.52**
Property-Damage-Only Crashes	**1.23**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**30**
Percent Property-Damage-Only Crashes (%)	**70**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**29.6532**
FI Crash Rate (crashes/mi/yr)	**8.8311**
PDO Crash Rate (crashes/mi/yr)	**20.8221**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.49**
Travel Crash Rate (crashes/million veh-mi)	**0.70**
Travel FI Crash Rate (crashes/million veh-mi)	**0.21**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.49**

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 5. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1137+45.515	1137+45.520	0.0000	0.000	0.0000	0.0000	0.0000	0.0000	0.00
2	1137+45.520	1139+25.515	0.0341	2.902	2.9019	0.7872	2.1147	85.1246	1.01
3	1139+25.515	1142+84.515	0.0680	5.822	5.8222	1.5790	4.2432	85.6298	1.02
4	1142+84.515	1144+57.600	0.0328	2.836	2.8356	0.7692	2.0664	86.4999	1.03
5	1144+57.600	1144+70.530	0.0024	0.209	0.2093	0.0569	0.1524	85.4826	1.01
6	1144+70.530	1155+46.100	0.2037	17.625	17.6251	4.7978	12.8274	86.5223	1.03
7	1155+46.100	1158+16.170	0.0490	4.459	4.4593	1.2169	3.2425	91.0524	1.08
9	1158+16.170	1158+19.515	0.0000	0.000	0.0000	0.0000	0.0000	0.0000	0.00
11	1158+19.515	1160+10.515	0.0181	1.726	1.7265	0.4704	1.2560	95.4520	1.13
13	1160+10.515	1161+05.035	0.0090	0.888	0.8881	0.2415	0.6466	99.2238	1.18
Total			0.4170	36.468	36.4680	9.9188	26.5492	87.4466	1.04

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 6. Predicted Crash Frequencies and Rates by Freeway Speed Change Lane (Speed Change)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
8	1157+93.210	1158+16.170	0.0043	0.130	0.1300	0.0388	0.0912	29.8932	0.71
10	1158+16.170	1158+19.515	0.0006	0.019	0.0189	0.0057	0.0133	29.8793	0.71
12	1158+19.515	1160+10.515	0.0362	1.076	1.0758	0.3205	0.7554	29.7407	0.70
14	1160+10.515	1161+05.035	0.0179	0.526	0.5265	0.1566	0.3699	29.4101	0.70
Total			0.0591	1.751	1.7513	0.5215	1.2297	29.6532	0.70

Note: *Travel Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 7. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1137+45.515	1140+78.292	0.0630	5.380	5.3796	1.4591	3.9205	85.3553	1.01
Simple Curve 2	1140+78.292	1144+57.601	0.0718	6.180	6.1800	1.6762	4.5038	86.0266	1.02
Tangent	1144+57.601	1158+52.405	0.2642	22.925	22.9253	6.2522	16.6731	86.7831	1.07
Simple Curve 3	1158+52.405	1161+05.035	0.0478	3.734	3.7344	1.0528	2.6815	78.0486	1.85

Table 8. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	38.22	10.44	27.317	27.78	72.683
Total	38.22	10.44	27.317	27.78	72.683
Average	38.22	10.44	27.317	27.78	72.683

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 9. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0185	0.0390	0.2659	0.4637	2.1147
3	0.0371	0.0783	0.5334	0.9302	4.2432
4	0.0181	0.0381	0.2598	0.4532	2.0664
5	0.0012	0.0023	0.0179	0.0355	0.1524
6	0.0970	0.1978	1.5070	2.9960	12.8274
7	0.0246	0.0502	0.3822	0.7599	3.2425
9	0.0000	0.0000	0.0000	0.0000	0.0000
11	0.0108	0.0226	0.1570	0.2800	1.2560
13	0.0057	0.0120	0.0816	0.1423	0.6466
Total	0.2129	0.4403	3.2047	6.0609	26.5492

Table 10. Predicted Crash Severity by Speed Change Lane (Speed Change)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
8	0.0008	0.0016	0.0122	0.0242	0.0912
10	0.0001	0.0002	0.0018	0.0035	0.0133
12	0.0073	0.0154	0.1069	0.1908	0.7554
14	0.0037	0.0078	0.0529	0.0923	0.3699
Total	0.0119	0.0250	0.1738	0.3108	1.2297

Table 11. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.0	0.20	0.5	0.21	0.6
Highway Segment	Collision with Fixed Object	2.45	6.7	6.38	17.5	8.83	24.2
Highway Segment	Collision with Other Object	0.17	0.5	1.24	3.4	1.41	3.9
Highway Segment	Other Single-vehicle Collision	0.70	1.9	0.95	2.6	1.66	4.5
Highway Segment	Collision with Parked Vehicle	0.05	0.1	0.14	0.4	0.19	0.5
Highway Segment	Total Single Vehicle Crashes	3.39	9.3	8.91	24.4	12.31	33.7
Highway Segment	Right-Angle Collision	0.20	0.6	0.32	0.9	0.52	1.4
Highway Segment	Head-on Collision	0.05	0.1	0.04	0.1	0.09	0.2
Highway Segment	Other Multi-vehicle Collision	0.20	0.6	0.42	1.2	0.63	1.7
Highway Segment	Rear-end Collision	4.90	13.4	12.17	33.4	17.06	46.8
Highway Segment	Sideswipe, Same Direction Collision	1.18	3.2	4.69	12.9	5.87	16.1
Highway Segment	Total Multiple Vehicle Crashes	6.53	17.9	17.63	48.4	24.16	66.3
Highway Segment	Total Highway Segment Crashes	9.92	27.2	26.55	72.8	36.47	100.0
	Total Crashes	9.92	27.2	26.55	72.8	36.47	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 12. Predicted Exit Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.01	0.5	0.01	0.5
Highway Segment	Collision with Fixed Object	0.10	5.8	0.26	14.5	0.36	20.4
Highway Segment	Collision with Other Object	0.01	0.5	0.04	2.1	0.04	2.6
Highway Segment	Other Single-vehicle Collision	0.03	1.5	0.03	1.6	0.05	3.1
Highway Segment	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Total Single Vehicle Crashes	0.14	7.8	0.33	18.7	0.46	26.5
Highway Segment	Right-Angle Collision	0.01	0.3	0.01	0.8	0.02	1.2
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.1	0.01	0.3
Highway Segment	Other Multi-vehicle Collision	0.01	0.5	0.02	1.1	0.03	1.6
Highway Segment	Rear-end Collision	0.29	16.4	0.69	39.7	0.98	56.0
Highway Segment	Sideswipe, Same Direction Collision	0.08	4.7	0.17	9.7	0.25	14.4
Highway Segment	Total Multiple Vehicle Crashes	0.39	22.0	0.90	51.5	1.29	73.5
Highway Segment	Total Highway Segment Crashes	0.52	29.8	1.23	70.2	1.75	100.0
	Total Crashes	0.52	29.8	1.23	70.2	1.75	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 13. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1137+45.515	1137+45.520	Information: for segment #1 (1137+45.515 to 1137+45.520), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1137+45.515	1137+45.520	Information: for segment #1 (1137+45.515 to 1137+45.520), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1137+45.515	1137+45.520	Information: for segment #1 (1137+45.515 to 1137+45.520), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1137+45.515	1137+45.520	Information: for segment #1 (1137+45.515 to 1137+45.520), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1137+45.520	1139+25.515	Information: for segment #2 (1137+45.520 to 1139+25.515), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1137+45.520	1139+25.515	Information: for segment #2 (1137+45.520 to 1139+25.515), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1137+45.520	1139+25.515	Information: for segment #2 (1137+45.520 to 1139+25.515), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1137+45.520	1139+25.515	Information: for segment #2 (1137+45.520 to 1139+25.515), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1139+25.515	1142+84.515	Information: for segment #3 (1139+25.515 to 1142+84.515), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1139+25.515	1142+84.515	Information: for segment #3 (1139+25.515 to 1142+84.515), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1139+25.515	1142+84.515	Information: for segment #3 (1139+25.515 to 1142+84.515), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1139+25.515	1142+84.515	Information: for segment #3 (1139+25.515 to 1142+84.515), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1142+84.515	1144+57.600	Information: for segment #4 (1142+84.515 to 1144+57.600), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1142+84.515	1144+57.600	Information: for segment #4 (1142+84.515 to 1144+57.600), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1142+84.515	1144+57.600	Information: for segment #4 (1142+84.515 to 1144+57.600), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1142+84.515	1144+57.600	Information: for segment #4 (1142+84.515 to 1144+57.600), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1144+57.600	1144+70.530	Information: for segment #5 (1144+57.600 to 1144+70.530), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1144+57.600	1144+70.530	Information: for segment #5 (1144+57.600 to 1144+70.530), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1144+57.600	1144+70.530	Information: for segment #5 (1144+57.600 to 1144+70.530), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1144+57.600	1144+70.530	Information: for segment #5 (1144+57.600 to 1144+70.530), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1144+70.530	1155+46.100	Information: for segment #6 (1144+70.530 to 1155+46.100), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1144+70.530	1155+46.100	Information: for segment #6 (1144+70.530 to 1155+46.100), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1144+70.530	1155+46.100	Information: for segment #6 (1144+70.530 to 1155+46.100), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1144+70.530	1155+46.100	Information: for segment #6 (1144+70.530 to 1155+46.100), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1155+46.100	1158+16.170	Information: for segment #7 (1155+46.100 to 1158+16.170), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1155+46.100	1158+16.170	Information: for segment #7 (1155+46.100 to 1158+16.170), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1155+46.100	1158+16.170	Information: for segment #7 (1155+46.100 to 1158+16.170), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1155+46.100	1158+16.170	Information: for segment #7 (1155+46.100 to 1158+16.170), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+16.170	1158+19.515	Information: for segment #9 (1158+16.170 to 1158+19.515), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+16.170	1158+19.515	Information: for segment #9 (1158+16.170 to 1158+19.515), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+16.170	1158+19.515	Information: for segment #9 (1158+16.170 to 1158+19.515), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+16.170	1158+19.515	Information: for segment #9 (1158+16.170 to 1158+19.515), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+19.515	1160+10.515	Information: for segment #11 (1158+19.515 to 1160+10.515), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+19.515	1160+10.515	Information: for segment #11 (1158+19.515 to 1160+10.515), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+19.515	1160+10.515	Information: for segment #11 (1158+19.515 to 1160+10.515), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+19.515	1160+10.515	Information: for segment #11 (1158+19.515 to 1160+10.515), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+10.515	1161+05.035	Information: for segment #13 (1160+10.515 to 1161+05.035), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+10.515	1161+05.035	Information: for segment #13 (1160+10.515 to 1161+05.035), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+10.515	1161+05.035	Information: for segment #13 (1160+10.515 to 1161+05.035), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+10.515	1161+05.035	Information: for segment #13 (1160+10.515 to 1161+05.035), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1157+93.210	1158+16.170	Information: for segment #8 (1157+93.210 to 1158+16.170), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+16.170	1158+19.515	Information: for segment #10 (1158+16.170 to 1158+19.515), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1158+19.515	1160+10.515	Information: for segment #12 (1158+19.515 to 1160+10.515), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1160+10.515	1161+05.035	Information: for segment #14 (1160+10.515 to 1161+05.035), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 9:24 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 12:25:22 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL3
Highway Comment: Imported from CENTRAL3.xml
Highway Version: 1

Evaluation Title: Section 3
Evaluation Comment: Created Thu Jun 23 12:22:56 CDT 2022

Minimum Location: 1188+09.855
Maximum Location: 1317+43.705

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1188+09.855
Evaluation End Location: 1317+43.705
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_EX=1.0; FI_MV=1.0; FI_SV=1.0; PDO_EX=1.0; PDO_MV=1.0; PDO_SV=1.0;

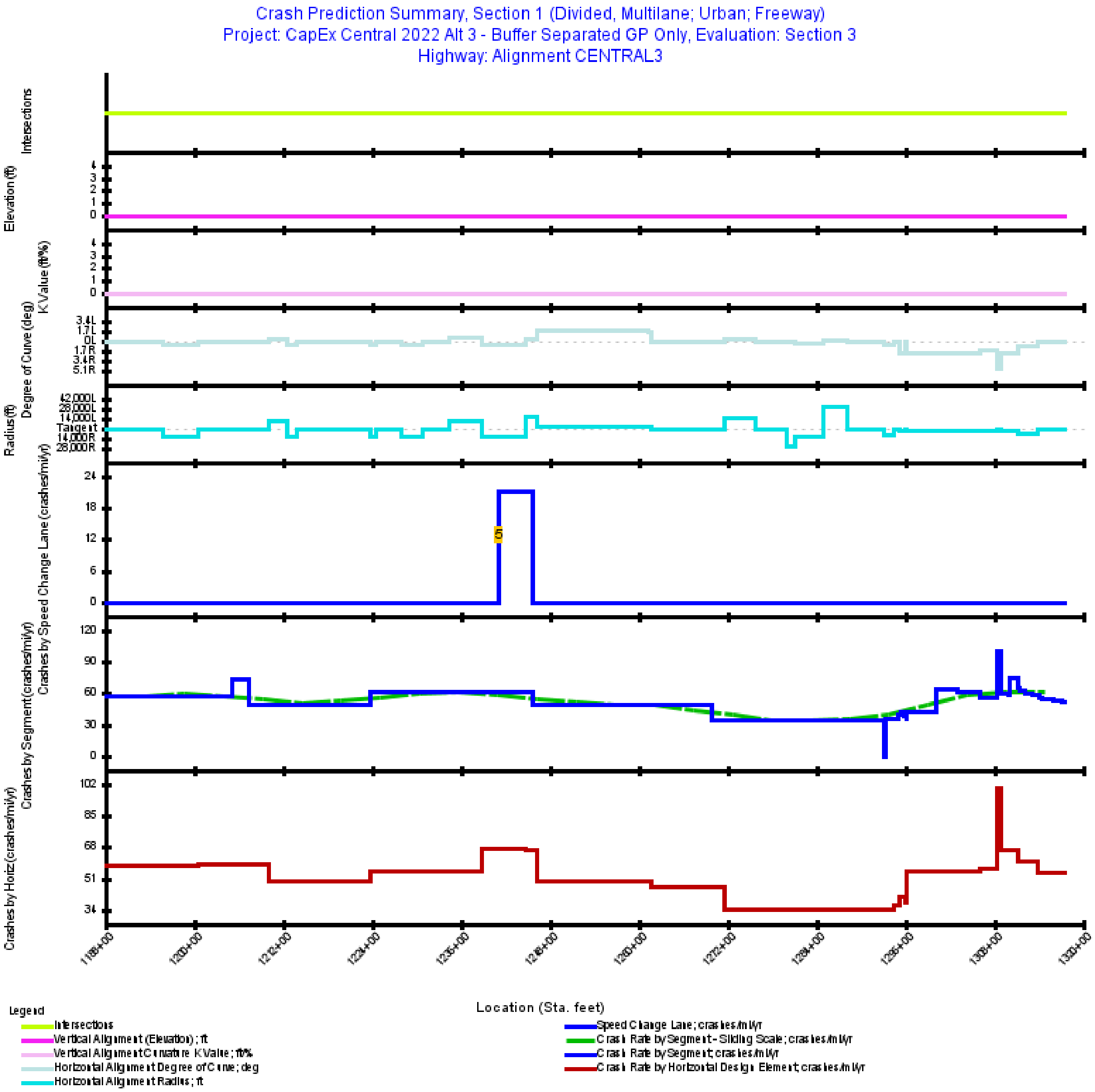

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Eight-lane Freeway	Urban	1188+09.855	1205+10.860	1,701.01	0.3222	2030: 158,500	64.00	Non-Traversable Median	72.00
2	Nine-lane Freeway	Urban	1205+10.860	1207+25.110	214.25	0.0406	2030: 178,450	64.00	Non-Traversable Median	72.00
3	Seven-lane Freeway	Urban	1207+25.110	1223+65.390	1,640.28	0.3107	2030: 139,250	64.00	Non-Traversable Median	72.00
4	Eight-lane Freeway	Urban	1223+65.390	1245+66.480	2,201.09	0.4169	2030: 163,000	64.00	Non-Traversable Median	71.61
6	Seven-lane Freeway	Urban	1245+66.480	1269+73.040	2,406.56	0.4558	2030: 130,600	58.57	Non-Traversable Median	71.18
7	Six-lane Freeway	Urban	1269+73.040	1272+14.855	241.81	0.0458	2030: 105,100	64.07	Non-Traversable Median	72.07
8	Six-lane Freeway	Urban	1272+14.855	1293+09.460	2,094.61	0.3967	2030: 105,100	67.30	Non-Traversable Median	76.50
9	Six-lane Freeway	Urban	1293+09.460	1293+14.390	4.93	0.0009	2030: 105,100	72.03	Non-Traversable Median	80.00
10	Six-lane Freeway	Urban	1293+14.390	1293+49.855	35.46	0.0067	2030: 105,100	72.30	Non-Traversable Median	79.76
11	Six-lane Freeway	Urban	1293+49.855	1294+24.855	75.00	0.0142	2030: 105,100	73.03	Non-Traversable Median	79.02
12	Six-lane Freeway	Urban	1294+24.855	1294+99.855	75.00	0.0142	2030: 105,100	74.03	Non-Traversable Median	78.02
13	Six-lane Freeway	Urban	1294+99.855	1295+35.855	36.00	0.0068	2030: 105,100	74.77	Non-Traversable Median	77.27
14	Six-lane Freeway	Urban	1295+35.855	1295+74.855	39.00	0.0074	2030: 105,100	75.26	Non-Traversable Median	76.77
15	Six-lane Freeway	Urban	1295+74.855	1296+07.550	32.70	0.0062	2030: 105,100	75.74	Non-Traversable Median	76.29
16	Six-lane Freeway	Urban	1296+07.550	1296+16.080	8.53	0.0016	2030: 105,100	76.01	Non-Traversable Median	76.07
17	Six-lane Freeway	Urban	1296+16.080	1300+07.160	391.08	0.0741	2030: 105,100	78.66	Non-Traversable Median	78.66
18	Seven-lane Freeway	Urban	1300+07.160	1302+89.855	282.69	0.0535	2030: 137,800	83.13	Non-Traversable Median	83.13
19	Seven-lane Freeway	Urban	1302+89.855	1305+90.560	300.71	0.0570	2030: 137,800	87.00	Non-Traversable Median	87.00
20	Seven-lane Freeway	Urban	1305+90.560	1306+64.855	74.29	0.0141	2030: 137,800	87.69	Non-Traversable Median	88.19
21	Seven-lane Freeway	Urban	1306+64.855	1307+03.855	39.00	0.0074	2030: 137,800	85.69	Non-Traversable Median	86.96
22	Seven-lane Freeway	Urban	1307+03.855	1308+11.855	108.00	0.0205	2030: 137,800	83.09	Non-Traversable Median	85.36
23	Seven-lane Freeway	Urban	1308+11.855	1308+33.900	22.05	0.0042	2030: 137,800	80.79	Non-Traversable Median	83.95
24	Seven-lane Freeway	Urban	1308+33.900	1308+85.530	51.63	0.0098	2030: 137,800	79.49	Non-Traversable Median	83.43
25	Seven-lane Freeway	Urban	1308+85.530	1309+25.855	40.32	0.0076	2030: 137,800	77.87	Non-Traversable Median	82.66
26	Seven-lane Freeway	Urban	1309+25.855	1309+87.855	62.00	0.0117	2030: 137,800	76.06	Non-Traversable Median	81.41

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
27	Seven-lane Freeway	Urban	1309+87.855	1310+05.140	17.29	0.0033	2030: 137,800	74.66	Non-Traversable Median	80.45
28	Eight-lane Freeway	Urban	1310+05.140	1311+06.855	101.71	0.0193	2030: 157,750	72.56	Non-Traversable Median	79.00
29	Eight-lane Freeway	Urban	1311+06.855	1311+28.540	21.69	0.0041	2030: 157,750	70.38	Non-Traversable Median	77.50
30	Eight-lane Freeway	Urban	1311+28.540	1312+13.855	85.31	0.0162	2030: 157,750	69.31	Non-Traversable Median	77.43
31	Eight-lane Freeway	Urban	1312+13.855	1313+10.855	97.00	0.0184	2030: 157,750	67.82	Non-Traversable Median	77.84
32	Eight-lane Freeway	Urban	1313+10.855	1314+06.855	96.00	0.0182	2030: 157,750	66.26	Non-Traversable Median	78.27
33	Eight-lane Freeway	Urban	1314+06.855	1314+36.855	30.00	0.0057	2030: 157,750	65.23	Non-Traversable Median	78.55
34	Eight-lane Freeway	Urban	1314+36.855	1315+02.855	66.00	0.0125	2030: 157,750	64.45	Non-Traversable Median	78.77
35	Eight-lane Freeway	Urban	1315+02.855	1315+99.855	97.00	0.0184	2030: 157,750	63.13	Non-Traversable Median	79.14
36	Eight-lane Freeway	Urban	1315+99.855	1316+95.855	96.00	0.0182	2030: 157,750	61.56	Non-Traversable Median	79.57
37	Eight-lane Freeway	Urban	1316+95.855	1317+43.705	47.85	0.0091	2030: 157,750	60.39	Non-Traversable Median	79.89

Table 2. Evaluation Freeway - Speed Change Lanes (Speed Change)

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
5	Eight-lane Freeway Speed Change	Exit	1241+11.480	1245+66.480	455.00	0.0862	2030: 163,000	64.00	Non-Traversable Median	71.61

Table 3. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**2.4056**
Average Future Road AADT (vpd)	**137,358**
Predicted Crashes	
Total Crashes	**123.48**
Fatal and Injury Crashes	**34.63**
Property-Damage-Only Crashes	**88.84**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**28**
Percent Property-Damage-Only Crashes (%)	**72**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**51.3293**
FI Crash Rate (crashes/mi/yr)	**14.3968**
PDO Crash Rate (crashes/mi/yr)	**36.9325**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**120.60**
Travel Crash Rate (crashes/million veh-mi)	**1.02**
Travel FI Crash Rate (crashes/million veh-mi)	**0.29**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.74**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Table 4. Predicted Freeway Speed Change Lane Crash Rates and Frequencies Summary (Speed Change)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Length (mi)	**0.0862**
Average Future Road AADT (vpd)	**81,500**
Predicted Crashes	
Total Crashes	**1.82**
Fatal and Injury Crashes	**0.53**
Property-Damage-Only Crashes	**1.28**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**29**
Percent Property-Damage-Only Crashes (%)	**71**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**21.0823**
FI Crash Rate (crashes/mi/yr)	**6.1730**
PDO Crash Rate (crashes/mi/yr)	**14.9093**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.56**
Travel Crash Rate (crashes/million veh-mi)	**0.71**
Travel FI Crash Rate (crashes/million veh-mi)	**0.21**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.50**

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 5. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1188+09.855	1205+10.860	0.3222	18.652	18.6521	5.1644	13.4878	57.8971	1.00
2	1205+10.860	1207+25.110	0.0406	2.978	2.9776	0.8457	2.1318	73.3792	1.13
3	1207+25.110	1223+65.390	0.3107	15.492	15.4916	4.3294	11.1622	49.8670	0.98
4	1223+65.390	1245+66.480	0.3738	22.884	22.8836	6.4552	16.4284	61.2212	1.03
6	1245+66.480	1269+73.040	0.4558	22.669	22.6691	6.3634	16.3057	49.7361	1.04
7	1269+73.040	1272+14.855	0.0458	1.581	1.5807	0.4510	1.1296	34.5136	0.90
8	1272+14.855	1293+09.460	0.3967	13.716	13.7162	3.9132	9.8030	34.5754	0.90
9	1293+09.460	1293+14.390	0.0000	0.000	0.0000	0.0000	0.0000	0.0000	0.00
10	1293+14.390	1293+49.855	0.0067	0.238	0.2378	0.0677	0.1701	35.3989	0.92
11	1293+49.855	1294+24.855	0.0142	0.509	0.5087	0.1450	0.3637	35.8145	0.93
12	1294+24.855	1294+99.855	0.0142	0.507	0.5070	0.1450	0.3620	35.6953	0.93
13	1294+99.855	1295+35.855	0.0068	0.275	0.2747	0.0776	0.1971	40.2863	1.05
14	1295+35.855	1295+74.855	0.0074	0.317	0.3172	0.0890	0.2281	42.9417	1.12
15	1295+74.855	1296+07.550	0.0062	0.241	0.2412	0.0684	0.1729	38.9558	1.01
16	1296+07.550	1296+16.080	0.0016	0.058	0.0575	0.0164	0.0410	35.5679	0.93
17	1296+16.080	1300+07.160	0.0741	3.179	3.1787	0.8924	2.2863	42.9162	1.12
18	1300+07.160	1302+89.855	0.0535	3.435	3.4349	0.9455	2.4894	64.1546	1.28
19	1302+89.855	1305+90.560	0.0570	3.519	3.5186	0.9683	2.5504	61.7823	1.23
20	1305+90.560	1306+64.855	0.0141	0.794	0.7939	0.2203	0.5736	56.4200	1.12
21	1306+64.855	1307+03.855	0.0074	0.415	0.4155	0.1153	0.3002	56.2488	1.12
22	1307+03.855	1308+11.855	0.0205	1.147	1.1468	0.3181	0.8286	56.0638	1.11
23	1308+11.855	1308+33.900	0.0042	0.234	0.2335	0.0648	0.1687	55.9217	1.11
24	1308+33.900	1308+85.530	0.0098	0.978	0.9779	0.2568	0.7211	100.0023	1.99
25	1308+85.530	1309+25.855	0.0076	0.457	0.4570	0.1255	0.3315	59.8396	1.19
26	1309+25.855	1309+87.855	0.0117	0.699	0.6986	0.1918	0.5068	59.4938	1.18
27	1309+87.855	1310+05.140	0.0033	0.194	0.1939	0.0532	0.1407	59.2331	1.18
28	1310+05.140	1311+06.855	0.0193	1.451	1.4511	0.4043	1.0468	75.3250	1.31
29	1311+06.855	1311+28.540	0.0041	0.266	0.2661	0.0755	0.1906	64.8030	1.12
30	1311+28.540	1312+13.855	0.0162	1.004	1.0042	0.2856	0.7187	62.1493	1.08
31	1312+13.855	1313+10.855	0.0184	1.105	1.1051	0.3137	0.7914	60.1539	1.04
32	1313+10.855	1314+06.855	0.0182	1.055	1.0554	0.2992	0.7562	58.0475	1.01
33	1314+06.855	1314+36.855	0.0057	0.318	0.3178	0.0902	0.2276	55.9287	0.97
34	1314+36.855	1315+02.855	0.0125	0.690	0.6899	0.1957	0.4942	55.1891	0.96
35	1315+02.855	1315+99.855	0.0184	0.993	0.9925	0.2810	0.7115	54.0257	0.94
36	1315+99.855	1316+95.855	0.0182	0.960	0.9595	0.2711	0.6884	52.7722	0.92
37	1316+95.855	1317+43.705	0.0091	0.470	0.4704	0.1327	0.3377	51.9094	0.90
Total			2.4056	123.476	123.4763	34.6325	88.8438	51.3293	1.02

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 6. Predicted Crash Frequencies and Rates by Freeway Speed Change Lane (Speed Change)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
5	1241+11.480	1245+66.480	0.0862	1.817	1.8168	0.5320	1.2848	21.0823	0.71
Total			0.0862	1.817	1.8168	0.5320	1.2848	21.0823	0.71

Note: *Travel Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 7. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1188+09.855	1195+72.323	0.1444	8.361	8.3607	2.3149	6.0458	57.8971	1.00
Simple Curve 1	1195+72.323	1200+47.172	0.0899	5.207	5.2069	1.4417	3.7652	57.8971	1.00
Tangent	1200+47.172	1210+00.018	0.1805	10.658	10.6584	2.9791	7.6793	59.0615	1.02
Simple Curve 2	1210+00.018	1212+46.080	0.0466	2.324	2.3239	0.6495	1.6745	49.8670	0.98
Simple Curve 3	1212+46.080	1213+83.648	0.0261	1.299	1.2993	0.3631	0.9362	49.8670	0.98
Tangent	1213+83.648	1223+73.936	0.1876	9.361	9.3609	2.6163	6.7446	49.9104	0.98
Simple Curve 4	1223+73.936	1224+55.134	0.0154	0.844	0.8442	0.2381	0.6060	54.8935	1.03
Tangent	1224+55.134	1227+89.560	0.0633	3.477	3.4769	0.9808	2.4961	54.8935	1.03
Simple Curve 5	1227+89.560	1230+74.643	0.0540	2.964	2.9639	0.8361	2.1278	54.8935	1.03
Tangent	1230+74.643	1234+28.850	0.0671	3.683	3.6825	1.0388	2.6437	54.8935	1.03
Simple Curve 6	1234+28.850	1238+69.498	0.0835	4.581	4.5812	1.2923	3.2889	54.8935	1.03
Simple Curve 7	1238+69.498	1244+66.641	0.1131	7.626	7.6263	2.1665	5.4598	67.4326	1.45
Simple Curve 8	1244+66.641	1246+25.198	0.0300	1.990	1.9897	0.5648	1.4249	66.2585	1.48
Simple Curve 9	1246+25.198	1261+30.755	0.2851	14.182	14.1819	3.9809	10.2010	49.7361	1.04
Simple Curve 10	1261+30.755	1261+58.272	0.0052	0.259	0.2592	0.0728	0.1864	49.7361	1.04
Tangent	1261+58.272	1271+56.218	0.1890	8.872	8.8723	2.4961	6.3762	46.9419	1.02
Simple Curve 11	1271+56.218	1275+79.192	0.0801	2.769	2.7691	0.7900	1.9791	34.5668	0.90
Tangent	1275+79.192	1279+96.280	0.0790	2.731	2.7312	0.7792	1.9520	34.5754	0.90
Simple Curve 12	1279+96.280	1281+03.641	0.0203	0.703	0.7030	0.2006	0.5025	34.5754	0.90
Simple Curve 13	1281+03.641	1284+86.326	0.0725	2.506	2.5060	0.7149	1.7910	34.5754	0.90
Simple Curve 14	1284+86.326	1288+06.180	0.0606	2.095	2.0945	0.5976	1.4970	34.5754	0.90
Tangent	1288+06.180	1293+09.171	0.0953	3.294	3.2938	0.9397	2.3541	34.5754	0.90
Simple Curve 15	1293+09.171	1294+36.580	0.0241	0.828	0.8277	0.2360	0.5917	34.2992	0.89
Tangent	1294+36.580	1295+12.819	0.0144	0.527	0.5267	0.1503	0.3764	36.4759	0.95
Simple Curve 16	1295+12.819	1295+89.877	0.0146	0.604	0.6038	0.1701	0.4337	41.3709	1.08
Tangent	1295+89.877	1296+17.142	0.0052	0.197	0.1965	0.0558	0.1407	38.0501	0.99
Simple Curve 17	1296+17.142	1305+90.520	0.1844	10.123	10.1231	2.8036	7.3195	54.9119	1.20
Simple Curve 18	1305+90.520	1308+35.045	0.0463	2.612	2.6118	0.7243	1.8874	56.3953	1.12
Simple Curve 19	1308+35.045	1308+85.408	0.0095	0.954	0.9539	0.2505	0.7034	100.0023	1.99
Simple Curve 20	1308+85.408	1311+09.781	0.0425	2.839	2.8388	0.7856	2.0532	66.8039	1.24
Simple Curve 21	1311+09.781	1313+87.205	0.0525	3.179	3.1789	0.9025	2.2764	60.5022	1.05
Tangent	1313+87.205	1317+43.705	0.0675	3.646	3.6461	1.0320	2.6141	54.0013	0.94

Table 8. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	125.29	35.16	28.066	90.13	71.934
Total	125.29	35.16	28.066	90.13	71.934
Average	125.29	35.16	28.066	90.13	71.934

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 9. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.1090	0.2243	1.6563	3.1748	13.4878
2	0.0171	0.0349	0.2656	0.5281	2.1318
3	0.0907	0.1864	1.3839	2.6683	11.1622
4	0.1439	0.3000	2.1266	3.8846	16.4284
6	0.1422	0.2966	2.0986	3.8260	16.3057
7	0.0095	0.0195	0.1443	0.2779	1.1296
8	0.0861	0.1790	1.2812	2.3668	9.8030
9	0.0000	0.0000	0.0000	0.0000	0.0000
10	0.0016	0.0034	0.0229	0.0399	0.1701
11	0.0034	0.0072	0.0490	0.0854	0.3637
12	0.0030	0.0062	0.0461	0.0898	0.3620
13	0.0017	0.0036	0.0255	0.0467	0.1971
14	0.0021	0.0044	0.0301	0.0525	0.2281
15	0.0015	0.0031	0.0222	0.0416	0.1729
16	0.0003	0.0007	0.0052	0.0103	0.0410
17	0.0210	0.0442	0.3014	0.5258	2.2863
18	0.0222	0.0469	0.3194	0.5570	2.4894
19	0.0227	0.0480	0.3271	0.5704	2.5504
20	0.0052	0.0109	0.0744	0.1298	0.5736
21	0.0027	0.0057	0.0389	0.0679	0.3002
22	0.0075	0.0158	0.1075	0.1874	0.8286
23	0.0015	0.0032	0.0219	0.0381	0.1687
24	0.0060	0.0127	0.0867	0.1513	0.7211
25	0.0029	0.0062	0.0424	0.0740	0.3315
26	0.0045	0.0095	0.0648	0.1130	0.5068
27	0.0013	0.0026	0.0180	0.0313	0.1407
28	0.0095	0.0200	0.1366	0.2382	1.0468
29	0.0018	0.0037	0.0255	0.0445	0.1906
30	0.0067	0.0142	0.0965	0.1682	0.7187
31	0.0074	0.0156	0.1060	0.1848	0.7914
32	0.0068	0.0143	0.0996	0.1785	0.7562
33	0.0018	0.0037	0.0283	0.0563	0.2276
34	0.0040	0.0081	0.0615	0.1222	0.4942
35	0.0057	0.0116	0.0883	0.1755	0.7115
36	0.0055	0.0112	0.0852	0.1693	0.6884
37	0.0027	0.0055	0.0417	0.0829	0.3377
Total	0.7615	1.5828	11.3291	20.9592	88.8438

Table 10. Predicted Crash Severity by Speed Change Lane (Speed Change)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
5	0.0125	0.0264	0.1797	0.3134	1.2848

Table 11. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.05	0.0	0.78	0.6	0.84	0.7
Highway Segment	Collision with Fixed Object	9.52	7.7	25.49	20.6	35.01	28.4
Highway Segment	Collision with Other Object	0.67	0.5	4.95	4.0	5.62	4.6
Highway Segment	Other Single-vehicle Collision	2.74	2.2	3.81	3.1	6.55	5.3
Highway Segment	Collision with Parked Vehicle	0.20	0.2	0.57	0.5	0.77	0.6
Highway Segment	Total Single Vehicle Crashes	13.19	10.7	35.60	28.8	48.79	39.5
Highway Segment	Right-Angle Collision	0.67	0.5	0.96	0.8	1.62	1.3
Highway Segment	Head-on Collision	0.17	0.1	0.11	0.1	0.28	0.2
Highway Segment	Other Multi-vehicle Collision	0.67	0.5	1.28	1.0	1.94	1.6
Highway Segment	Rear-end Collision	16.08	13.0	36.74	29.8	52.82	42.8
Highway Segment	Sideswipe, Same Direction Collision	3.86	3.1	14.16	11.5	18.02	14.6
Highway Segment	Total Multiple Vehicle Crashes	21.45	17.4	53.24	43.1	74.69	60.5
Highway Segment	Total Highway Segment Crashes	34.63	28.0	88.84	72.0	123.48	100.0
	Total Crashes	34.63	28.0	88.84	72.0	123.48	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 12. Predicted Exit Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.01	0.5	0.01	0.5
Highway Segment	Collision with Fixed Object	0.10	5.7	0.27	14.6	0.37	20.4
Highway Segment	Collision with Other Object	0.01	0.5	0.04	2.1	0.05	2.6
Highway Segment	Other Single-vehicle Collision	0.03	1.4	0.03	1.6	0.06	3.1
Highway Segment	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Total Single Vehicle Crashes	0.14	7.6	0.34	18.9	0.48	26.5
Highway Segment	Right-Angle Collision	0.01	0.3	0.01	0.8	0.02	1.2
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.1	0.01	0.3
Highway Segment	Other Multi-vehicle Collision	0.01	0.5	0.02	1.1	0.03	1.6
Highway Segment	Rear-end Collision	0.29	16.1	0.73	40.0	1.02	56.0
Highway Segment	Sideswipe, Same Direction Collision	0.08	4.6	0.18	9.8	0.26	14.4
Highway Segment	Total Multiple Vehicle Crashes	0.39	21.6	0.94	51.8	1.33	73.5
Highway Segment	Total Highway Segment Crashes	0.53	29.3	1.28	70.7	1.82	100.0
	Total Crashes	0.53	29.3	1.28	70.7	1.82	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 13. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1188+09.855	1205+10.860	Information: for segment #1 (1188+09.855 to 1205+10.860), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1188+09.855	1205+10.860	Information: for segment #1 (1188+09.855 to 1205+10.860), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1188+09.855	1205+10.860	Information: for segment #1 (1188+09.855 to 1205+10.860), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1188+09.855	1205+10.860	Information: for segment #1 (1188+09.855 to 1205+10.860), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1205+10.860	1207+25.110	Information: for segment #2 (1205+10.860 to 1207+25.110), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1205+10.860	1207+25.110	Information: for segment #2 (1205+10.860 to 1207+25.110), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1205+10.860	1207+25.110	Information: for segment #2 (1205+10.860 to 1207+25.110), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1205+10.860	1207+25.110	Information: for segment #2 (1205+10.860 to 1207+25.110), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1207+25.110	1223+65.390	Information: for segment #3 (1207+25.110 to 1223+65.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1207+25.110	1223+65.390	Information: for segment #3 (1207+25.110 to 1223+65.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1207+25.110	1223+65.390	Information: for segment #3 (1207+25.110 to 1223+65.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1207+25.110	1223+65.390	Information: for segment #3 (1207+25.110 to 1223+65.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1223+65.390	1245+66.480	Information: for segment #4 (1223+65.390 to 1245+66.480), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1223+65.390	1245+66.480	Information: for segment #4 (1223+65.390 to 1245+66.480), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1223+65.390	1245+66.480	Information: for segment #4 (1223+65.390 to 1245+66.480), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1223+65.390	1245+66.480	Information: for segment #4 (1223+65.390 to 1245+66.480), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1245+66.480	1269+73.040	Information: for segment #6 (1245+66.480 to 1269+73.040), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1245+66.480	1269+73.040	Information: for segment #6 (1245+66.480 to 1269+73.040), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1245+66.480	1269+73.040	Information: for segment #6 (1245+66.480 to 1269+73.040), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1245+66.480	1269+73.040	Information: for segment #6 (1245+66.480 to 1269+73.040), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1269+73.040	1272+14.855	Information: for segment #7 (1269+73.040 to 1272+14.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1269+73.040	1272+14.855	Information: for segment #7 (1269+73.040 to 1272+14.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1269+73.040	1272+14.855	Information: for segment #7 (1269+73.040 to 1272+14.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1269+73.040	1272+14.855	Information: for segment #7 (1269+73.040 to 1272+14.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1272+14.855	1293+09.460	Information: for segment #8 (1272+14.855 to 1293+09.460), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1272+14.855	1293+09.460	Information: for segment #8 (1272+14.855 to 1293+09.460), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1272+14.855	1293+09.460	Information: for segment #8 (1272+14.855 to 1293+09.460), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1272+14.855	1293+09.460	Information: for segment #8 (1272+14.855 to 1293+09.460), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+09.460	1293+14.390	Information: for segment #9 (1293+09.460 to 1293+14.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+09.460	1293+14.390	Information: for segment #9 (1293+09.460 to 1293+14.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+09.460	1293+14.390	Information: for segment #9 (1293+09.460 to 1293+14.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+09.460	1293+14.390	Information: for segment #9 (1293+09.460 to 1293+14.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+14.390	1293+49.855	Information: for segment #10 (1293+14.390 to 1293+49.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+14.390	1293+49.855	Information: for segment #10 (1293+14.390 to 1293+49.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+14.390	1293+49.855	Information: for segment #10 (1293+14.390 to 1293+49.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+14.390	1293+49.855	Information: for segment #10 (1293+14.390 to 1293+49.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+49.855	1294+24.855	Information: for segment #11 (1293+49.855 to 1294+24.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+49.855	1294+24.855	Information: for segment #11 (1293+49.855 to 1294+24.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+49.855	1294+24.855	Information: for segment #11 (1293+49.855 to 1294+24.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+49.855	1294+24.855	Information: for segment #11 (1293+49.855 to 1294+24.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+24.855	1294+99.855	Information: for segment #12 (1294+24.855 to 1294+99.855), Inside shoulder width (1.99 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1294+24.855	1294+99.855	Information: for segment #12 (1294+24.855 to 1294+99.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+24.855	1294+99.855	Information: for segment #12 (1294+24.855 to 1294+99.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+24.855	1294+99.855	Information: for segment #12 (1294+24.855 to 1294+99.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+24.855	1294+99.855	Information: for segment #12 (1294+24.855 to 1294+99.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+99.855	1295+35.855	Information: for segment #13 (1294+99.855 to 1295+35.855), Inside shoulder width (1.25 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1294+99.855	1295+35.855	Information: for segment #13 (1294+99.855 to 1295+35.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+99.855	1295+35.855	Information: for segment #13 (1294+99.855 to 1295+35.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+99.855	1295+35.855	Information: for segment #13 (1294+99.855 to 1295+35.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+99.855	1295+35.855	Information: for segment #13 (1294+99.855 to 1295+35.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1295+35.855	1295+74.855	Information: for segment #14 (1295+35.855 to 1295+74.855), Inside shoulder width (0.75 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1295+35.855	1295+74.855	Information: for segment #14 (1295+35.855 to 1295+74.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1295+35.855	1295+74.855	Information: for segment #14 (1295+35.855 to 1295+74.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1295+35.855	1295+74.855	Information: for segment #14 (1295+35.855 to 1295+74.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1295+35.855	1295+74.855	Information: for segment #14 (1295+35.855 to 1295+74.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1295+74.855	1296+07.550	Information: for segment #15 (1295+74.855 to 1296+07.550), Inside shoulder width (0.27 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1295+74.855	1296+07.550	Information: for segment #15 (1295+74.855 to 1296+07.550), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1295+74.855	1296+07.550	Information: for segment #15 (1295+74.855 to 1296+07.550), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1295+74.855	1296+07.550	Information: for segment #15 (1295+74.855 to 1296+07.550), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1295+74.855	1296+07.550	Information: for segment #15 (1295+74.855 to 1296+07.550), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+07.550	1296+16.080	Information: for segment #16 (1296+07.550 to 1296+16.080), Inside shoulder width (0.03 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1296+07.550	1296+16.080	Information: for segment #16 (1296+07.550 to 1296+16.080), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+07.550	1296+16.080	Information: for segment #16 (1296+07.550 to 1296+16.080), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+07.550	1296+16.080	Information: for segment #16 (1296+07.550 to 1296+16.080), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+07.550	1296+16.080	Information: for segment #16 (1296+07.550 to 1296+16.080), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+16.080	1300+07.160	Information: for segment #17 (1296+16.080 to 1300+07.160), Inside shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1296+16.080	1300+07.160	Information: for segment #17 (1296+16.080 to 1300+07.160), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+16.080	1300+07.160	Information: for segment #17 (1296+16.080 to 1300+07.160), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+16.080	1300+07.160	Information: for segment #17 (1296+16.080 to 1300+07.160), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+16.080	1300+07.160	Information: for segment #17 (1296+16.080 to 1300+07.160), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1300+07.160	1302+89.855	Information: for segment #18 (1300+07.160 to 1302+89.855), Inside shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1300+07.160	1302+89.855	Information: for segment #18 (1300+07.160 to 1302+89.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1300+07.160	1302+89.855	Information: for segment #18 (1300+07.160 to 1302+89.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1300+07.160	1302+89.855	Information: for segment #18 (1300+07.160 to 1302+89.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1300+07.160	1302+89.855	Information: for segment #18 (1300+07.160 to 1302+89.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1302+89.855	1305+90.560	Information: for segment #19 (1302+89.855 to 1305+90.560), Inside shoulder width (0.00 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1302+89.855	1305+90.560	Information: for segment #19 (1302+89.855 to 1305+90.560), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1302+89.855	1305+90.560	Information: for segment #19 (1302+89.855 to 1305+90.560), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1302+89.855	1305+90.560	Information: for segment #19 (1302+89.855 to 1305+90.560), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1302+89.855	1305+90.560	Information: for segment #19 (1302+89.855 to 1305+90.560), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1305+90.560	1306+64.855	Information: for segment #20 (1305+90.560 to 1306+64.855), Inside shoulder width (0.25 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1305+90.560	1306+64.855	Information: for segment #20 (1305+90.560 to 1306+64.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1305+90.560	1306+64.855	Information: for segment #20 (1305+90.560 to 1306+64.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1305+90.560	1306+64.855	Information: for segment #20 (1305+90.560 to 1306+64.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1305+90.560	1306+64.855	Information: for segment #20 (1305+90.560 to 1306+64.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1306+64.855	1307+03.855	Information: for segment #21 (1306+64.855 to 1307+03.855), Inside shoulder width (0.64 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1306+64.855	1307+03.855	Information: for segment #21 (1306+64.855 to 1307+03.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1306+64.855	1307+03.855	Information: for segment #21 (1306+64.855 to 1307+03.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1306+64.855	1307+03.855	Information: for segment #21 (1306+64.855 to 1307+03.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1306+64.855	1307+03.855	Information: for segment #21 (1306+64.855 to 1307+03.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1307+03.855	1308+11.855	Information: for segment #22 (1307+03.855 to 1308+11.855), Inside shoulder width (1.13 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1307+03.855	1308+11.855	Information: for segment #22 (1307+03.855 to 1308+11.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1307+03.855	1308+11.855	Information: for segment #22 (1307+03.855 to 1308+11.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1307+03.855	1308+11.855	Information: for segment #22 (1307+03.855 to 1308+11.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1307+03.855	1308+11.855	Information: for segment #22 (1307+03.855 to 1308+11.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+11.855	1308+33.900	Information: for segment #23 (1308+11.855 to 1308+33.900), Inside shoulder width (1.58 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1308+11.855	1308+33.900	Information: for segment #23 (1308+11.855 to 1308+33.900), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+11.855	1308+33.900	Information: for segment #23 (1308+11.855 to 1308+33.900), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+11.855	1308+33.900	Information: for segment #23 (1308+11.855 to 1308+33.900), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+11.855	1308+33.900	Information: for segment #23 (1308+11.855 to 1308+33.900), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+33.900	1308+85.530	Information: for segment #24 (1308+33.900 to 1308+85.530), Inside shoulder width (1.97 feet) is less than specified boundaries (2.00 feet); adjusted in CMF calculations.
1308+33.900	1308+85.530	Information: for segment #24 (1308+33.900 to 1308+85.530), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+33.900	1308+85.530	Information: for segment #24 (1308+33.900 to 1308+85.530), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+33.900	1308+85.530	Information: for segment #24 (1308+33.900 to 1308+85.530), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+33.900	1308+85.530	Information: for segment #24 (1308+33.900 to 1308+85.530), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+85.530	1309+25.855	Information: for segment #25 (1308+85.530 to 1309+25.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+85.530	1309+25.855	Information: for segment #25 (1308+85.530 to 1309+25.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+85.530	1309+25.855	Information: for segment #25 (1308+85.530 to 1309+25.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+85.530	1309+25.855	Information: for segment #25 (1308+85.530 to 1309+25.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1309+25.855	1309+87.855	Information: for segment #26 (1309+25.855 to 1309+87.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1309+25.855	1309+87.855	Information: for segment #26 (1309+25.855 to 1309+87.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1309+25.855	1309+87.855	Information: for segment #26 (1309+25.855 to 1309+87.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1309+25.855	1309+87.855	Information: for segment #26 (1309+25.855 to 1309+87.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1309+87.855	1310+05.140	Information: for segment #27 (1309+87.855 to 1310+05.140), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1309+87.855	1310+05.140	Information: for segment #27 (1309+87.855 to 1310+05.140), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1309+87.855	1310+05.140	Information: for segment #27 (1309+87.855 to 1310+05.140), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1309+87.855	1310+05.140	Information: for segment #27 (1309+87.855 to 1310+05.140), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1310+05.140	1311+06.855	Information: for segment #28 (1310+05.140 to 1311+06.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1310+05.140	1311+06.855	Information: for segment #28 (1310+05.140 to 1311+06.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1310+05.140	1311+06.855	Information: for segment #28 (1310+05.140 to 1311+06.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1310+05.140	1311+06.855	Information: for segment #28 (1310+05.140 to 1311+06.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1311+06.855	1311+28.540	Information: for segment #29 (1311+06.855 to 1311+28.540), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1311+06.855	1311+28.540	Information: for segment #29 (1311+06.855 to 1311+28.540), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1311+06.855	1311+28.540	Information: for segment #29 (1311+06.855 to 1311+28.540), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1311+06.855	1311+28.540	Information: for segment #29 (1311+06.855 to 1311+28.540), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1311+28.540	1312+13.855	Information: for segment #30 (1311+28.540 to 1312+13.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1311+28.540	1312+13.855	Information: for segment #30 (1311+28.540 to 1312+13.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1311+28.540	1312+13.855	Information: for segment #30 (1311+28.540 to 1312+13.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1311+28.540	1312+13.855	Information: for segment #30 (1311+28.540 to 1312+13.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1312+13.855	1313+10.855	Information: for segment #31 (1312+13.855 to 1313+10.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1312+13.855	1313+10.855	Information: for segment #31 (1312+13.855 to 1313+10.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1312+13.855	1313+10.855	Information: for segment #31 (1312+13.855 to 1313+10.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1312+13.855	1313+10.855	Information: for segment #31 (1312+13.855 to 1313+10.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1313+10.855	1314+06.855	Information: for segment #32 (1313+10.855 to 1314+06.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1313+10.855	1314+06.855	Information: for segment #32 (1313+10.855 to 1314+06.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1313+10.855	1314+06.855	Information: for segment #32 (1313+10.855 to 1314+06.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1313+10.855	1314+06.855	Information: for segment #32 (1313+10.855 to 1314+06.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1314+06.855	1314+36.855	Information: for segment #33 (1314+06.855 to 1314+36.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1314+06.855	1314+36.855	Information: for segment #33 (1314+06.855 to 1314+36.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1314+06.855	1314+36.855	Information: for segment #33 (1314+06.855 to 1314+36.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1314+06.855	1314+36.855	Information: for segment #33 (1314+06.855 to 1314+36.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1314+36.855	1315+02.855	Information: for segment #34 (1314+36.855 to 1315+02.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1314+36.855	1315+02.855	Information: for segment #34 (1314+36.855 to 1315+02.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1314+36.855	1315+02.855	Information: for segment #34 (1314+36.855 to 1315+02.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1314+36.855	1315+02.855	Information: for segment #34 (1314+36.855 to 1315+02.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1315+02.855	1315+99.855	Information: for segment #35 (1315+02.855 to 1315+99.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1315+02.855	1315+99.855	Information: for segment #35 (1315+02.855 to 1315+99.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1315+02.855	1315+99.855	Information: for segment #35 (1315+02.855 to 1315+99.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1315+02.855	1315+99.855	Information: for segment #35 (1315+02.855 to 1315+99.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1315+99.855	1316+95.855	Information: for segment #36 (1315+99.855 to 1316+95.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1315+99.855	1316+95.855	Information: for segment #36 (1315+99.855 to 1316+95.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1315+99.855	1316+95.855	Information: for segment #36 (1315+99.855 to 1316+95.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1315+99.855	1316+95.855	Information: for segment #36 (1315+99.855 to 1316+95.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1316+95.855	1317+43.705	Information: for segment #37 (1316+95.855 to 1317+43.705), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1316+95.855	1317+43.705	Information: for segment #37 (1316+95.855 to 1317+43.705), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1316+95.855	1317+43.705	Information: for segment #37 (1316+95.855 to 1317+43.705), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1316+95.855	1317+43.705	Information: for segment #37 (1316+95.855 to 1317+43.705), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1241+11.480	1245+66.480	Information: for segment #5 (1241+11.480 to 1245+66.480), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1188+09.855	1205+10.860	Warning: for segment #1 (1188+09.855 to 1205+10.860), Freeway Segment of type 8F is using unbalanced lane processing with 3 + 5 lanes. While results are provided, the HSM specifies that this approach only applies when the number of lanes varies by no more than one lane between the two travel directions.
1205+10.860	1207+25.110	Information: for segment #2 (1205+10.860 to 1207+25.110), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1207+25.110	1223+65.390	Information: for segment #3 (1207+25.110 to 1223+65.390), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1245+66.480	1269+73.040	Information: for segment #6 (1245+66.480 to 1269+73.040), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1300+07.160	1302+89.855	Information: for segment #18 (1300+07.160 to 1302+89.855), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1302+89.855	1305+90.560	Information: for segment #19 (1302+89.855 to 1305+90.560), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1305+90.560	1306+64.855	Information: for segment #20 (1305+90.560 to 1306+64.855), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1306+64.855	1307+03.855	Information: for segment #21 (1306+64.855 to 1307+03.855), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1307+03.855	1308+11.855	Information: for segment #22 (1307+03.855 to 1308+11.855), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1308+11.855	1308+33.900	Information: for segment #23 (1308+11.855 to 1308+33.900), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1308+33.900	1308+85.530	Information: for segment #24 (1308+33.900 to 1308+85.530), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1308+85.530	1309+25.855	Information: for segment #25 (1308+85.530 to 1309+25.855), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1309+25.855	1309+87.855	Information: for segment #26 (1309+25.855 to 1309+87.855), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1309+87.855	1310+05.140	Information: for segment #27 (1309+87.855 to 1310+05.140), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 9:25 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 12:26:44 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL3
Highway Comment: Imported from CENTRAL3.xml
Highway Version: 1

Evaluation Title: Section 4
Evaluation Comment: Created Thu Jun 23 12:25:39 CDT 2022

Minimum Location: 1340+47.770
Maximum Location: 1418+65.083

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1340+47.770
Evaluation End Location: 1418+65.083
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_EN=1.0; FI_EX=1.0; FI_MV=1.0; FI_SV=1.0; PDO_EN=1.0; PDO_EX=1.0; PDO_MV=1.0; PDO_SV=1.0;

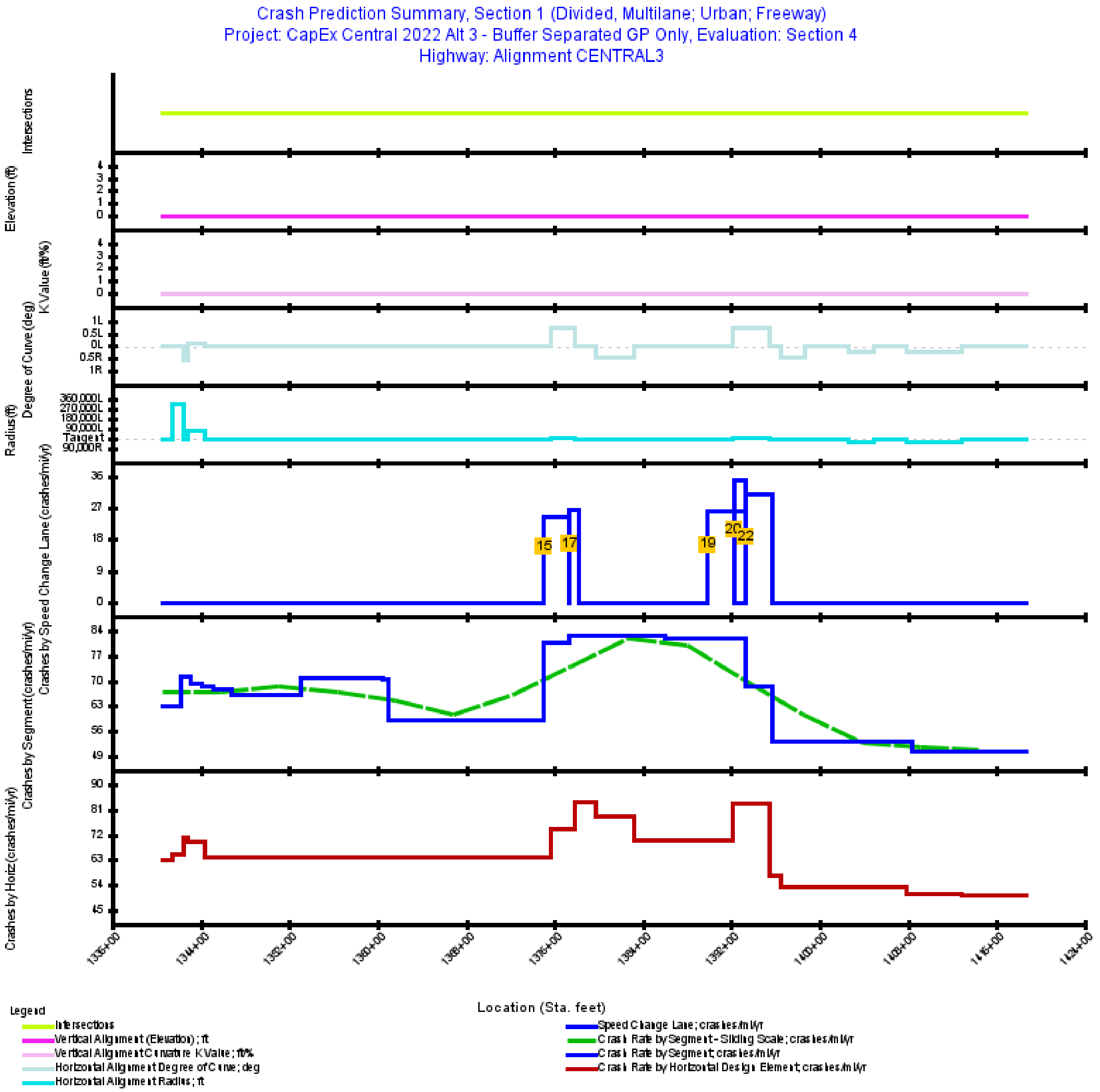

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Nine-lane Freeway	Urban	1340+47.770	1340+99.770	52.00	0.0098	2030: 183,600	58.00	Non-Traversable Median	77.49
2	Nine-lane Freeway	Urban	1340+99.770	1342+01.770	102.00	0.0193	2030: 183,600	58.00	Non-Traversable Median	75.99
3	Nine-lane Freeway	Urban	1342+01.770	1342+19.830	18.06	0.0034	2030: 183,600	58.00	Non-Traversable Median	74.81
4	Ten-lane Freeway	Urban	1342+19.830	1343+03.770	83.94	0.0159	2030: 190,950	58.00	Non-Traversable Median	73.81
5	Ten-lane Freeway	Urban	1343+03.770	1344+05.770	102.00	0.0193	2030: 190,950	58.00	Non-Traversable Median	71.99
6	Ten-lane Freeway	Urban	1344+05.770	1345+08.770	103.00	0.0195	2030: 190,950	58.00	Non-Traversable Median	69.99
7	Ten-lane Freeway	Urban	1345+08.770	1346+10.770	102.00	0.0193	2030: 190,950	58.00	Non-Traversable Median	67.98
8	Ten-lane Freeway	Urban	1346+10.770	1346+41.680	30.91	0.0059	2030: 190,950	58.00	Non-Traversable Median	66.68
9	Ten-lane Freeway	Urban	1346+41.680	1346+82.020	40.34	0.0076	2030: 190,950	58.00	Non-Traversable Median	66.19
10	Ten-lane Freeway	Urban	1346+82.020	1353+07.770	625.75	0.1185	2030: 190,950	58.00	Non-Traversable Median	64.50
11	Ten-lane Freeway	Urban	1353+07.770	1360+43.040	735.27	0.1393	2030: 190,950	54.00	Non-Traversable Median	62.50
12	Nine-lane Freeway	Urban	1360+43.040	1361+03.200	60.16	0.0114	2030: 178,550	54.00	Non-Traversable Median	62.00
13	Eight-lane Freeway	Urban	1361+03.200	1375+05.490	1,402.29	0.2656	2030: 164,450	54.00	Non-Traversable Median	62.00
14	Eight-lane Freeway	Urban	1375+05.490	1377+37.430	231.94	0.0439	2030: 188,500	54.00	Non-Traversable Median	62.00
16	Nine-lane Freeway	Urban	1377+37.430	1385+97.770	860.34	0.1629	2030: 203,000	54.00	Non-Traversable Median	62.50
18	Nine-lane Freeway	Urban	1385+97.770	1393+31.380	733.61	0.1389	2030: 203,000	58.00	Non-Traversable Median	64.50
21	Eight-lane Freeway	Urban	1393+31.380	1395+77.290	245.91	0.0466	2030: 168,550	58.00	Non-Traversable Median	66.00
23	Seven-lane Freeway	Urban	1395+77.290	1408+10.770	1,233.48	0.2336	2030: 147,550	58.00	Non-Traversable Median	69.50
24	Seven-lane Freeway	Urban	1408+10.770	1408+37.210	26.44	0.0050	2030: 147,550	65.18	Non-Traversable Median	73.18
25	Eight-lane Freeway	Urban	1408+37.210	1418+65.083	1,027.87	0.1947	2030: 147,550	70.00	Non-Traversable Median	75.67

Table 2. Evaluation Freeway - Speed Change Lanes (Speed Change)

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
15	Eight-lane Freeway Speed Change	Exit	1375+05.490	1377+37.430	231.94	0.0439	2030: 188,500	54.00	Non-Traversable Median	62.00
17	Nine-lane Freeway Speed Change	Exit	1377+37.430	1378+25.490	88.06	0.0167	2030: 203,000	54.00	Non-Traversable Median	62.00
19	Nine-lane Freeway Speed Change	Exit	1389+86.380	1393+31.380	345.00	0.0653	2030: 203,000	58.00	Non-Traversable Median	66.00
20	Nine-lane Freeway Speed Change	Entrance	1392+22.290	1393+31.380	109.09	0.0207	2030: 203,000	58.00	Non-Traversable Median	66.00
22	Eight-lane Freeway Speed Change	Entrance	1393+31.380	1395+77.290	245.91	0.0466	2030: 168,550	58.00	Non-Traversable Median	66.00

Table 3. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**1.3840**
Average Future Road AADT (vpd)	**173,767**
Predicted Crashes	
Total Crashes	**88.76**
Fatal and Injury Crashes	**24.91**
Property-Damage-Only Crashes	**63.85**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**28**
Percent Property-Damage-Only Crashes (%)	**72**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**64.1367**
FI Crash Rate (crashes/mi/yr)	**17.9972**
PDO Crash Rate (crashes/mi/yr)	**46.1396**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**87.78**
Travel Crash Rate (crashes/million veh-mi)	**1.01**
Travel FI Crash Rate (crashes/million veh-mi)	**0.28**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.73**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Table 4. Predicted Freeway Speed Change Lane Crash Rates and Frequencies Summary (Speed Change)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Length (mi)	**0.1932**
Average Future Road AADT (vpd)	**95,699**
Predicted Crashes	
Total Crashes	**5.39**
Fatal and Injury Crashes	**1.77**
Property-Damage-Only Crashes	**3.62**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**33**
Percent Property-Damage-Only Crashes (%)	**67**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**27.8827**
FI Crash Rate (crashes/mi/yr)	**9.1516**
PDO Crash Rate (crashes/mi/yr)	**18.7311**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**6.75**
Travel Crash Rate (crashes/million veh-mi)	**0.80**
Travel FI Crash Rate (crashes/million veh-mi)	**0.26**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.54**

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 5. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1340+47.770	1340+99.770	0.0098	0.620	0.6198	0.1728	0.4470	62.9295	0.94
2	1340+99.770	1342+01.770	0.0193	1.216	1.2163	0.3394	0.8769	62.9638	0.94
3	1342+01.770	1342+19.830	0.0034	0.216	0.2157	0.0602	0.1555	63.0670	0.94
4	1342+19.830	1343+03.770	0.0159	1.133	1.1327	0.3226	0.8102	71.2516	1.02
5	1343+03.770	1344+05.770	0.0193	1.339	1.3393	0.3826	0.9567	69.3268	0.99
6	1344+05.770	1345+08.770	0.0195	1.333	1.3327	0.3813	0.9514	68.3164	0.98
7	1345+08.770	1346+10.770	0.0193	1.310	1.3095	0.3752	0.9343	67.7855	0.97
8	1346+10.770	1346+41.680	0.0059	0.396	0.3960	0.1136	0.2824	67.6431	0.97
9	1346+41.680	1346+82.020	0.0076	0.516	0.5159	0.1480	0.3679	67.5272	0.97
10	1346+82.020	1353+07.770	0.1185	7.832	7.8324	2.2462	5.5862	66.0888	0.95
11	1353+07.770	1360+43.040	0.1393	9.854	9.8542	2.8277	7.0265	70.7631	1.01
12	1360+43.040	1361+03.200	0.0114	0.800	0.8004	0.2265	0.5739	70.2472	1.08
13	1361+03.200	1375+05.490	0.2656	15.669	15.6692	4.3966	11.2726	58.9987	0.98
14	1375+05.490	1377+37.430	0.0220	1.773	1.7733	0.4820	1.2913	80.7378	1.17
16	1377+37.430	1385+97.770	0.1546	12.776	12.7757	3.5070	9.2687	82.6352	1.11
18	1385+97.770	1393+31.380	0.0959	7.856	7.8557	2.1579	5.6978	81.8812	1.10
21	1393+31.380	1395+77.290	0.0233	1.599	1.5987	0.4473	1.1514	68.6523	1.12
23	1395+77.290	1408+10.770	0.2336	12.421	12.4213	3.4147	9.0066	53.1702	0.99
24	1408+10.770	1408+37.210	0.0050	0.266	0.2660	0.0731	0.1929	53.1243	0.99
25	1408+37.210	1418+65.083	0.1947	9.838	9.8379	2.8326	7.0053	50.5353	0.94
Total			1.3840	88.763	88.7627	24.9074	63.8553	64.1367	1.01

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 6. Predicted Crash Frequencies and Rates by Freeway Speed Change Lane (Speed Change)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
15	1375+05.490	1377+37.430	0.0439	1.082	1.0824	0.3282	0.7542	24.6392	0.72
17	1377+37.430	1378+25.490	0.0167	0.439	0.4389	0.1330	0.3059	26.3183	0.71
19	1389+86.380	1393+31.380	0.0653	1.706	1.7061	0.5129	1.1933	26.1114	0.70
20	1392+22.290	1393+31.380	0.0207	0.720	0.7198	0.2608	0.4590	34.8377	0.94
22	1393+31.380	1395+77.290	0.0466	1.439	1.4392	0.5330	0.9062	30.9017	1.00
Total			0.1932	5.386	5.3864	1.7679	3.6185	27.8827	0.80

Note: *Travel Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 7. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1340+47.770	1341+42.902	0.0180	1.134	1.1341	0.3163	0.8178	62.9450	0.94
Simple Curve 1	1341+42.902	1342+42.169	0.0188	1.219	1.2192	0.3420	0.8772	64.8476	0.96
Simple Curve 2	1342+42.169	1342+86.867	0.0085	0.603	0.6032	0.1718	0.4314	71.2516	1.02
Simple Curve 3	1342+86.867	1344+37.730	0.0286	1.981	1.9809	0.5658	1.4150	69.3284	0.99
Tangent	1344+37.730	1375+63.881	0.5921	38.016	38.0156	10.8007	27.2149	64.2075	1.00
Simple Curve 4	1375+63.881	1377+88.365	0.0425	3.147	3.1470	0.8908	2.2562	74.0196	1.88
Tangent	1377+88.365	1379+71.752	0.0347	2.908	2.9083	0.8036	2.1047	83.7340	1.26
Simple Curve 5	1379+71.752	1383+24.607	0.0668	5.240	5.2398	1.4384	3.8014	78.4061	1.11
Tangent	1383+24.607	1392+18.622	0.1693	11.853	11.8532	3.2850	8.5681	70.0040	1.29
Simple Curve 6	1392+18.622	1395+40.606	0.0610	5.070	5.0696	1.5942	3.4754	83.1327	2.33
Tangent	1395+40.606	1396+51.008	0.0209	1.196	1.1955	0.3503	0.8452	57.1767	1.36
Simple Curve 7	1396+51.008	1398+60.102	0.0396	2.106	2.1056	0.5788	1.5268	53.1702	0.99
Tangent	1398+60.102	1402+63.279	0.0764	4.060	4.0600	1.1161	2.9439	53.1702	0.99
Simple Curve 8	1402+63.279	1404+92.432	0.0434	2.308	2.3076	0.6344	1.6732	53.1702	0.99
Tangent	1404+92.432	1407+87.804	0.0559	2.974	2.9744	0.8177	2.1567	53.1702	0.99
Simple Curve 9	1407+87.804	1412+77.721	0.0928	4.713	4.7135	1.3506	3.3628	50.7986	0.94
Tangent	1412+77.721	1418+65.083	0.1112	5.622	5.6217	1.6186	4.0031	50.5353	0.94

Table 8. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	94.15	26.68	28.333	67.47	71.667
Total	94.15	26.68	28.333	67.47	71.667
Average	94.15	26.68	28.333	67.47	71.667

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 9. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0035	0.0071	0.0543	0.1079	0.4470
2	0.0075	0.0156	0.1113	0.2051	0.8769
3	0.0014	0.0030	0.0203	0.0355	0.1555
4	0.0076	0.0160	0.1090	0.1900	0.8102
5	0.0090	0.0190	0.1292	0.2254	0.9567
6	0.0081	0.0167	0.1226	0.2340	0.9514
7	0.0076	0.0155	0.1179	0.2343	0.9343
8	0.0023	0.0047	0.0357	0.0709	0.2824
9	0.0030	0.0061	0.0465	0.0924	0.3679
10	0.0454	0.0926	0.7055	1.4027	5.5862
11	0.0572	0.1166	0.8882	1.7658	7.0265
12	0.0046	0.0093	0.0712	0.1415	0.5739
13	0.0889	0.1812	1.3809	2.7455	11.2726
14	0.0109	0.0228	0.1599	0.2883	1.2913
16	0.0761	0.1576	1.1401	2.1332	9.2687
18	0.0437	0.0890	0.6780	1.3473	5.6978
21	0.0103	0.0216	0.1495	0.2659	1.1514
23	0.0731	0.1509	1.1029	2.0878	9.0066
24	0.0017	0.0036	0.0247	0.0431	0.1929
25	0.0611	0.1265	0.9185	1.7265	7.0053
Total	0.5229	1.0753	7.9661	15.3431	63.8553

Table 10. Predicted Crash Severity by Speed Change Lane (Speed Change)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
15	0.0074	0.0155	0.1089	0.1963	0.7542
17	0.0029	0.0061	0.0436	0.0804	0.3059
19	0.0109	0.0225	0.1651	0.3144	1.1933
20	0.0061	0.0129	0.0881	0.1536	0.4590
22	0.0122	0.0257	0.1782	0.3169	0.9062
Total	0.0396	0.0828	0.5839	1.0616	3.6185

Table 11. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.03	0.0	0.50	0.6	0.54	0.6
Highway Segment	Collision with Fixed Object	6.21	7.0	16.42	18.5	22.62	25.5
Highway Segment	Collision with Other Object	0.44	0.5	3.19	3.6	3.62	4.1
Highway Segment	Other Single-vehicle Collision	1.79	2.0	2.45	2.8	4.24	4.8
Highway Segment	Collision with Parked Vehicle	0.13	0.1	0.37	0.4	0.50	0.6
Highway Segment	Total Single Vehicle Crashes	8.60	9.7	22.93	25.8	31.52	35.5
Highway Segment	Right-Angle Collision	0.51	0.6	0.74	0.8	1.24	1.4
Highway Segment	Head-on Collision	0.13	0.1	0.08	0.1	0.21	0.2
Highway Segment	Other Multi-vehicle Collision	0.51	0.6	0.98	1.1	1.49	1.7
Highway Segment	Rear-end Collision	12.23	13.8	28.24	31.8	40.47	45.6
Highway Segment	Sideswipe, Same Direction Collision	2.94	3.3	10.89	12.3	13.82	15.6
Highway Segment	Total Multiple Vehicle Crashes	16.31	18.4	40.93	46.1	57.24	64.5
Highway Segment	Total Highway Segment Crashes	24.91	28.1	63.85	71.9	88.76	100.0
	Total Crashes	24.91	28.1	63.85	71.9	88.76	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 12. Predicted Exit Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.02	0.5	0.02	0.5
Highway Segment	Collision with Fixed Object	0.19	5.9	0.47	14.5	0.66	20.4
Highway Segment	Collision with Other Object	0.02	0.5	0.07	2.1	0.08	2.6
Highway Segment	Other Single-vehicle Collision	0.05	1.5	0.05	1.6	0.10	3.1
Highway Segment	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Total Single Vehicle Crashes	0.25	7.9	0.60	18.6	0.86	26.5
Highway Segment	Right-Angle Collision	0.01	0.3	0.03	0.8	0.04	1.2
Highway Segment	Head-on Collision	0.01	0.2	0.01	0.1	0.01	0.3
Highway Segment	Other Multi-vehicle Collision	0.02	0.5	0.04	1.1	0.05	1.6
Highway Segment	Rear-end Collision	0.54	16.6	1.27	39.4	1.81	56.0
Highway Segment	Sideswipe, Same Direction Collision	0.15	4.8	0.31	9.6	0.47	14.4
Highway Segment	Total Multiple Vehicle Crashes	0.72	22.3	1.65	51.2	2.37	73.5
Highway Segment	Total Highway Segment Crashes	0.97	30.2	2.25	69.8	3.23	100.0
	Total Crashes	0.97	30.2	2.25	69.8	3.23	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 13. Predicted Entrance Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.00	0.1	0.00	0.1
Highway Segment	Collision with Fixed Object	0.15	7.1	0.18	8.2	0.33	15.3
Highway Segment	Collision with Other Object	0.01	0.7	0.05	2.3	0.06	3.0
Highway Segment	Other Single-vehicle Collision	0.05	2.5	0.02	1.0	0.07	3.5
Highway Segment	Collision with Parked Vehicle	0.00	0.1	0.00	0.2	0.01	0.3
Highway Segment	Total Single Vehicle Crashes	0.23	10.4	0.25	11.8	0.48	22.2
Highway Segment	Right-Angle Collision	0.01	0.7	0.02	1.0	0.04	1.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.1	0.01	0.2
Highway Segment	Other Multi-vehicle Collision	0.01	0.6	0.02	0.9	0.03	1.6
Highway Segment	Rear-end Collision	0.43	20.0	0.72	33.5	1.16	53.5
Highway Segment	Sideswipe, Same Direction Collision	0.11	4.9	0.34	15.9	0.45	20.8
Highway Segment	Total Multiple Vehicle Crashes	0.57	26.3	1.11	51.5	1.68	77.8
Highway Segment	Total Highway Segment Crashes	0.79	36.8	1.36	63.2	2.16	100.0
	Total Crashes	0.79	36.8	1.36	63.2	2.16	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 14. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1340+47.770	1340+99.770	Information: for segment #1 (1340+47.770 to 1340+99.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1340+47.770	1340+99.770	Information: for segment #1 (1340+47.770 to 1340+99.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1340+47.770	1340+99.770	Information: for segment #1 (1340+47.770 to 1340+99.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1340+47.770	1340+99.770	Information: for segment #1 (1340+47.770 to 1340+99.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1340+99.770	1342+01.770	Information: for segment #2 (1340+99.770 to 1342+01.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1340+99.770	1342+01.770	Information: for segment #2 (1340+99.770 to 1342+01.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1340+99.770	1342+01.770	Information: for segment #2 (1340+99.770 to 1342+01.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1340+99.770	1342+01.770	Information: for segment #2 (1340+99.770 to 1342+01.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+01.770	1342+19.830	Information: for segment #3 (1342+01.770 to 1342+19.830), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+01.770	1342+19.830	Information: for segment #3 (1342+01.770 to 1342+19.830), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+01.770	1342+19.830	Information: for segment #3 (1342+01.770 to 1342+19.830), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+01.770	1342+19.830	Information: for segment #3 (1342+01.770 to 1342+19.830), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+19.830	1343+03.770	Information: for segment #4 (1342+19.830 to 1343+03.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+19.830	1343+03.770	Information: for segment #4 (1342+19.830 to 1343+03.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+19.830	1343+03.770	Information: for segment #4 (1342+19.830 to 1343+03.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+19.830	1343+03.770	Information: for segment #4 (1342+19.830 to 1343+03.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1343+03.770	1344+05.770	Information: for segment #5 (1343+03.770 to 1344+05.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1343+03.770	1344+05.770	Information: for segment #5 (1343+03.770 to 1344+05.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1343+03.770	1344+05.770	Information: for segment #5 (1343+03.770 to 1344+05.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1343+03.770	1344+05.770	Information: for segment #5 (1343+03.770 to 1344+05.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1344+05.770	1345+08.770	Information: for segment #6 (1344+05.770 to 1345+08.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1344+05.770	1345+08.770	Information: for segment #6 (1344+05.770 to 1345+08.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1344+05.770	1345+08.770	Information: for segment #6 (1344+05.770 to 1345+08.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1344+05.770	1345+08.770	Information: for segment #6 (1344+05.770 to 1345+08.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1345+08.770	1346+10.770	Information: for segment #7 (1345+08.770 to 1346+10.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1345+08.770	1346+10.770	Information: for segment #7 (1345+08.770 to 1346+10.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1345+08.770	1346+10.770	Information: for segment #7 (1345+08.770 to 1346+10.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1345+08.770	1346+10.770	Information: for segment #7 (1345+08.770 to 1346+10.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+10.770	1346+41.680	Information: for segment #8 (1346+10.770 to 1346+41.680), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+10.770	1346+41.680	Information: for segment #8 (1346+10.770 to 1346+41.680), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+10.770	1346+41.680	Information: for segment #8 (1346+10.770 to 1346+41.680), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+10.770	1346+41.680	Information: for segment #8 (1346+10.770 to 1346+41.680), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+41.680	1346+82.020	Information: for segment #9 (1346+41.680 to 1346+82.020), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+41.680	1346+82.020	Information: for segment #9 (1346+41.680 to 1346+82.020), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+41.680	1346+82.020	Information: for segment #9 (1346+41.680 to 1346+82.020), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+41.680	1346+82.020	Information: for segment #9 (1346+41.680 to 1346+82.020), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+82.020	1353+07.770	Information: for segment #10 (1346+82.020 to 1353+07.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+82.020	1353+07.770	Information: for segment #10 (1346+82.020 to 1353+07.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+82.020	1353+07.770	Information: for segment #10 (1346+82.020 to 1353+07.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1346+82.020	1353+07.770	Information: for segment #10 (1346+82.020 to 1353+07.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1353+07.770	1360+43.040	Information: for segment #11 (1353+07.770 to 1360+43.040), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1353+07.770	1360+43.040	Information: for segment #11 (1353+07.770 to 1360+43.040), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1353+07.770	1360+43.040	Information: for segment #11 (1353+07.770 to 1360+43.040), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1353+07.770	1360+43.040	Information: for segment #11 (1353+07.770 to 1360+43.040), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1360+43.040	1361+03.200	Information: for segment #12 (1360+43.040 to 1361+03.200), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1360+43.040	1361+03.200	Information: for segment #12 (1360+43.040 to 1361+03.200), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1360+43.040	1361+03.200	Information: for segment #12 (1360+43.040 to 1361+03.200), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1360+43.040	1361+03.200	Information: for segment #12 (1360+43.040 to 1361+03.200), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1361+03.200	1375+05.490	Information: for segment #13 (1361+03.200 to 1375+05.490), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1361+03.200	1375+05.490	Information: for segment #13 (1361+03.200 to 1375+05.490), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1361+03.200	1375+05.490	Information: for segment #13 (1361+03.200 to 1375+05.490), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1361+03.200	1375+05.490	Information: for segment #13 (1361+03.200 to 1375+05.490), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1375+05.490	1377+37.430	Information: for segment #14 (1375+05.490 to 1377+37.430), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1375+05.490	1377+37.430	Information: for segment #14 (1375+05.490 to 1377+37.430), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1375+05.490	1377+37.430	Information: for segment #14 (1375+05.490 to 1377+37.430), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1375+05.490	1377+37.430	Information: for segment #14 (1375+05.490 to 1377+37.430), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+37.430	1385+97.770	Information: for segment #16 (1377+37.430 to 1385+97.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+37.430	1385+97.770	Information: for segment #16 (1377+37.430 to 1385+97.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+37.430	1385+97.770	Information: for segment #16 (1377+37.430 to 1385+97.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+37.430	1385+97.770	Information: for segment #16 (1377+37.430 to 1385+97.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1385+97.770	1393+31.380	Information: for segment #18 (1385+97.770 to 1393+31.380), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1385+97.770	1393+31.380	Information: for segment #18 (1385+97.770 to 1393+31.380), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1385+97.770	1393+31.380	Information: for segment #18 (1385+97.770 to 1393+31.380), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1385+97.770	1393+31.380	Information: for segment #18 (1385+97.770 to 1393+31.380), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1393+31.380	1395+77.290	Information: for segment #21 (1393+31.380 to 1395+77.290), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1393+31.380	1395+77.290	Information: for segment #21 (1393+31.380 to 1395+77.290), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1393+31.380	1395+77.290	Information: for segment #21 (1393+31.380 to 1395+77.290), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1393+31.380	1395+77.290	Information: for segment #21 (1393+31.380 to 1395+77.290), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1395+77.290	1408+10.770	Information: for segment #23 (1395+77.290 to 1408+10.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1395+77.290	1408+10.770	Information: for segment #23 (1395+77.290 to 1408+10.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1395+77.290	1408+10.770	Information: for segment #23 (1395+77.290 to 1408+10.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1395+77.290	1408+10.770	Information: for segment #23 (1395+77.290 to 1408+10.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+10.770	1408+37.210	Information: for segment #24 (1408+10.770 to 1408+37.210), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+10.770	1408+37.210	Information: for segment #24 (1408+10.770 to 1408+37.210), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+10.770	1408+37.210	Information: for segment #24 (1408+10.770 to 1408+37.210), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+10.770	1408+37.210	Information: for segment #24 (1408+10.770 to 1408+37.210), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+37.210	1418+65.083	Information: for segment #25 (1408+37.210 to 1418+65.083), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+37.210	1418+65.083	Information: for segment #25 (1408+37.210 to 1418+65.083), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+37.210	1418+65.083	Information: for segment #25 (1408+37.210 to 1418+65.083), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+37.210	1418+65.083	Information: for segment #25 (1408+37.210 to 1418+65.083), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1375+05.490	1377+37.430	Information: for segment #15 (1375+05.490 to 1377+37.430), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+37.430	1378+25.490	Information: for segment #17 (1377+37.430 to 1378+25.490), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1389+86.380	1393+31.380	Information: for segment #19 (1389+86.380 to 1393+31.380), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1392+22.290	1393+31.380	Information: for segment #20 (1392+22.290 to 1393+31.380), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1393+31.380	1395+77.290	Information: for segment #22 (1393+31.380 to 1395+77.290), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1340+47.770	1340+99.770	Information: for segment #1 (1340+47.770 to 1340+99.770), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1340+99.770	1342+01.770	Information: for segment #2 (1340+99.770 to 1342+01.770), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1342+01.770	1342+19.830	Information: for segment #3 (1342+01.770 to 1342+19.830), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1360+43.040	1361+03.200	Information: for segment #12 (1360+43.040 to 1361+03.200), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1377+37.430	1385+97.770	Information: for segment #16 (1377+37.430 to 1385+97.770), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1385+97.770	1393+31.380	Information: for segment #18 (1385+97.770 to 1393+31.380), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1395+77.290	1408+10.770	Information: for segment #23 (1395+77.290 to 1408+10.770), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1408+10.770	1408+37.210	Information: for segment #24 (1408+10.770 to 1408+37.210), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1377+37.430	1378+25.490	Information: for segment #17 (1377+37.430 to 1378+25.490), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
1389+86.380	1393+31.380	Information: for segment #19 (1389+86.380 to 1393+31.380), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
1392+22.290	1393+31.380	Information: for segment #20 (1392+22.290 to 1393+31.380), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 1:49 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 12:29:05 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP+ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL3
Highway Comment: Imported from CENTRAL3.xml
Highway Version: 1

Evaluation Title: Section 1
Evaluation Comment: Created Thu Jun 23 12:27:08 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1055+87.420

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1055+87.420
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_MV=1.0; FI_SV=1.0; PDO_MV=1.0; PDO_SV=1.0;

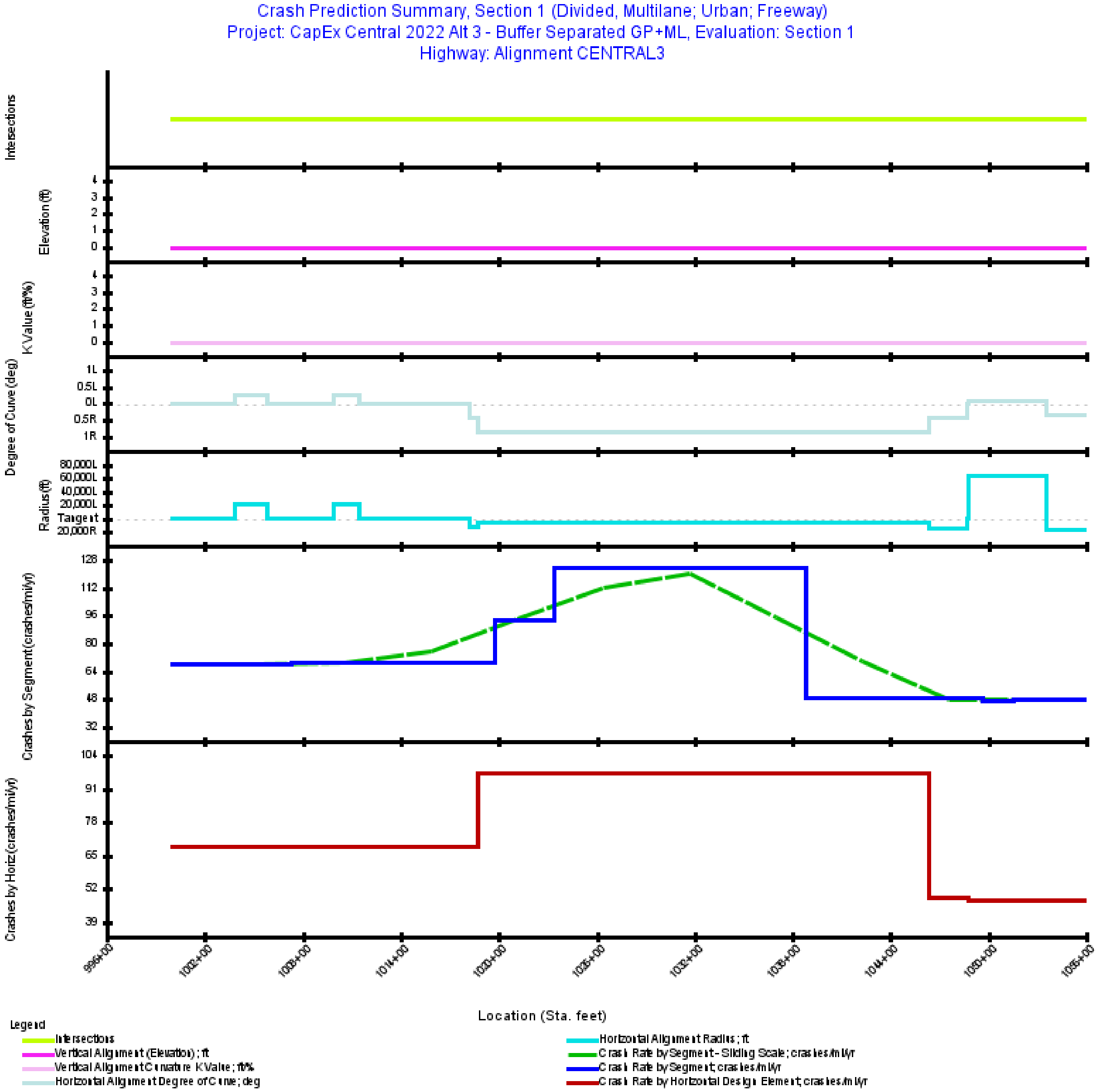

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Ten-lane Freeway	Urban	1000+00.000	1007+26.000	726.00	0.1375	2030: 203,650	20.00	Non-Traversable Median	25.50
2	Ten-lane Freeway	Urban	1007+26.000	1019+79.090	1,253.09	0.2373	2030: 203,650	8.13	Non-Traversable Median	18.56
3	Ten-lane Freeway	Urban	1019+79.090	1023+40.350	361.26	0.0684	2030: 216,500	6.32	Non-Traversable Median	14.32
4	Ten-lane Freeway	Urban	1023+40.350	1038+82.880	1,542.53	0.2921	2030: 234,500	7.35	Non-Traversable Median	15.35
5	Ten-lane Freeway	Urban	1038+82.880	1049+61.000	1,078.12	0.2042	2030: 156,650	8.77	Non-Traversable Median	19.59
6	Ten-lane Freeway	Urban	1049+61.000	1051+50.000	189.00	0.0358	2030: 156,650	16.73	Non-Traversable Median	23.00
7	Ten-lane Freeway	Urban	1051+50.000	1055+48.000	398.00	0.0754	2030: 156,650	9.99	Non-Traversable Median	17.99
8	Ten-lane Freeway	Urban	1055+48.000	1055+87.420	39.42	0.0075	2030: 156,650	4.50	Non-Traversable Median	12.50

Table 2. User Defined CMF Used in the Eval Segment CPM Evaluation (Section 1)

Name	Description	Start Loc. (Sta. ft)	End Loc. (Sta. ft)	Start CMF Year	End CMF Year	Severity	CMF Value
11	remove 20 left	1019+79.090	1023+40.350	2030	2050	Total	1.1000
12	remove 20 both	1023+40.350	1038+82.050	2030	2050	Total	1.2000
11	remove 20 left	1038+82.050	1038+82.880	2030	2050	Total	1.1000

Table 3. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**1.0582**
Average Future Road AADT (vpd)	**198,659**
Predicted Crashes	
Total Crashes	**83.80**
Fatal and Injury Crashes	**23.36**
Property-Damage-Only Crashes	**60.44**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**28**
Percent Property-Damage-Only Crashes (%)	**72**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**79.1892**
FI Crash Rate (crashes/mi/yr)	**22.0740**
PDO Crash Rate (crashes/mi/yr)	**57.1152**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**76.73**
Travel Crash Rate (crashes/million veh-mi)	**1.09**
Travel FI Crash Rate (crashes/million veh-mi)	**0.30**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.79**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.
Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 4. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1007+26.000	0.1375	9.414	9.4142	2.6351	6.7790	68.4668	0.92
2	1007+26.000	1019+79.090	0.2373	16.299	16.2985	4.5617	11.7368	68.6752	0.92
3	1019+79.090	1023+40.350	0.0684	6.398	6.3983	1.7626	4.6358	93.5147	1.18
4	1023+40.350	1038+82.880	0.2921	36.139	36.1391	9.7575	26.3816	123.7022	1.45
5	1038+82.880	1049+61.000	0.2042	9.915	9.9147	2.9584	6.9563	48.5566	0.85
6	1049+61.000	1051+50.000	0.0358	1.697	1.6972	0.5073	1.1899	47.4134	0.83
7	1051+50.000	1055+48.000	0.0754	3.582	3.5821	1.0704	2.5117	47.5216	0.83
8	1055+48.000	1055+87.420	0.0075	0.356	0.3557	0.1063	0.2494	47.6438	0.83
Total			1.0582	83.800	83.7999	23.3593	60.4406	79.1892	1.09

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 5. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1003+79.564	0.0719	4.922	4.9219	1.3777	3.5442	68.4668	0.92
Simple Curve 1	1003+79.564	1005+82.145	0.0384	2.627	2.6269	0.7353	1.8916	68.4668	0.92
Tangent	1005+82.145	1009+85.344	0.0764	5.239	5.2386	1.4663	3.7723	68.6009	0.92
Simple Curve 2	1009+85.344	1011+41.697	0.0296	2.034	2.0336	0.5692	1.4644	68.6752	0.92
Tangent	1011+41.697	1018+22.837	0.1290	8.859	8.8594	2.4796	6.3797	68.6752	0.92
Simple Curve 3	1018+22.837	1018+69.126	0.0088	0.602	0.6021	0.1685	0.4336	68.6752	0.92
Simple Curve 4	1018+69.126	1046+33.680	0.5236	50.872	50.8723	13.9806	36.8917	97.1605	1.23
Simple Curve 5	1046+33.680	1048+65.895	0.0440	2.135	2.1355	0.6372	1.4983	48.5566	0.85
Tangent	1048+65.895	1048+78.600	0.0024	0.117	0.1168	0.0349	0.0820	48.5566	0.85
Simple Curve 6	1048+78.600	1053+54.829	0.0902	4.298	4.2985	1.2843	3.0142	47.6578	0.83
Simple Curve 7	1053+54.829	1055+87.420	0.0441	2.094	2.0943	0.6258	1.4685	47.5423	0.83

Table 6. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	83.80	23.36	27.875	60.44	72.125
Total	83.80	23.36	27.875	60.44	72.125
Average	83.80	23.36	27.875	60.44	72.125

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 7. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0556	0.1144	0.8451	1.6200	6.7790
2	0.0958	0.1970	1.4598	2.8091	11.7368
3	0.0414	0.0874	0.5954	1.0384	4.6358
4	0.2292	0.4838	3.2960	5.7484	26.3816
5	0.0694	0.1464	0.9985	1.7441	6.9563
6	0.0119	0.0252	0.1714	0.2989	1.1899
7	0.0251	0.0531	0.3616	0.6306	2.5117
8	0.0025	0.0053	0.0359	0.0626	0.2494
Total	0.5310	1.1125	7.7638	13.9520	60.4406

Table 8. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.03	0.0	0.48	0.6	0.52	0.6
Highway Segment	Collision with Fixed Object	6.18	7.4	15.64	18.7	21.82	26.0
Highway Segment	Collision with Other Object	0.44	0.5	3.04	3.6	3.47	4.1
Highway Segment	Other Single-vehicle Collision	1.78	2.1	2.34	2.8	4.12	4.9
Highway Segment	Collision with Parked Vehicle	0.13	0.2	0.35	0.4	0.48	0.6
Highway Segment	Total Single Vehicle Crashes	8.56	10.2	21.85	26.1	30.40	36.3
Highway Segment	Right-Angle Collision	0.46	0.5	0.69	0.8	1.15	1.4
Highway Segment	Head-on Collision	0.12	0.1	0.08	0.1	0.20	0.2
Highway Segment	Other Multi-vehicle Collision	0.46	0.5	0.93	1.1	1.39	1.7
Highway Segment	Rear-end Collision	11.10	13.2	26.63	31.8	37.73	45.0
Highway Segment	Sideswipe, Same Direction Collision	2.67	3.2	10.27	12.2	12.93	15.4
Highway Segment	Total Multiple Vehicle Crashes	14.80	17.7	38.59	46.1	53.40	63.7
Highway Segment	Total Highway Segment Crashes	23.36	27.9	60.44	72.1	83.80	100.0
	Total Crashes	23.36	27.9	60.44	72.1	83.80	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 9. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1007+26.000	Information: for segment #1 (1000+00.000 to 1007+26.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1000+00.000	1007+26.000	Information: for segment #1 (1000+00.000 to 1007+26.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1000+00.000	1007+26.000	Information: for segment #1 (1000+00.000 to 1007+26.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1000+00.000	1007+26.000	Information: for segment #1 (1000+00.000 to 1007+26.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1007+26.000	1019+79.090	Information: for segment #2 (1007+26.000 to 1019+79.090), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1007+26.000	1019+79.090	Information: for segment #2 (1007+26.000 to 1019+79.090), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1007+26.000	1019+79.090	Information: for segment #2 (1007+26.000 to 1019+79.090), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1007+26.000	1019+79.090	Information: for segment #2 (1007+26.000 to 1019+79.090), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1019+79.090	1023+40.350	Information: for segment #3 (1019+79.090 to 1023+40.350), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1019+79.090	1023+40.350	Information: for segment #3 (1019+79.090 to 1023+40.350), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1019+79.090	1023+40.350	Information: for segment #3 (1019+79.090 to 1023+40.350), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1019+79.090	1023+40.350	Information: for segment #3 (1019+79.090 to 1023+40.350), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1023+40.350	1038+82.880	Information: for segment #4 (1023+40.350 to 1038+82.880), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1023+40.350	1038+82.880	Information: for segment #4 (1023+40.350 to 1038+82.880), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1023+40.350	1038+82.880	Information: for segment #4 (1023+40.350 to 1038+82.880), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1023+40.350	1038+82.880	Information: for segment #4 (1023+40.350 to 1038+82.880), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+82.880	1049+61.000	Information: for segment #5 (1038+82.880 to 1049+61.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+82.880	1049+61.000	Information: for segment #5 (1038+82.880 to 1049+61.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+82.880	1049+61.000	Information: for segment #5 (1038+82.880 to 1049+61.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1038+82.880	1049+61.000	Information: for segment #5 (1038+82.880 to 1049+61.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1049+61.000	1051+50.000	Information: for segment #6 (1049+61.000 to 1051+50.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1049+61.000	1051+50.000	Information: for segment #6 (1049+61.000 to 1051+50.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1049+61.000	1051+50.000	Information: for segment #6 (1049+61.000 to 1051+50.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1049+61.000	1051+50.000	Information: for segment #6 (1049+61.000 to 1051+50.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1051+50.000	1055+48.000	Information: for segment #7 (1051+50.000 to 1055+48.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1051+50.000	1055+48.000	Information: for segment #7 (1051+50.000 to 1055+48.000), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1051+50.000	1055+48.000	Information: for segment #7 (1051+50.000 to 1055+48.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1051+50.000	1055+48.000	Information: for segment #7 (1051+50.000 to 1055+48.000), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1055+48.000	1055+87.420	Information: for segment #8 (1055+48.000 to 1055+87.420), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1055+48.000	1055+87.420	Information: for segment #8 (1055+48.000 to 1055+87.420), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1055+48.000	1055+87.420	Information: for segment #8 (1055+48.000 to 1055+87.420), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1055+48.000	1055+87.420	Information: for segment #8 (1055+48.000 to 1055+87.420), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 1:53 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 12:30:37 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP+ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL3
Highway Comment: Imported from CENTRAL3.xml
Highway Version: 1

Evaluation Title: Section 2
Evaluation Comment: Created Thu Jun 23 12:29:22 CDT 2022

Minimum Location: 1137+45.515
Maximum Location: 1161+05.035

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1137+45.515
Evaluation End Location: 1161+05.035
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_EX=1.0; FI_MV=1.0; FI_SV=1.0; PDO_EX=1.0; PDO_MV=1.0; PDO_SV=1.0;

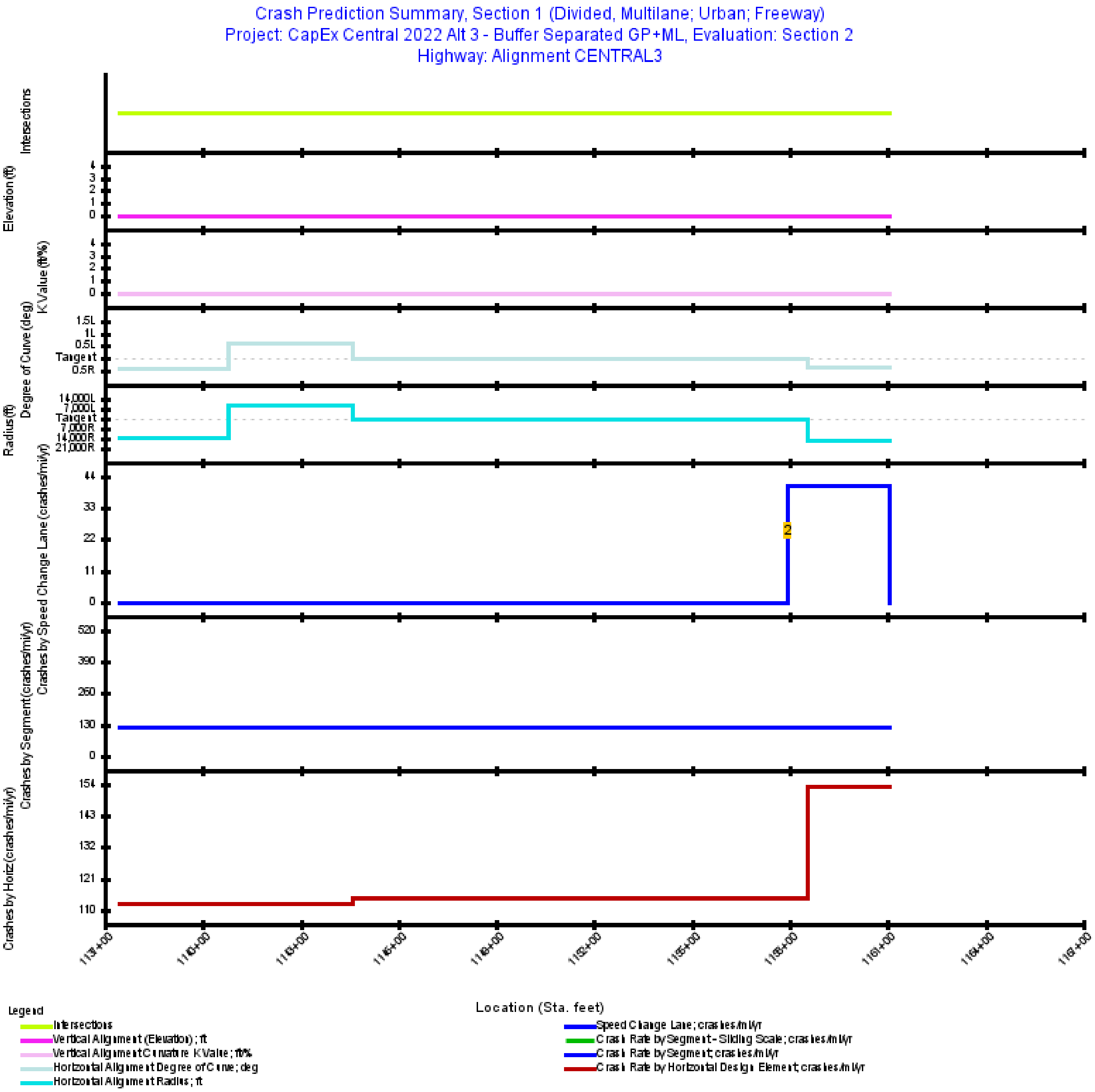

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Ten-lane Freeway	Urban	1137+45.515	1161+05.035	2,359.52	0.4469	2030: 231,000	14.00	Non-Traversable Median	18.00

Table 2. Evaluation Freeway - Speed Change Lanes (Speed Change)

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
2	Ten-lane Freeway Speed Change	Exit	1157+93.210	1161+05.035	311.82	0.0591	2030: 231,000	13.23	Non-Traversable Median	21.00

Table 3. User Defined CMF Used in the Eval Segment CPM Evaluation (Section 1)

Name	Description	Start Loc. (Sta. ft)	End Loc. (Sta. ft)	Start CMF Year	End CMF Year	Severity	CMF Value
14	remove 10 both, remove 20 both	1137+45.515	1161+05.035	2030	2050	Total	1.4000

Table 4. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**0.4173**
Average Future Road AADT (vpd)	**231,000**
Predicted Crashes	
Total Crashes	**50.24**
Fatal and Injury Crashes	**13.64**
Property-Damage-Only Crashes	**36.60**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**27**
Percent Property-Damage-Only Crashes (%)	**73**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**120.3701**
FI Crash Rate (crashes/mi/yr)	**32.6760**
PDO Crash Rate (crashes/mi/yr)	**87.6941**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**35.19**
Travel Crash Rate (crashes/million veh-mi)	**1.43**
Travel FI Crash Rate (crashes/million veh-mi)	**0.39**
Travel PDO Crash Rate (crashes/million veh-mi)	**1.04**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Table 5. Predicted Freeway Speed Change Lane Crash Rates and Frequencies Summary (Speed Change)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Length (mi)	**0.0591**
Average Future Road AADT (vpd)	**115,500**
Predicted Crashes	
Total Crashes	**2.42**
Fatal and Injury Crashes	**0.72**
Property-Damage-Only Crashes	**1.70**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**30**
Percent Property-Damage-Only Crashes (%)	**70**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**40.9800**
FI Crash Rate (crashes/mi/yr)	**12.1910**
PDO Crash Rate (crashes/mi/yr)	**28.7890**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.49**
Travel Crash Rate (crashes/million veh-mi)	**0.97**
Travel FI Crash Rate (crashes/million veh-mi)	**0.29**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.68**

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 6. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1137+45.515	1161+05.035	0.4173	50.236	50.2365	13.6373	36.5991	120.3701	1.43
Total			0.4173	50.236	50.2365	13.6373	36.5991	120.3701	1.43

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 7. Predicted Crash Frequencies and Rates by Freeway Speed Change Lane (Speed Change)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
2	1157+93.210	1161+05.035	0.0591	2.420	2.4202	0.7200	1.7002	40.9800	0.97
Total			0.0591	2.420	2.4202	0.7200	1.7002	40.9800	0.97

Note: *Travel Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 8. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1137+45.515	1140+78.292	0.0630	7.085	7.0852	1.9234	5.1618	112.4163	1.43
Simple Curve 2	1140+78.292	1144+57.601	0.0718	8.076	8.0758	2.1923	5.8836	112.4163	1.43
Tangent	1144+57.601	1158+52.405	0.2642	30.156	30.1562	8.1982	21.9579	114.1555	1.47
Simple Curve 3	1158+52.405	1161+05.035	0.0478	7.340	7.3395	2.0434	5.2961	153.3963	2.40

Table 9. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	52.66	14.36	27.266	38.30	72.734
Total	52.66	14.36	27.266	38.30	72.734
Average	52.66	14.36	27.266	38.30	72.734

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 10. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.2922	0.6035	4.4066	8.3351	36.5991

Table 11. Predicted Crash Severity by Speed Change Lane (Speed Change)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
2	0.0164	0.0345	0.2400	0.4291	1.7002

Table 12. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.02	0.0	0.27	0.5	0.29	0.6
Highway Segment	Collision with Fixed Object	3.34	6.6	8.73	17.4	12.07	24.0
Highway Segment	Collision with Other Object	0.24	0.5	1.70	3.4	1.93	3.8
Highway Segment	Other Single-vehicle Collision	0.96	1.9	1.30	2.6	2.27	4.5
Highway Segment	Collision with Parked Vehicle	0.07	0.1	0.20	0.4	0.26	0.5
Highway Segment	Total Single Vehicle Crashes	4.62	9.2	12.20	24.3	16.82	33.5
Highway Segment	Right-Angle Collision	0.28	0.6	0.44	0.9	0.72	1.4
Highway Segment	Head-on Collision	0.07	0.1	0.05	0.1	0.12	0.2
Highway Segment	Other Multi-vehicle Collision	0.28	0.6	0.59	1.2	0.86	1.7
Highway Segment	Rear-end Collision	6.76	13.5	16.84	33.5	23.60	47.0
Highway Segment	Sideswipe, Same Direction Collision	1.62	3.2	6.49	12.9	8.11	16.2
Highway Segment	Total Multiple Vehicle Crashes	9.01	17.9	24.40	48.6	33.42	66.5
Highway Segment	Total Highway Segment Crashes	13.64	27.1	36.60	72.9	50.24	100.0
	Total Crashes	13.64	27.1	36.60	72.9	50.24	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 13. Predicted Exit Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.01	0.5	0.01	0.5
Highway Segment	Collision with Fixed Object	0.14	5.8	0.35	14.5	0.49	20.4
Highway Segment	Collision with Other Object	0.01	0.5	0.05	2.1	0.06	2.6
Highway Segment	Other Single-vehicle Collision	0.04	1.5	0.04	1.6	0.07	3.1
Highway Segment	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Total Single Vehicle Crashes	0.19	7.8	0.45	18.8	0.64	26.5
Highway Segment	Right-Angle Collision	0.01	0.3	0.02	0.8	0.03	1.2
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.1	0.01	0.3
Highway Segment	Other Multi-vehicle Collision	0.01	0.5	0.03	1.1	0.04	1.6
Highway Segment	Rear-end Collision	0.40	16.3	0.96	39.7	1.36	56.0
Highway Segment	Sideswipe, Same Direction Collision	0.11	4.7	0.23	9.7	0.35	14.4
Highway Segment	Total Multiple Vehicle Crashes	0.53	22.0	1.25	51.5	1.78	73.5
Highway Segment	Total Highway Segment Crashes	0.72	29.7	1.70	70.3	2.42	100.0
	Total Crashes	0.72	29.7	1.70	70.3	2.42	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 14. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1137+45.515	1161+05.035	Information: for segment #1 (1137+45.515 to 1161+05.035), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1137+45.515	1161+05.035	Information: for segment #1 (1137+45.515 to 1161+05.035), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1137+45.515	1161+05.035	Information: for segment #1 (1137+45.515 to 1161+05.035), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1137+45.515	1161+05.035	Information: for segment #1 (1137+45.515 to 1161+05.035), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1157+93.210	1161+05.035	Information: for segment #2 (1157+93.210 to 1161+05.035), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 1:54 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 12:38:22 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP+ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL3
Highway Comment: Imported from CENTRAL3.xml
Highway Version: 1

Evaluation Title: Section 3
Evaluation Comment: Created Thu Jun 23 12:37:04 CDT 2022

Minimum Location: 1188+09.855
Maximum Location: 1317+43.705

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

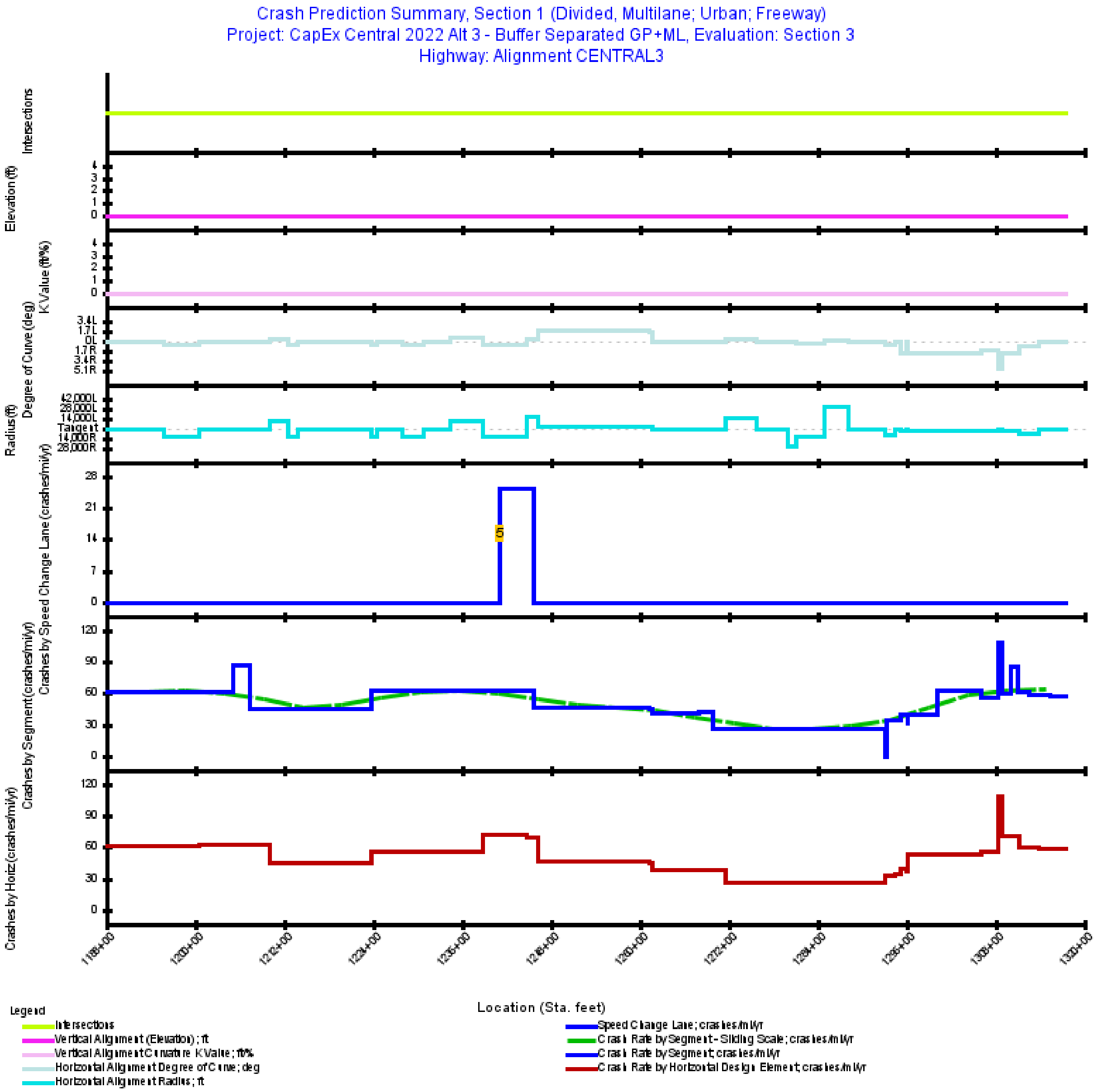
The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1188+09.855
Evaluation End Location: 1317+43.705
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_EX=1.0; FI_MV=1.0; FI_SV=1.0; PDO_EX=1.0; PDO_MV=1.0; PDO_SV=1.0;



Crash Prediction Summary, Section 1 (Divided, Multilane; Urban; Freeway)
Project: CapEx Central 2022 Alt 3 - Buffer Separated GP+ML, Evaluation: Section 3
Highway: Alignment CENTRAL3

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Ten-lane Freeway	Urban	1188+09.855	1205+10.860	1,701.01	0.3222	2030: 158,500	12.00	Non-Traversable Median	20.00
2	Ten-lane Freeway	Urban	1205+10.860	1207+25.110	214.25	0.0406	2030: 178,450	12.00	Non-Traversable Median	20.00
3	Ten-lane Freeway	Urban	1207+25.110	1223+65.390	1,640.28	0.3107	2030: 139,250	12.00	Non-Traversable Median	20.00
4	Ten-lane Freeway	Urban	1223+65.390	1245+66.480	2,201.09	0.4169	2030: 163,000	12.00	Non-Traversable Median	19.60
6	Ten-lane Freeway	Urban	1245+66.480	1261+30.760	1,564.28	0.2963	2030: 130,600	8.10	Non-Traversable Median	16.10
7	Ten-lane Freeway	Urban	1261+30.760	1261+64.030	33.27	0.0063	2030: 130,600	5.00	Non-Traversable Median	13.06
8	Ten-lane Freeway	Urban	1261+64.030	1262+76.855	112.82	0.0214	2030: 130,600	5.00	Non-Traversable Median	13.57
9	Ten-lane Freeway	Urban	1262+76.855	1265+36.855	260.00	0.0492	2030: 130,600	5.00	Non-Traversable Median	15.00
10	Ten-lane Freeway	Urban	1265+36.855	1267+95.855	259.00	0.0491	2030: 130,600	5.00	Non-Traversable Median	17.01
11	Ten-lane Freeway	Urban	1267+95.855	1269+73.040	177.19	0.0336	2030: 130,600	5.00	Non-Traversable Median	18.69
12	Ten-lane Freeway	Urban	1269+73.040	1270+54.855	81.81	0.0155	2030: 105,100	5.00	Non-Traversable Median	19.69
13	Ten-lane Freeway	Urban	1270+54.855	1271+54.640	99.79	0.0189	2030: 105,100	5.00	Non-Traversable Median	20.39
14	Ten-lane Freeway	Urban	1271+54.640	1272+14.320	59.68	0.0113	2030: 105,100	5.00	Non-Traversable Median	20.89
15	Ten-lane Freeway	Urban	1272+14.320	1293+09.460	2,095.14	0.3968	2030: 105,100	7.19	Non-Traversable Median	24.50
16	Nine-lane Freeway	Urban	1293+09.460	1293+14.390	4.93	0.0009	2030: 105,100	11.91	Non-Traversable Median	27.93
17	Nine-lane Freeway	Urban	1293+14.390	1294+72.855	158.46	0.0300	2030: 105,100	9.17	Non-Traversable Median	24.68
18	Nine-lane Freeway	Urban	1294+72.855	1295+18.855	46.00	0.0087	2030: 105,100	5.74	Non-Traversable Median	20.59
19	Nine-lane Freeway	Urban	1295+18.855	1296+07.680	88.83	0.0168	2030: 105,100	3.49	Non-Traversable Median	17.89
20	Ten-lane Freeway	Urban	1296+07.680	1296+16.160	8.48	0.0016	2030: 105,100	2.04	Non-Traversable Median	16.10
21	Ten-lane Freeway	Urban	1296+16.160	1299+27.855	311.69	0.0590	2030: 105,100	3.54	Non-Traversable Median	17.54
22	Ten-lane Freeway	Urban	1299+27.855	1300+07.160	79.31	0.0150	2030: 105,100	5.38	Non-Traversable Median	19.38
23	Ten-lane Freeway	Urban	1300+07.160	1305+90.560	583.40	0.1105	2030: 137,800	8.49	Non-Traversable Median	22.49
24	Ten-lane Freeway	Urban	1305+90.560	1308+33.680	243.12	0.0460	2030: 137,800	12.37	Non-Traversable Median	26.37
25	Nine-lane Freeway	Urban	1308+33.680	1308+85.530	51.85	0.0098	2030: 137,800	13.76	Non-Traversable Median	27.76
26	Nine-lane Freeway	Urban	1308+85.530	1310+05.140	119.61	0.0227	2030: 137,800	13.43	Non-Traversable Median	27.43

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
27	Nine-lane Freeway	Urban	1310+05.140	1310+93.940	88.80	0.0168	2030: 157,750	12.45	Non-Traversable Median	26.45
28	Nine-lane Freeway	Urban	1310+93.940	1311+04.140	10.20	0.0019	2030: 157,750	11.98	Non-Traversable Median	25.95
29	Ten-lane Freeway	Urban	1311+04.140	1312+42.855	138.71	0.0263	2030: 157,750	11.28	Non-Traversable Median	24.74
30	Ten-lane Freeway	Urban	1312+42.855	1315+38.855	296.00	0.0561	2030: 157,750	9.23	Non-Traversable Median	21.23
31	Ten-lane Freeway	Urban	1315+38.855	1317+43.705	204.85	0.0388	2030: 157,750	6.87	Non-Traversable Median	17.17

Table 2. Evaluation Freeway - Speed Change Lanes (Speed Change)

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
5	Ten-lane Freeway Speed Change	Exit	1241+11.480	1245+66.480	455.00	0.0862	2030: 163,000	12.00	Non-Traversable Median	19.60

Table 3. User Defined CMF Used in the Eval Segment CPM Evaluation (Section 1)

Name	Description	Start Loc. (Sta. ft)	End Loc. (Sta. ft)	Start CMF Year	End CMF Year	Severity	CMF Value
12	remove 10 left, remove 20 left	1188+09.855	1205+10.860	2030	2050	Total	1.2000
13	remove 10 both, remove 20 left	1205+10.860	1207+25.110	2030	2050	Total	1.3000
11	remove 10 right	1207+25.110	1223+65.390	2030	2050	Total	1.1000
12	remove 10 both	1223+65.390	1245+66.480	2030	2050	Total	1.2000
11	remove 10 left	1245+66.480	1269+73.040	2030	2050	Total	1.1000
11	remove 10 left	1293+09.460	1293+14.390	2030	2050	Total	1.1000
12	remove 10 both	1293+14.390	1300+07.160	2030	2050	Total	1.2000
13	remove 10 both, remove 20 right	1300+07.160	1308+85.530	2030	2050	Total	1.3000
12	remove 10 right, remove 20 right	1308+85.530	1310+05.140	2030	2050	Total	1.2000
13	remove 10 both, remove 20 right	1310+05.140	1311+04.140	2030	2050	Total	1.3000
12	remove 10 both	1311+04.140	1317+43.705	2030	2050	Total	1.2000

Table 4. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**2.4056**
Average Future Road AADT (vpd)	**137,358**
Predicted Crashes	
Total Crashes	**118.76**
Fatal and Injury Crashes	**36.17**
Property-Damage-Only Crashes	**82.59**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**30**
Percent Property-Damage-Only Crashes (%)	**70**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**49.3680**
FI Crash Rate (crashes/mi/yr)	**15.0362**
PDO Crash Rate (crashes/mi/yr)	**34.3318**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**120.60**
Travel Crash Rate (crashes/million veh-mi)	**0.98**
Travel FI Crash Rate (crashes/million veh-mi)	**0.30**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.69**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Table 5. Predicted Freeway Speed Change Lane Crash Rates and Frequencies Summary (Speed Change)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Length (mi)	**0.0862**
Average Future Road AADT (vpd)	**81,500**
Predicted Crashes	
Total Crashes	**2.18**
Fatal and Injury Crashes	**0.64**
Property-Damage-Only Crashes	**1.54**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**29**
Percent Property-Damage-Only Crashes (%)	**71**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**25.2988**
FI Crash Rate (crashes/mi/yr)	**7.4076**
PDO Crash Rate (crashes/mi/yr)	**17.8912**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.56**
Travel Crash Rate (crashes/million veh-mi)	**0.85**
Travel FI Crash Rate (crashes/million veh-mi)	**0.25**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.60**

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 6. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1188+09.855	1205+10.860	0.3222	19.552	19.5518	5.8516	13.7002	60.6896	1.05
2	1205+10.860	1207+25.110	0.0406	3.541	3.5409	1.0329	2.5081	87.2631	1.34
3	1207+25.110	1223+65.390	0.3107	14.082	14.0818	4.3333	9.7485	45.3288	0.89
4	1223+65.390	1245+66.480	0.3738	23.531	23.5310	6.9865	16.5446	62.9532	1.06
6	1245+66.480	1261+30.760	0.2963	13.979	13.9788	4.3141	9.6646	47.1833	0.99
7	1261+30.760	1261+64.030	0.0063	0.284	0.2837	0.0880	0.1957	45.0249	0.94
8	1261+64.030	1262+76.855	0.0214	0.883	0.8831	0.2757	0.6074	41.3273	0.87
9	1262+76.855	1265+36.855	0.0492	2.031	2.0314	0.6341	1.3973	41.2528	0.86
10	1265+36.855	1267+95.855	0.0491	2.037	2.0372	0.6358	1.4014	41.5309	0.87
11	1267+95.855	1269+73.040	0.0336	1.421	1.4208	0.4433	0.9775	42.3398	0.89
12	1269+73.040	1270+54.855	0.0155	0.413	0.4128	0.1340	0.2787	26.6385	0.69
13	1270+54.855	1271+54.640	0.0189	0.501	0.5006	0.1625	0.3381	26.4904	0.69
14	1271+54.640	1272+14.320	0.0113	0.300	0.3003	0.0974	0.2029	26.5670	0.69
15	1272+14.320	1293+09.460	0.3968	10.498	10.4985	3.4057	7.0928	26.4574	0.69
16	1293+09.460	1293+14.390	0.0000	0.000	0.0000	0.0000	0.0000	0.0000	0.00
17	1293+14.390	1294+72.855	0.0300	1.034	1.0344	0.3267	0.7077	34.4642	0.90
18	1294+72.855	1295+18.855	0.0087	0.305	0.3048	0.0962	0.2086	34.9879	0.91
19	1295+18.855	1296+07.680	0.0168	0.674	0.6740	0.2108	0.4631	40.0620	1.04
20	1296+07.680	1296+16.160	0.0016	0.052	0.0516	0.0168	0.0348	32.1275	0.84
21	1296+16.160	1299+27.855	0.0590	2.318	2.3177	0.7448	1.5729	39.2609	1.02
22	1299+27.855	1300+07.160	0.0150	0.590	0.5900	0.1896	0.4004	39.2834	1.02
23	1300+07.160	1305+90.560	0.1105	6.941	6.9409	2.1028	4.8380	62.8174	1.25
24	1305+90.560	1308+33.680	0.0460	2.584	2.5845	0.7874	1.7971	56.1297	1.12
25	1308+33.680	1308+85.530	0.0098	1.066	1.0662	0.3021	0.7641	108.5757	2.16
26	1308+85.530	1310+05.140	0.0227	1.353	1.3530	0.3975	0.9556	59.7279	1.19
27	1310+05.140	1310+93.940	0.0168	1.444	1.4443	0.4109	1.0334	85.8763	1.49
28	1310+93.940	1311+04.140	0.0019	0.164	0.1639	0.0466	0.1173	84.8430	1.47
29	1311+04.140	1312+42.855	0.0263	1.618	1.6180	0.4820	1.1360	61.5887	1.07
30	1312+42.855	1315+38.855	0.0561	3.316	3.3163	0.9902	2.3261	59.1549	1.03
31	1315+38.855	1317+43.705	0.0388	2.246	2.2460	0.6714	1.5746	57.8900	1.00
Total			2.4056	118.758	118.7583	36.1706	82.5877	49.3680	0.98

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 7. Predicted Crash Frequencies and Rates by Freeway Speed Change Lane (Speed Change)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
5	1241+11.480	1245+66.480	0.0862	2.180	2.1801	0.6383	1.5418	25.2988	0.85
Total			0.0862	2.180	2.1801	0.6383	1.5418	25.2988	0.85

Note: *Travel Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 8. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1188+09.855	1195+72.323	0.1444	8.764	8.7640	2.6229	6.1410	60.6896	1.05
Simple Curve 1	1195+72.323	1200+47.172	0.0899	5.458	5.4580	1.6335	3.8245	60.6896	1.05
Tangent	1200+47.172	1210+00.018	0.1805	11.231	11.2308	3.3542	7.8765	62.2330	1.07
Simple Curve 2	1210+00.018	1212+46.080	0.0466	2.112	2.1124	0.6500	1.4624	45.3288	0.89
Simple Curve 3	1212+46.080	1213+83.648	0.0261	1.181	1.1810	0.3634	0.8176	45.3288	0.89
Tangent	1213+83.648	1223+73.936	0.1876	8.520	8.5196	2.6207	5.8989	45.4247	0.89
Simple Curve 4	1223+73.936	1224+55.134	0.0154	0.868	0.8681	0.2577	0.6103	56.4465	1.06
Tangent	1224+55.134	1227+89.560	0.0633	3.575	3.5752	1.0615	2.5137	56.4465	1.06
Simple Curve 5	1227+89.560	1230+74.643	0.0540	3.048	3.0477	0.9049	2.1428	56.4465	1.06
Tangent	1230+74.643	1234+28.850	0.0671	3.787	3.7867	1.1243	2.6624	56.4465	1.06
Simple Curve 6	1234+28.850	1238+69.498	0.0835	4.711	4.7108	1.3987	3.3121	56.4465	1.06
Simple Curve 7	1238+69.498	1244+66.641	0.1131	8.086	8.0856	2.3937	5.6919	71.4934	1.56
Simple Curve 8	1244+66.641	1246+25.198	0.0300	2.070	2.0704	0.6189	1.4515	68.9460	1.57
Simple Curve 9	1246+25.198	1261+30.755	0.2851	13.454	13.4540	4.1522	9.3018	47.1833	0.99
Simple Curve 10	1261+30.755	1261+58.272	0.0052	0.235	0.2346	0.0728	0.1619	45.0253	0.94
Tangent	1261+58.272	1271+56.218	0.1890	7.343	7.3430	2.3032	5.0398	38.8507	0.84
Simple Curve 11	1271+56.218	1275+79.192	0.0801	2.121	2.1207	0.6879	1.4327	26.4725	0.69
Tangent	1275+79.192	1279+96.280	0.0790	2.090	2.0900	0.6780	1.4120	26.4574	0.69
Simple Curve 12	1279+96.280	1281+03.641	0.0203	0.538	0.5380	0.1745	0.3635	26.4574	0.69
Simple Curve 13	1281+03.641	1284+86.326	0.0725	1.918	1.9176	0.6221	1.2955	26.4574	0.69
Simple Curve 14	1284+86.326	1288+06.180	0.0606	1.603	1.6027	0.5199	1.0828	26.4574	0.69
Tangent	1288+06.180	1293+09.171	0.0953	2.520	2.5204	0.8176	1.7028	26.4574	0.69
Simple Curve 15	1293+09.171	1294+36.580	0.0241	0.799	0.7990	0.2523	0.5467	33.1125	0.86
Tangent	1294+36.580	1295+12.819	0.0144	0.502	0.5016	0.1584	0.3432	34.7387	0.91
Simple Curve 16	1295+12.819	1295+89.877	0.0146	0.579	0.5789	0.1812	0.3977	39.6646	1.03
Tangent	1295+89.877	1296+17.142	0.0052	0.194	0.1940	0.0614	0.1326	37.5654	0.98
Simple Curve 17	1296+17.142	1305+90.520	0.1844	9.841	9.8408	3.0347	6.8061	53.3805	1.16
Simple Curve 18	1305+90.520	1308+35.045	0.0463	2.613	2.6131	0.7955	1.8176	56.4235	1.12
Simple Curve 19	1308+35.045	1308+85.408	0.0095	1.036	1.0357	0.2935	0.7422	108.5757	2.16
Simple Curve 20	1308+85.408	1311+09.781	0.0425	3.030	3.0295	0.8754	2.1542	71.2917	1.32
Simple Curve 21	1311+09.781	1313+87.205	0.0525	3.170	3.1695	0.9453	2.2242	60.3223	1.05
Tangent	1313+87.205	1317+43.705	0.0675	3.945	3.9450	1.1787	2.7663	58.4280	1.01

Table 9. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	120.94	36.81	30.436	84.13	69.564
Total	120.94	36.81	30.436	84.13	69.564
Average	120.94	36.81	30.436	84.13	69.564

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 10. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.1235	0.2541	1.8768	3.5973	13.7002
2	0.0209	0.0426	0.3244	0.6450	2.5081
3	0.0908	0.1866	1.3851	2.6707	9.7485
4	0.1558	0.3247	2.3017	4.2043	16.5446
6	0.1013	0.2139	1.4573	2.5416	9.6646
7	0.0020	0.0042	0.0294	0.0524	0.1957
8	0.0056	0.0114	0.0866	0.1722	0.6074
9	0.0128	0.0261	0.1992	0.3960	1.3973
10	0.0129	0.0262	0.1997	0.3970	1.4014
11	0.0090	0.0183	0.1392	0.2768	0.9775
12	0.0027	0.0055	0.0421	0.0837	0.2787
13	0.0033	0.0067	0.0510	0.1015	0.3381
14	0.0023	0.0048	0.0328	0.0575	0.2029
15	0.0750	0.1558	1.1151	2.0598	7.0928
16	0.0000	0.0000	0.0000	0.0000	0.0000
17	0.0074	0.0155	0.1086	0.1951	0.7077
18	0.0020	0.0041	0.0305	0.0597	0.2086
19	0.0048	0.0101	0.0702	0.1257	0.4631
20	0.0003	0.0007	0.0053	0.0105	0.0348
21	0.0175	0.0369	0.2515	0.4388	1.5729
22	0.0045	0.0094	0.0640	0.1117	0.4004
23	0.0494	0.1043	0.7103	1.2388	4.8380
24	0.0185	0.0390	0.2660	0.4639	1.7971
25	0.0071	0.0150	0.1021	0.1780	0.7641
26	0.0093	0.0197	0.1343	0.2342	0.9556
27	0.0097	0.0204	0.1388	0.2421	1.0334
28	0.0011	0.0023	0.0158	0.0275	0.1173
29	0.0113	0.0239	0.1628	0.2840	1.1360
30	0.0216	0.0447	0.3225	0.6014	2.3261
31	0.0136	0.0277	0.2109	0.4193	1.5746
Total	0.7958	1.6546	11.8339	21.8863	82.5877

Table 11. Predicted Crash Severity by Speed Change Lane (Speed Change)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
5	0.0150	0.0317	0.2156	0.3761	1.5418

Table 12. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.07	0.1	0.84	0.7	0.90	0.8
Highway Segment	Collision with Fixed Object	11.77	9.9	27.31	23.0	39.07	32.9
Highway Segment	Collision with Other Object	0.83	0.7	5.30	4.5	6.13	5.2
Highway Segment	Other Single-vehicle Collision	3.39	2.9	4.08	3.4	7.47	6.3
Highway Segment	Collision with Parked Vehicle	0.24	0.2	0.61	0.5	0.85	0.7
Highway Segment	Total Single Vehicle Crashes	16.30	13.7	38.14	32.1	54.44	45.8
Highway Segment	Right-Angle Collision	0.62	0.5	0.80	0.7	1.42	1.2
Highway Segment	Head-on Collision	0.16	0.1	0.09	0.1	0.25	0.2
Highway Segment	Other Multi-vehicle Collision	0.62	0.5	1.07	0.9	1.68	1.4
Highway Segment	Rear-end Collision	14.90	12.6	30.67	25.8	45.57	38.4
Highway Segment	Sideswipe, Same Direction Collision	3.58	3.0	11.82	10.0	15.40	13.0
Highway Segment	Total Multiple Vehicle Crashes	19.87	16.7	44.45	37.4	64.32	54.2
Highway Segment	Total Highway Segment Crashes	36.17	30.5	82.59	69.5	118.76	100.0
	Total Crashes	36.17	30.5	82.59	69.5	118.76	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 13. Predicted Exit Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.01	0.5	0.01	0.5
Highway Segment	Collision with Fixed Object	0.12	5.7	0.32	14.6	0.44	20.4
Highway Segment	Collision with Other Object	0.01	0.5	0.05	2.1	0.06	2.6
Highway Segment	Other Single-vehicle Collision	0.03	1.4	0.04	1.6	0.07	3.1
Highway Segment	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Total Single Vehicle Crashes	0.17	7.6	0.41	18.9	0.58	26.5
Highway Segment	Right-Angle Collision	0.01	0.3	0.02	0.8	0.03	1.2
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.1	0.01	0.3
Highway Segment	Other Multi-vehicle Collision	0.01	0.5	0.03	1.1	0.04	1.6
Highway Segment	Rear-end Collision	0.35	16.1	0.87	40.0	1.22	56.0
Highway Segment	Sideswipe, Same Direction Collision	0.10	4.6	0.21	9.8	0.31	14.4
Highway Segment	Total Multiple Vehicle Crashes	0.47	21.6	1.13	51.8	1.60	73.5
Highway Segment	Total Highway Segment Crashes	0.64	29.3	1.54	70.7	2.18	100.0
	Total Crashes	0.64	29.3	1.54	70.7	2.18	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 14. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1188+09.855	1205+10.860	Information: for segment #1 (1188+09.855 to 1205+10.860), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1188+09.855	1205+10.860	Information: for segment #1 (1188+09.855 to 1205+10.860), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1188+09.855	1205+10.860	Information: for segment #1 (1188+09.855 to 1205+10.860), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1188+09.855	1205+10.860	Information: for segment #1 (1188+09.855 to 1205+10.860), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1205+10.860	1207+25.110	Information: for segment #2 (1205+10.860 to 1207+25.110), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1205+10.860	1207+25.110	Information: for segment #2 (1205+10.860 to 1207+25.110), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1205+10.860	1207+25.110	Information: for segment #2 (1205+10.860 to 1207+25.110), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1205+10.860	1207+25.110	Information: for segment #2 (1205+10.860 to 1207+25.110), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1207+25.110	1223+65.390	Information: for segment #3 (1207+25.110 to 1223+65.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1207+25.110	1223+65.390	Information: for segment #3 (1207+25.110 to 1223+65.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1207+25.110	1223+65.390	Information: for segment #3 (1207+25.110 to 1223+65.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1207+25.110	1223+65.390	Information: for segment #3 (1207+25.110 to 1223+65.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1223+65.390	1245+66.480	Information: for segment #4 (1223+65.390 to 1245+66.480), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1223+65.390	1245+66.480	Information: for segment #4 (1223+65.390 to 1245+66.480), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1223+65.390	1245+66.480	Information: for segment #4 (1223+65.390 to 1245+66.480), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1223+65.390	1245+66.480	Information: for segment #4 (1223+65.390 to 1245+66.480), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1245+66.480	1261+30.760	Information: for segment #6 (1245+66.480 to 1261+30.760), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1245+66.480	1261+30.760	Information: for segment #6 (1245+66.480 to 1261+30.760), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1245+66.480	1261+30.760	Information: for segment #6 (1245+66.480 to 1261+30.760), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1245+66.480	1261+30.760	Information: for segment #6 (1245+66.480 to 1261+30.760), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1261+30.760	1261+64.030	Information: for segment #7 (1261+30.760 to 1261+64.030), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1261+30.760	1261+64.030	Information: for segment #7 (1261+30.760 to 1261+64.030), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1261+30.760	1261+64.030	Information: for segment #7 (1261+30.760 to 1261+64.030), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1261+30.760	1261+64.030	Information: for segment #7 (1261+30.760 to 1261+64.030), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1261+64.030	1262+76.855	Information: for segment #8 (1261+64.030 to 1262+76.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1261+64.030	1262+76.855	Information: for segment #8 (1261+64.030 to 1262+76.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1261+64.030	1262+76.855	Information: for segment #8 (1261+64.030 to 1262+76.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1261+64.030	1262+76.855	Information: for segment #8 (1261+64.030 to 1262+76.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1262+76.855	1265+36.855	Information: for segment #9 (1262+76.855 to 1265+36.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1262+76.855	1265+36.855	Information: for segment #9 (1262+76.855 to 1265+36.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1262+76.855	1265+36.855	Information: for segment #9 (1262+76.855 to 1265+36.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1262+76.855	1265+36.855	Information: for segment #9 (1262+76.855 to 1265+36.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1265+36.855	1267+95.855	Information: for segment #10 (1265+36.855 to 1267+95.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1265+36.855	1267+95.855	Information: for segment #10 (1265+36.855 to 1267+95.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1265+36.855	1267+95.855	Information: for segment #10 (1265+36.855 to 1267+95.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1265+36.855	1267+95.855	Information: for segment #10 (1265+36.855 to 1267+95.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1267+95.855	1269+73.040	Information: for segment #11 (1267+95.855 to 1269+73.040), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1267+95.855	1269+73.040	Information: for segment #11 (1267+95.855 to 1269+73.040), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1267+95.855	1269+73.040	Information: for segment #11 (1267+95.855 to 1269+73.040), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1267+95.855	1269+73.040	Information: for segment #11 (1267+95.855 to 1269+73.040), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1269+73.040	1270+54.855	Information: for segment #12 (1269+73.040 to 1270+54.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1269+73.040	1270+54.855	Information: for segment #12 (1269+73.040 to 1270+54.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1269+73.040	1270+54.855	Information: for segment #12 (1269+73.040 to 1270+54.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1269+73.040	1270+54.855	Information: for segment #12 (1269+73.040 to 1270+54.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1270+54.855	1271+54.640	Information: for segment #13 (1270+54.855 to 1271+54.640), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1270+54.855	1271+54.640	Information: for segment #13 (1270+54.855 to 1271+54.640), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1270+54.855	1271+54.640	Information: for segment #13 (1270+54.855 to 1271+54.640), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1270+54.855	1271+54.640	Information: for segment #13 (1270+54.855 to 1271+54.640), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1271+54.640	1272+14.320	Information: for segment #14 (1271+54.640 to 1272+14.320), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1271+54.640	1272+14.320	Information: for segment #14 (1271+54.640 to 1272+14.320), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1271+54.640	1272+14.320	Information: for segment #14 (1271+54.640 to 1272+14.320), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1271+54.640	1272+14.320	Information: for segment #14 (1271+54.640 to 1272+14.320), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1272+14.320	1293+09.460	Information: for segment #15 (1272+14.320 to 1293+09.460), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1272+14.320	1293+09.460	Information: for segment #15 (1272+14.320 to 1293+09.460), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1272+14.320	1293+09.460	Information: for segment #15 (1272+14.320 to 1293+09.460), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1272+14.320	1293+09.460	Information: for segment #15 (1272+14.320 to 1293+09.460), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1272+14.320	1293+09.460	Information: for segment #15 (1272+14.320 to 1293+09.460), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+09.460	1293+14.390	Information: for segment #16 (1293+09.460 to 1293+14.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+09.460	1293+14.390	Information: for segment #16 (1293+09.460 to 1293+14.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+09.460	1293+14.390	Information: for segment #16 (1293+09.460 to 1293+14.390), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+09.460	1293+14.390	Information: for segment #16 (1293+09.460 to 1293+14.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+09.460	1293+14.390	Information: for segment #16 (1293+09.460 to 1293+14.390), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+14.390	1294+72.855	Information: for segment #17 (1293+14.390 to 1294+72.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+14.390	1294+72.855	Information: for segment #17 (1293+14.390 to 1294+72.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+14.390	1294+72.855	Information: for segment #17 (1293+14.390 to 1294+72.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+14.390	1294+72.855	Information: for segment #17 (1293+14.390 to 1294+72.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+72.855	1295+18.855	Information: for segment #18 (1294+72.855 to 1295+18.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+72.855	1295+18.855	Information: for segment #18 (1294+72.855 to 1295+18.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1294+72.855	1295+18.855	Information: for segment #18 (1294+72.855 to 1295+18.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1294+72.855	1295+18.855	Information: for segment #18 (1294+72.855 to 1295+18.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1295+18.855	1296+07.680	Information: for segment #19 (1295+18.855 to 1296+07.680), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1295+18.855	1296+07.680	Information: for segment #19 (1295+18.855 to 1296+07.680), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1295+18.855	1296+07.680	Information: for segment #19 (1295+18.855 to 1296+07.680), Median barrier distance from edge of inside shoulder to barrier face (0.30 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1295+18.855	1296+07.680	Information: for segment #19 (1295+18.855 to 1296+07.680), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1295+18.855	1296+07.680	Information: for segment #19 (1295+18.855 to 1296+07.680), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+07.680	1296+16.160	Information: for segment #20 (1296+07.680 to 1296+16.160), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+07.680	1296+16.160	Information: for segment #20 (1296+07.680 to 1296+16.160), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+07.680	1296+16.160	Warning: for segment #20 (1296+07.680 to 1296+16.160), Median barrier offset (4.00 feet) is less than the right side inside shoulder width (4.06 feet). This indicates there is problem with the input data.
1296+07.680	1296+16.160	Information: for segment #20 (1296+07.680 to 1296+16.160), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+07.680	1296+16.160	Information: for segment #20 (1296+07.680 to 1296+16.160), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+16.160	1299+27.855	Information: for segment #21 (1296+16.160 to 1299+27.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+16.160	1299+27.855	Information: for segment #21 (1296+16.160 to 1299+27.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+16.160	1299+27.855	Information: for segment #21 (1296+16.160 to 1299+27.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1296+16.160	1299+27.855	Information: for segment #21 (1296+16.160 to 1299+27.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1299+27.855	1300+07.160	Information: for segment #22 (1299+27.855 to 1300+07.160), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1299+27.855	1300+07.160	Information: for segment #22 (1299+27.855 to 1300+07.160), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1299+27.855	1300+07.160	Information: for segment #22 (1299+27.855 to 1300+07.160), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1299+27.855	1300+07.160	Information: for segment #22 (1299+27.855 to 1300+07.160), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1300+07.160	1305+90.560	Information: for segment #23 (1300+07.160 to 1305+90.560), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1300+07.160	1305+90.560	Information: for segment #23 (1300+07.160 to 1305+90.560), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1300+07.160	1305+90.560	Information: for segment #23 (1300+07.160 to 1305+90.560), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1300+07.160	1305+90.560	Information: for segment #23 (1300+07.160 to 1305+90.560), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1305+90.560	1308+33.680	Information: for segment #24 (1305+90.560 to 1308+33.680), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1305+90.560	1308+33.680	Information: for segment #24 (1305+90.560 to 1308+33.680), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1305+90.560	1308+33.680	Information: for segment #24 (1305+90.560 to 1308+33.680), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1305+90.560	1308+33.680	Information: for segment #24 (1305+90.560 to 1308+33.680), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+33.680	1308+85.530	Information: for segment #25 (1308+33.680 to 1308+85.530), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+33.680	1308+85.530	Information: for segment #25 (1308+33.680 to 1308+85.530), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+33.680	1308+85.530	Information: for segment #25 (1308+33.680 to 1308+85.530), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+33.680	1308+85.530	Information: for segment #25 (1308+33.680 to 1308+85.530), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+85.530	1310+05.140	Information: for segment #26 (1308+85.530 to 1310+05.140), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+85.530	1310+05.140	Information: for segment #26 (1308+85.530 to 1310+05.140), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+85.530	1310+05.140	Information: for segment #26 (1308+85.530 to 1310+05.140), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1308+85.530	1310+05.140	Information: for segment #26 (1308+85.530 to 1310+05.140), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1310+05.140	1310+93.940	Information: for segment #27 (1310+05.140 to 1310+93.940), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1310+05.140	1310+93.940	Information: for segment #27 (1310+05.140 to 1310+93.940), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1310+05.140	1310+93.940	Information: for segment #27 (1310+05.140 to 1310+93.940), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1310+05.140	1310+93.940	Information: for segment #27 (1310+05.140 to 1310+93.940), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1310+93.940	1311+04.140	Information: for segment #28 (1310+93.940 to 1311+04.140), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1310+93.940	1311+04.140	Information: for segment #28 (1310+93.940 to 1311+04.140), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1310+93.940	1311+04.140	Information: for segment #28 (1310+93.940 to 1311+04.140), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1310+93.940	1311+04.140	Information: for segment #28 (1310+93.940 to 1311+04.140), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1311+04.140	1312+42.855	Information: for segment #29 (1311+04.140 to 1312+42.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1311+04.140	1312+42.855	Information: for segment #29 (1311+04.140 to 1312+42.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1311+04.140	1312+42.855	Information: for segment #29 (1311+04.140 to 1312+42.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1311+04.140	1312+42.855	Information: for segment #29 (1311+04.140 to 1312+42.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1312+42.855	1315+38.855	Information: for segment #30 (1312+42.855 to 1315+38.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1312+42.855	1315+38.855	Information: for segment #30 (1312+42.855 to 1315+38.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1312+42.855	1315+38.855	Information: for segment #30 (1312+42.855 to 1315+38.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1312+42.855	1315+38.855	Information: for segment #30 (1312+42.855 to 1315+38.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1315+38.855	1317+43.705	Information: for segment #31 (1315+38.855 to 1317+43.705), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1315+38.855	1317+43.705	Information: for segment #31 (1315+38.855 to 1317+43.705), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1315+38.855	1317+43.705	Information: for segment #31 (1315+38.855 to 1317+43.705), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1315+38.855	1317+43.705	Information: for segment #31 (1315+38.855 to 1317+43.705), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1241+11.480	1245+66.480	Information: for segment #5 (1241+11.480 to 1245+66.480), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1293+09.460	1293+14.390	Information: for segment #16 (1293+09.460 to 1293+14.390), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1293+14.390	1294+72.855	Information: for segment #17 (1293+14.390 to 1294+72.855), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1294+72.855	1295+18.855	Information: for segment #18 (1294+72.855 to 1295+18.855), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1295+18.855	1296+07.680	Information: for segment #19 (1295+18.855 to 1296+07.680), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1308+33.680	1308+85.530	Information: for segment #25 (1308+33.680 to 1308+85.530), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1308+85.530	1310+05.140	Information: for segment #26 (1308+85.530 to 1310+05.140), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1310+05.140	1310+93.940	Information: for segment #27 (1310+05.140 to 1310+93.940), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1310+93.940	1311+04.140	Information: for segment #28 (1310+93.940 to 1311+04.140), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 1:55 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 12:40:58 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP+ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL3
Highway Comment: Imported from CENTRAL3.xml
Highway Version: 1

Evaluation Title: Section 4
Evaluation Comment: Created Thu Jun 23 12:38:39 CDT 2022

Minimum Location: 1340+47.770
Maximum Location: 1418+65.083

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1340+47.770
Evaluation End Location: 1418+65.083
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_EN=1.0; FI_EX=1.0; FI_MV=1.0; FI_SV=1.0; PDO_EN=1.0; PDO_EX=1.0; PDO_MV=1.0; PDO_SV=1.0;

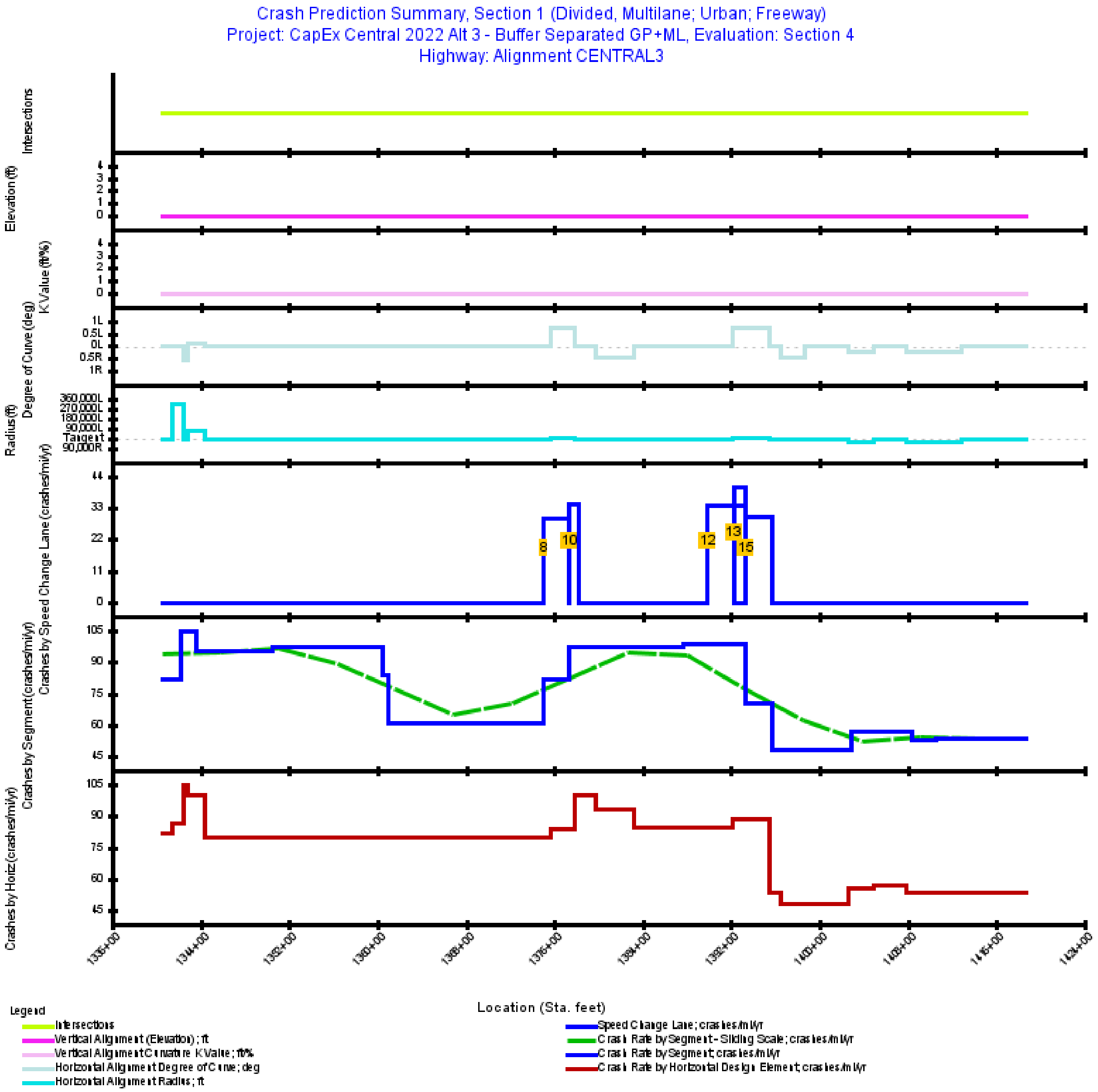

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Ten-lane Freeway	Urban	1340+47.770	1342+19.830	172.06	0.0326	2030: 183,600	2.00	Non-Traversable Median	10.52
2	Ten-lane Freeway	Urban	1342+19.830	1343+64.770	144.94	0.0275	2030: 190,950	4.03	Non-Traversable Median	12.03
3	Ten-lane Freeway	Urban	1343+64.770	1350+54.770	690.00	0.1307	2030: 190,950	6.00	Non-Traversable Median	12.99
4	Ten-lane Freeway	Urban	1350+54.770	1360+43.040	988.27	0.1872	2030: 190,950	2.00	Non-Traversable Median	11.48
5	Ten-lane Freeway	Urban	1360+43.040	1361+03.200	60.16	0.0114	2030: 178,550	2.00	Non-Traversable Median	10.00
6	Ten-lane Freeway	Urban	1361+03.200	1375+05.490	1,402.29	0.2656	2030: 164,450	2.00	Non-Traversable Median	10.00
7	Ten-lane Freeway	Urban	1375+05.490	1377+37.430	231.94	0.0439	2030: 188,500	2.00	Non-Traversable Median	10.00
9	Ten-lane Freeway	Urban	1377+37.430	1387+61.770	1,024.34	0.1940	2030: 203,000	2.00	Non-Traversable Median	11.50
11	Ten-lane Freeway	Urban	1387+61.770	1393+31.380	569.61	0.1079	2030: 203,000	6.00	Non-Traversable Median	13.50
14	Ten-lane Freeway	Urban	1393+31.380	1395+77.290	245.91	0.0466	2030: 168,550	6.00	Non-Traversable Median	14.00
16	Ten-lane Freeway	Urban	1395+77.290	1402+87.940	710.65	0.1346	2030: 147,550	6.00	Non-Traversable Median	14.17
17	Nine-lane Freeway	Urban	1402+87.940	1408+37.910	549.97	0.1042	2030: 147,550	10.14	Non-Traversable Median	18.14
18	Ten-lane Freeway	Urban	1408+37.910	1409+15.770	77.86	0.0147	2030: 147,550	14.47	Non-Traversable Median	22.29
19	Ten-lane Freeway	Urban	1409+15.770	1410+58.770	143.00	0.0271	2030: 147,550	15.99	Non-Traversable Median	23.31
20	Ten-lane Freeway	Urban	1410+58.770	1412+77.720	218.95	0.0415	2030: 147,550	18.49	Non-Traversable Median	24.99
21	Ten-lane Freeway	Urban	1412+77.720	1418+65.083	587.36	0.1112	2030: 147,550	20.00	Non-Traversable Median	26.00

Table 2. Evaluation Freeway - Speed Change Lanes (Speed Change)

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
8	Ten-lane Freeway Speed Change	Exit	1375+05.490	1377+37.430	231.94	0.0439	2030: 188,500	2.00	Non-Traversable Median	10.00
10	Ten-lane Freeway Speed Change	Exit	1377+37.430	1378+25.490	88.06	0.0167	2030: 203,000	2.00	Non-Traversable Median	10.00
12	Ten-lane Freeway Speed Change	Exit	1389+86.380	1393+31.380	345.00	0.0653	2030: 203,000	6.00	Non-Traversable Median	14.00
13	Ten-lane Freeway Speed Change	Entrance	1392+22.290	1393+31.380	109.09	0.0207	2030: 203,000	6.00	Non-Traversable Median	14.00
15	Ten-lane Freeway Speed Change	Entrance	1393+31.380	1395+77.290	245.91	0.0466	2030: 168,550	6.00	Non-Traversable Median	14.00

Table 3. User Defined CMF Used in the Eval Segment CPM Evaluation (Section 1)

Name	Description	Start Loc. (Sta. ft)	End Loc. (Sta. ft)	Start CMF Year	End CMF Year	Severity	CMF Value
13	remove 10 both, remove 20 right	1340+47.770	1342+19.830	2030	2050	Total	1.3000
14	remove 10 both, remove 20 both	1342+19.830	1360+43.040	2030	2050	Total	1.4000
13	remove 10 both, remove 20 left	1360+43.040	1361+03.200	2030	2050	Total	1.3000
12	remove 10 both	1361+03.200	1377+37.430	2030	2050	Total	1.2000
13	remove 10 both, remove 20 right	1377+37.430	1393+31.380	2030	2050	Total	1.3000
12	remove 10 both	1393+31.380	1395+77.290	2030	2050	Total	1.2000
11	remove 10 right	1395+77.290	1402+87.940	2030	2050	Total	1.1000
12	remove 10 both	1402+87.940	1418+65.083	2030	2050	Total	1.2000

Table 4. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**1.3840**
Average Future Road AADT (vpd)	**173,767**
Predicted Crashes	
Total Crashes	**103.91**
Fatal and Injury Crashes	**30.18**
Property-Damage-Only Crashes	**73.73**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**29**
Percent Property-Damage-Only Crashes (%)	**71**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**75.0808**
FI Crash Rate (crashes/mi/yr)	**21.8064**
PDO Crash Rate (crashes/mi/yr)	**53.2744**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**87.78**
Travel Crash Rate (crashes/million veh-mi)	**1.18**
Travel FI Crash Rate (crashes/million veh-mi)	**0.34**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.84**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Table 5. Predicted Freeway Speed Change Lane Crash Rates and Frequencies Summary (Speed Change)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Length (mi)	**0.1932**
Average Future Road AADT (vpd)	**95,699**
Predicted Crashes	
Total Crashes	**6.30**
Fatal and Injury Crashes	**2.02**
Property-Damage-Only Crashes	**4.28**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**32**
Percent Property-Damage-Only Crashes (%)	**68**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**32.6168**
FI Crash Rate (crashes/mi/yr)	**10.4663**
PDO Crash Rate (crashes/mi/yr)	**22.1504**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**6.75**
Travel Crash Rate (crashes/million veh-mi)	**0.93**
Travel FI Crash Rate (crashes/million veh-mi)	**0.30**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.63**

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 6. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1340+47.770	1342+19.830	0.0326	2.658	2.6583	0.7677	1.8906	81.5744	1.22
2	1342+19.830	1343+64.770	0.0275	2.871	2.8708	0.8225	2.0483	104.5793	1.50
3	1343+64.770	1350+54.770	0.1307	12.404	12.4044	3.5582	8.8462	94.9203	1.36
4	1350+54.770	1360+43.040	0.1872	18.215	18.2152	5.2263	12.9888	97.3177	1.40
5	1360+43.040	1361+03.200	0.0114	0.954	0.9536	0.2773	0.6763	83.6910	1.28
6	1361+03.200	1375+05.490	0.2656	16.160	16.1599	4.7759	11.3840	60.8464	1.01
7	1375+05.490	1377+37.430	0.0220	1.801	1.8007	0.5154	1.2853	81.9825	1.19
9	1377+37.430	1387+61.770	0.1857	18.108	18.1081	5.1102	12.9979	97.5314	1.32
11	1387+61.770	1393+31.380	0.0649	6.379	6.3789	1.8011	4.5778	98.3182	1.33
14	1393+31.380	1395+77.290	0.0233	1.634	1.6339	0.4811	1.1528	70.1650	1.14
16	1395+77.290	1402+87.940	0.1346	6.495	6.4953	1.9689	4.5265	48.2593	0.90
17	1402+87.940	1408+37.910	0.1042	5.892	5.8924	1.7381	4.1543	56.5703	1.05
18	1408+37.910	1409+15.770	0.0147	0.776	0.7758	0.2351	0.5407	52.6112	0.98
19	1409+15.770	1410+58.770	0.0271	1.431	1.4306	0.4338	0.9968	52.8214	0.98
20	1410+58.770	1412+77.720	0.0415	2.205	2.2047	0.6688	1.5359	53.1676	0.99
21	1412+77.720	1418+65.083	0.1112	5.926	5.9263	1.7987	4.1276	53.2737	0.99
Total			1.3840	103.909	103.9089	30.1792	73.7296	75.0808	1.18

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 7. Predicted Crash Frequencies and Rates by Freeway Speed Change Lane (Speed Change)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
8	1375+05.490	1377+37.430	0.0439	1.299	1.2988	0.3938	0.9050	29.5671	0.86
10	1377+37.430	1378+25.490	0.0167	0.571	0.5706	0.1729	0.3977	34.2138	0.92
12	1389+86.380	1393+31.380	0.0653	2.218	2.2180	0.6667	1.5512	33.9448	0.92
13	1392+22.290	1393+31.380	0.0207	0.832	0.8318	0.2952	0.5366	40.2608	1.09
15	1393+31.380	1395+77.290	0.0466	1.382	1.3817	0.4932	0.8885	29.6672	0.96
Total			0.1932	6.301	6.3010	2.0219	4.2791	32.6168	0.93

Note: *Travel Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 8. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1340+47.770	1341+42.902	0.0180	1.470	1.4698	0.4244	1.0453	81.5744	1.22
Simple Curve 1	1341+42.902	1342+42.169	0.0188	1.631	1.6310	0.4700	1.1610	86.7514	1.28
Simple Curve 2	1342+42.169	1342+86.867	0.0085	0.885	0.8853	0.2536	0.6317	104.5793	1.50
Simple Curve 3	1342+86.867	1344+37.730	0.0286	2.855	2.8546	0.8183	2.0363	99.9080	1.43
Tangent	1344+37.730	1375+63.881	0.5921	47.202	47.2017	13.6904	33.5113	79.7226	1.23
Simple Curve 4	1375+63.881	1377+88.365	0.0425	3.550	3.5497	1.0345	2.5152	83.4902	2.09
Tangent	1377+88.365	1379+71.752	0.0347	3.482	3.4825	0.9878	2.4947	100.2654	1.50
Simple Curve 5	1379+71.752	1383+24.607	0.0668	6.238	6.2377	1.7603	4.4774	93.3391	1.32
Tangent	1383+24.607	1392+18.622	0.1693	14.337	14.3373	4.0743	10.2630	84.6752	1.56
Simple Curve 6	1392+18.622	1395+40.606	0.0610	5.385	5.3852	1.6986	3.6867	88.3093	2.52
Tangent	1395+40.606	1396+51.008	0.0209	1.124	1.1236	0.3496	0.7741	53.7387	1.30
Simple Curve 7	1396+51.008	1398+60.102	0.0396	1.911	1.9111	0.5793	1.3318	48.2593	0.90
Tangent	1398+60.102	1402+63.279	0.0764	3.685	3.6850	1.1170	2.5680	48.2593	0.90
Simple Curve 8	1402+63.279	1404+92.432	0.0434	2.416	2.4164	0.7146	1.7017	55.6759	1.03
Tangent	1404+92.432	1407+87.804	0.0559	3.165	3.1646	0.9335	2.2311	56.5703	1.05
Simple Curve 9	1407+87.804	1412+77.721	0.0928	4.948	4.9480	1.4961	3.4519	53.3260	0.99
Tangent	1412+77.721	1418+65.083	0.1112	5.926	5.9263	1.7987	4.1276	53.2738	0.99

Table 9. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	110.21	32.20	29.218	78.01	70.782
Total	110.21	32.20	29.218	78.01	70.782
Average	110.21	32.20	29.218	78.01	70.782

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 10. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0166	0.0344	0.2493	0.4674	1.8906
2	0.0193	0.0408	0.2778	0.4845	2.0483
3	0.0731	0.1496	1.1265	2.2089	8.8462
4	0.1057	0.2154	1.6416	3.2637	12.9888
5	0.0056	0.0114	0.0871	0.1731	0.6763
6	0.0966	0.1969	1.5001	2.9824	11.3840
7	0.0117	0.0244	0.1710	0.3083	1.2853
9	0.1096	0.2264	1.6519	3.1224	12.9979
11	0.0365	0.0743	0.5659	1.1244	4.5778
14	0.0111	0.0232	0.1608	0.2860	1.1528
16	0.0419	0.0863	0.6338	1.2069	4.5265
17	0.0377	0.0781	0.5650	1.0573	4.1543
18	0.0055	0.0117	0.0794	0.1385	0.5407
19	0.0102	0.0215	0.1465	0.2555	0.9968
20	0.0157	0.0332	0.2259	0.3940	1.5359
21	0.0364	0.0741	0.5650	1.1232	4.1276
Total	0.6331	1.3016	9.6478	18.5967	73.7296

Table 11. Predicted Crash Severity by Speed Change Lane (Speed Change)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
8	0.0089	0.0187	0.1307	0.2356	0.9050
10	0.0038	0.0079	0.0567	0.1045	0.3977
12	0.0142	0.0292	0.2146	0.4088	1.5512
13	0.0069	0.0146	0.0997	0.1739	0.5366
15	0.0113	0.0238	0.1649	0.2932	0.8885
Total	0.0452	0.0942	0.6666	1.2159	4.2791

Table 12. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.05	0.0	0.63	0.6	0.67	0.6
Highway Segment	Collision with Fixed Object	8.29	8.0	20.43	19.7	28.71	27.6
Highway Segment	Collision with Other Object	0.58	0.6	3.97	3.8	4.55	4.4
Highway Segment	Other Single-vehicle Collision	2.39	2.3	3.05	2.9	5.44	5.2
Highway Segment	Collision with Parked Vehicle	0.17	0.2	0.46	0.4	0.63	0.6
Highway Segment	Total Single Vehicle Crashes	11.48	11.0	28.53	27.5	40.01	38.5
Highway Segment	Right-Angle Collision	0.58	0.6	0.81	0.8	1.39	1.3
Highway Segment	Head-on Collision	0.15	0.1	0.09	0.1	0.24	0.2
Highway Segment	Other Multi-vehicle Collision	0.58	0.6	1.08	1.0	1.67	1.6
Highway Segment	Rear-end Collision	14.03	13.5	31.19	30.0	45.22	43.5
Highway Segment	Sideswipe, Same Direction Collision	3.37	3.2	12.02	11.6	15.39	14.8
Highway Segment	Total Multiple Vehicle Crashes	18.70	18.0	45.20	43.5	63.90	61.5
Highway Segment	Total Highway Segment Crashes	30.18	29.0	73.73	71.0	103.91	100.0
	Total Crashes	30.18	29.0	73.73	71.0	103.91	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 13. Predicted Exit Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.02	0.5	0.02	0.5
Highway Segment	Collision with Fixed Object	0.24	5.9	0.59	14.5	0.83	20.4
Highway Segment	Collision with Other Object	0.02	0.5	0.09	2.1	0.10	2.6
Highway Segment	Other Single-vehicle Collision	0.06	1.5	0.07	1.6	0.13	3.1
Highway Segment	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Total Single Vehicle Crashes	0.32	7.9	0.76	18.6	1.08	26.5
Highway Segment	Right-Angle Collision	0.01	0.3	0.03	0.8	0.05	1.2
Highway Segment	Head-on Collision	0.01	0.2	0.01	0.1	0.01	0.3
Highway Segment	Other Multi-vehicle Collision	0.02	0.5	0.05	1.1	0.07	1.6
Highway Segment	Rear-end Collision	0.68	16.6	1.61	39.4	2.29	56.0
Highway Segment	Sideswipe, Same Direction Collision	0.20	4.8	0.39	9.6	0.59	14.4
Highway Segment	Total Multiple Vehicle Crashes	0.91	22.3	2.09	51.2	3.00	73.5
Highway Segment	Total Highway Segment Crashes	1.23	30.2	2.85	69.8	4.09	100.0
	Total Crashes	1.23	30.2	2.85	69.8	4.09	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 14. Predicted Entrance Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.00	0.1	0.00	0.1
Highway Segment	Collision with Fixed Object	0.15	6.9	0.18	8.3	0.34	15.2
Highway Segment	Collision with Other Object	0.01	0.7	0.05	2.3	0.07	3.0
Highway Segment	Other Single-vehicle Collision	0.05	2.4	0.02	1.0	0.08	3.4
Highway Segment	Collision with Parked Vehicle	0.00	0.1	0.00	0.2	0.01	0.3
Highway Segment	Total Single Vehicle Crashes	0.22	10.1	0.27	12.0	0.49	22.1
Highway Segment	Right-Angle Collision	0.01	0.7	0.02	1.0	0.04	1.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.1	0.01	0.2
Highway Segment	Other Multi-vehicle Collision	0.01	0.6	0.02	1.0	0.04	1.6
Highway Segment	Rear-end Collision	0.43	19.3	0.76	34.1	1.18	53.5
Highway Segment	Sideswipe, Same Direction Collision	0.10	4.7	0.36	16.2	0.46	21.0
Highway Segment	Total Multiple Vehicle Crashes	0.56	25.5	1.16	52.4	1.73	77.9
Highway Segment	Total Highway Segment Crashes	0.79	35.6	1.43	64.4	2.21	100.0
	Total Crashes	0.79	35.6	1.43	64.4	2.21	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 15. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1340+47.770	1342+19.830	Information: for segment #1 (1340+47.770 to 1342+19.830), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1340+47.770	1342+19.830	Information: for segment #1 (1340+47.770 to 1342+19.830), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1340+47.770	1342+19.830	Information: for segment #1 (1340+47.770 to 1342+19.830), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1340+47.770	1342+19.830	Information: for segment #1 (1340+47.770 to 1342+19.830), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+19.830	1343+64.770	Information: for segment #2 (1342+19.830 to 1343+64.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+19.830	1343+64.770	Information: for segment #2 (1342+19.830 to 1343+64.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+19.830	1343+64.770	Information: for segment #2 (1342+19.830 to 1343+64.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1342+19.830	1343+64.770	Information: for segment #2 (1342+19.830 to 1343+64.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1343+64.770	1350+54.770	Information: for segment #3 (1343+64.770 to 1350+54.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1343+64.770	1350+54.770	Information: for segment #3 (1343+64.770 to 1350+54.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1343+64.770	1350+54.770	Information: for segment #3 (1343+64.770 to 1350+54.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1343+64.770	1350+54.770	Information: for segment #3 (1343+64.770 to 1350+54.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1350+54.770	1360+43.040	Information: for segment #4 (1350+54.770 to 1360+43.040), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1350+54.770	1360+43.040	Information: for segment #4 (1350+54.770 to 1360+43.040), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1350+54.770	1360+43.040	Information: for segment #4 (1350+54.770 to 1360+43.040), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1350+54.770	1360+43.040	Information: for segment #4 (1350+54.770 to 1360+43.040), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1360+43.040	1361+03.200	Information: for segment #5 (1360+43.040 to 1361+03.200), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1360+43.040	1361+03.200	Information: for segment #5 (1360+43.040 to 1361+03.200), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1360+43.040	1361+03.200	Information: for segment #5 (1360+43.040 to 1361+03.200), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1360+43.040	1361+03.200	Information: for segment #5 (1360+43.040 to 1361+03.200), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1361+03.200	1375+05.490	Information: for segment #6 (1361+03.200 to 1375+05.490), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1361+03.200	1375+05.490	Information: for segment #6 (1361+03.200 to 1375+05.490), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1361+03.200	1375+05.490	Information: for segment #6 (1361+03.200 to 1375+05.490), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1361+03.200	1375+05.490	Information: for segment #6 (1361+03.200 to 1375+05.490), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1375+05.490	1377+37.430	Information: for segment #7 (1375+05.490 to 1377+37.430), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1375+05.490	1377+37.430	Information: for segment #7 (1375+05.490 to 1377+37.430), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1375+05.490	1377+37.430	Information: for segment #7 (1375+05.490 to 1377+37.430), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1375+05.490	1377+37.430	Information: for segment #7 (1375+05.490 to 1377+37.430), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+37.430	1387+61.770	Information: for segment #9 (1377+37.430 to 1387+61.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+37.430	1387+61.770	Information: for segment #9 (1377+37.430 to 1387+61.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+37.430	1387+61.770	Information: for segment #9 (1377+37.430 to 1387+61.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+37.430	1387+61.770	Information: for segment #9 (1377+37.430 to 1387+61.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1387+61.770	1393+31.380	Information: for segment #11 (1387+61.770 to 1393+31.380), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1387+61.770	1393+31.380	Information: for segment #11 (1387+61.770 to 1393+31.380), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1387+61.770	1393+31.380	Information: for segment #11 (1387+61.770 to 1393+31.380), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1387+61.770	1393+31.380	Information: for segment #11 (1387+61.770 to 1393+31.380), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1393+31.380	1395+77.290	Information: for segment #14 (1393+31.380 to 1395+77.290), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1393+31.380	1395+77.290	Information: for segment #14 (1393+31.380 to 1395+77.290), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1393+31.380	1395+77.290	Information: for segment #14 (1393+31.380 to 1395+77.290), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1393+31.380	1395+77.290	Information: for segment #14 (1393+31.380 to 1395+77.290), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1395+77.290	1402+87.940	Information: for segment #16 (1395+77.290 to 1402+87.940), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1395+77.290	1402+87.940	Information: for segment #16 (1395+77.290 to 1402+87.940), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1395+77.290	1402+87.940	Information: for segment #16 (1395+77.290 to 1402+87.940), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1395+77.290	1402+87.940	Information: for segment #16 (1395+77.290 to 1402+87.940), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1402+87.940	1408+37.910	Information: for segment #17 (1402+87.940 to 1408+37.910), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1402+87.940	1408+37.910	Information: for segment #17 (1402+87.940 to 1408+37.910), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1402+87.940	1408+37.910	Information: for segment #17 (1402+87.940 to 1408+37.910), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1402+87.940	1408+37.910	Information: for segment #17 (1402+87.940 to 1408+37.910), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+37.910	1409+15.770	Information: for segment #18 (1408+37.910 to 1409+15.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+37.910	1409+15.770	Information: for segment #18 (1408+37.910 to 1409+15.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+37.910	1409+15.770	Information: for segment #18 (1408+37.910 to 1409+15.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1408+37.910	1409+15.770	Information: for segment #18 (1408+37.910 to 1409+15.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1409+15.770	1410+58.770	Information: for segment #19 (1409+15.770 to 1410+58.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1409+15.770	1410+58.770	Information: for segment #19 (1409+15.770 to 1410+58.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1409+15.770	1410+58.770	Information: for segment #19 (1409+15.770 to 1410+58.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1409+15.770	1410+58.770	Information: for segment #19 (1409+15.770 to 1410+58.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1410+58.770	1412+77.720	Information: for segment #20 (1410+58.770 to 1412+77.720), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1410+58.770	1412+77.720	Information: for segment #20 (1410+58.770 to 1412+77.720), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1410+58.770	1412+77.720	Information: for segment #20 (1410+58.770 to 1412+77.720), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1410+58.770	1412+77.720	Information: for segment #20 (1410+58.770 to 1412+77.720), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1412+77.720	1418+65.083	Information: for segment #21 (1412+77.720 to 1418+65.083), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1412+77.720	1418+65.083	Information: for segment #21 (1412+77.720 to 1418+65.083), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1412+77.720	1418+65.083	Information: for segment #21 (1412+77.720 to 1418+65.083), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1412+77.720	1418+65.083	Information: for segment #21 (1412+77.720 to 1418+65.083), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1375+05.490	1377+37.430	Information: for segment #8 (1375+05.490 to 1377+37.430), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1377+37.430	1378+25.490	Information: for segment #10 (1377+37.430 to 1378+25.490), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1389+86.380	1393+31.380	Information: for segment #12 (1389+86.380 to 1393+31.380), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1392+22.290	1393+31.380	Information: for segment #13 (1392+22.290 to 1393+31.380), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1393+31.380	1395+77.290	Information: for segment #15 (1393+31.380 to 1395+77.290), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1402+87.940	1408+37.910	Information: for segment #17 (1402+87.940 to 1408+37.910), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway

I-35 Modified Build Alternative 3 Model Barrier-Separated GP Lanes

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 1:55 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 12:42:35 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL3
Highway Comment: Imported from CENTRAL3.xml
Highway Version: 1

Evaluation Title: Section 1
Evaluation Comment: Created Thu Jun 23 12:41:26 CDT 2022

Minimum Location: 1055+87.420
Maximum Location: 1137+45.515

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1055+87.420
Evaluation End Location: 1137+45.515
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_EX=1.0; FI_MV=1.0; FI_SV=1.0; PDO_EX=1.0; PDO_MV=1.0; PDO_SV=1.0;

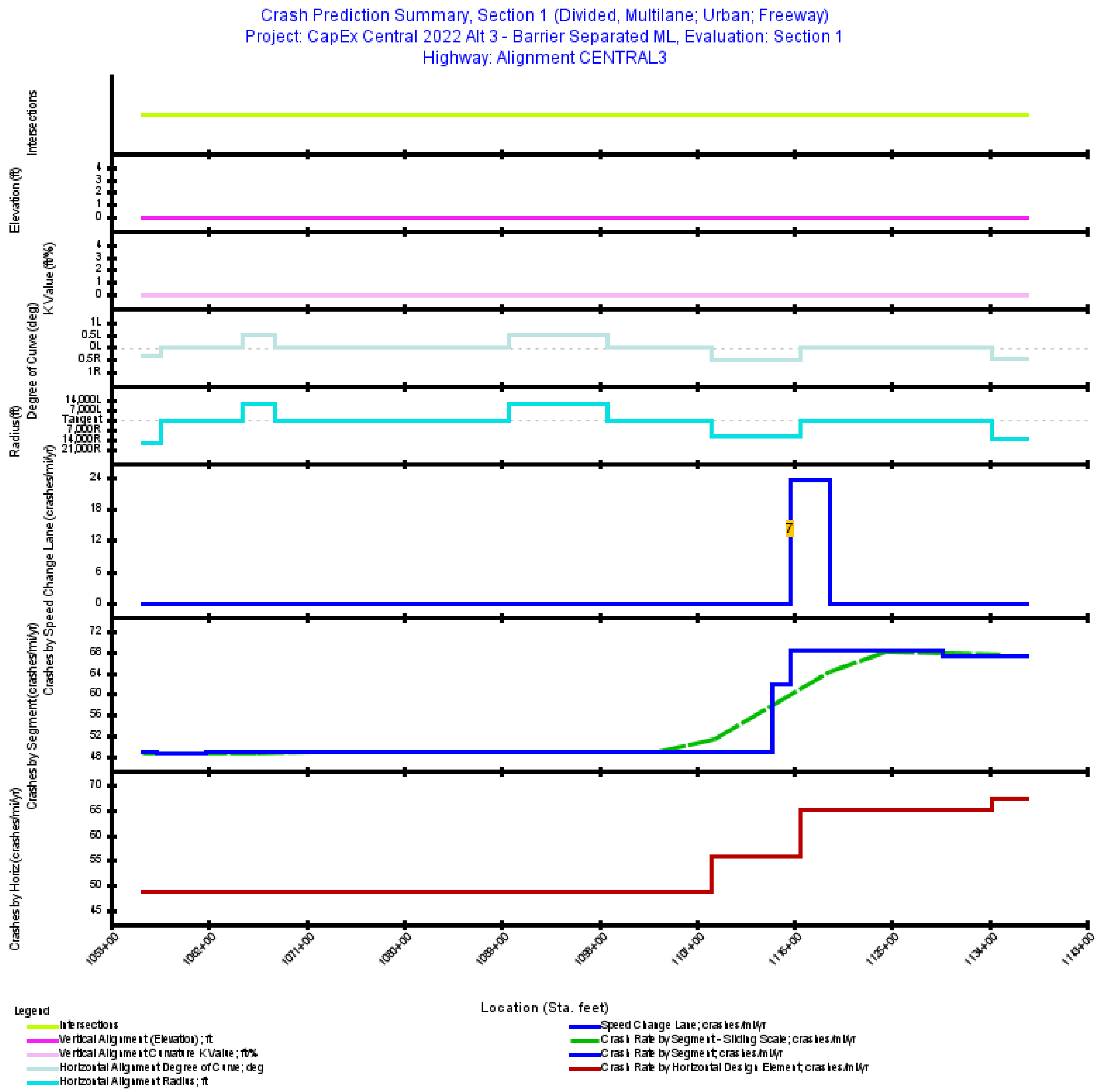

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Eight-lane Freeway	Urban	1055+87.420	1057+23.420	136.00	0.0258	2030: 143,650	63.51	Non-Traversable Median	71.51
2	Eight-lane Freeway	Urban	1057+23.420	1061+73.420	450.00	0.0852	2030: 143,650	70.01	Non-Traversable Median	78.01
3	Eight-lane Freeway	Urban	1061+73.420	1070+03.420	830.00	0.1572	2030: 143,650	79.45	Non-Traversable Median	88.01
4	Eight-lane Freeway	Urban	1070+03.420	1113+93.760	4,390.34	0.8315	2030: 143,650	87.00	Non-Traversable Median	94.01
5	Nine-lane Freeway	Urban	1113+93.760	1115+60.130	166.37	0.0315	2030: 165,550	87.00	Non-Traversable Median	95.00
6	Nine-lane Freeway	Urban	1115+60.130	1129+72.250	1,412.12	0.2674	2030: 184,050	87.00	Non-Traversable Median	95.00
8	Ten-lane Freeway	Urban	1129+72.250	1137+45.515	773.26	0.1465	2030: 189,850	87.00	Non-Traversable Median	95.00

Table 2. Evaluation Freeway - Speed Change Lanes (Speed Change)

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
7	Nine-lane Freeway Speed Change	Exit	1115+60.130	1119+25.130	365.00	0.0691	2030: 184,050	87.00	Non-Traversable Median	95.00

Table 3. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**1.5105**
Average Future Road AADT (vpd)	**154,815**
Predicted Crashes	
Total Crashes	**81.39**
Fatal and Injury Crashes	**23.40**
Property-Damage-Only Crashes	**57.99**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**29**
Percent Property-Damage-Only Crashes (%)	**71**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**53.8831**
FI Crash Rate (crashes/mi/yr)	**15.4890**
PDO Crash Rate (crashes/mi/yr)	**38.3941**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**85.36**
Travel Crash Rate (crashes/million veh-mi)	**0.95**
Travel FI Crash Rate (crashes/million veh-mi)	**0.27**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.68**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Table 4. Predicted Freeway Speed Change Lane Crash Rates and Frequencies Summary (Speed Change)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Length (mi)	**0.0691**
Average Future Road AADT (vpd)	**92,025**
Predicted Crashes	
Total Crashes	**1.64**
Fatal and Injury Crashes	**0.49**
Property-Damage-Only Crashes	**1.15**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**30**
Percent Property-Damage-Only Crashes (%)	**70**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**23.7191**
FI Crash Rate (crashes/mi/yr)	**7.1036**
PDO Crash Rate (crashes/mi/yr)	**16.6155**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.32**
Travel Crash Rate (crashes/million veh-mi)	**0.71**
Travel FI Crash Rate (crashes/million veh-mi)	**0.21**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.50**

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 5. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1055+87.420	1057+23.420	0.0258	1.259	1.2590	0.3646	0.8944	48.8806	0.93
2	1057+23.420	1061+73.420	0.0852	4.146	4.1459	1.2014	2.9445	48.6450	0.93
3	1061+73.420	1070+03.420	0.1572	7.676	7.6760	2.2232	5.4528	48.8304	0.93
4	1070+03.420	1113+93.760	0.8315	40.589	40.5893	11.7566	28.8327	48.8143	0.93
5	1113+93.760	1115+60.130	0.0315	1.946	1.9458	0.5602	1.3857	61.7542	1.02
6	1115+60.130	1129+72.250	0.2329	15.922	15.9218	4.4709	11.4508	68.3683	1.02
8	1129+72.250	1137+45.515	0.1465	9.854	9.8542	2.8198	7.0345	67.2866	0.97
Total			1.5105	81.392	81.3921	23.3966	57.9954	53.8831	0.95

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 6. Predicted Crash Frequencies and Rates by Freeway Speed Change Lane (Speed Change)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
7	1115+60.130	1119+25.130	0.0691	1.640	1.6397	0.4911	1.1486	23.7191	0.71
Total			0.0691	1.640	1.6397	0.4911	1.1486	23.7191	0.71

Note: *Travel Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 7. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1055+87.420	1057+55.049	0.0317	1.550	1.5504	0.4491	1.1014	48.8362	0.93
Tangent	1057+55.049	1065+19.124	0.1447	7.052	7.0516	2.0429	5.0087	48.7289	0.93
Simple Curve 2	1065+19.124	1068+17.975	0.0566	2.764	2.7638	0.8005	1.9633	48.8304	0.93
Tangent	1068+17.975	1089+71.311	0.4078	19.908	19.9084	5.7664	14.1420	48.8157	0.93
Simple Curve 3	1089+71.311	1098+76.481	0.1714	8.368	8.3684	2.4239	5.9445	48.8143	0.93
Tangent	1098+76.481	1108+43.529	0.1832	8.941	8.9405	2.5896	6.3509	48.8143	0.93
Simple Curve 4	1108+43.529	1116+62.034	0.1550	8.640	8.6396	2.4933	6.1462	55.7319	1.05
Tangent	1116+62.034	1134+21.922	0.3333	21.685	21.6852	6.1420	15.5432	65.0597	1.11
Simple Curve 5	1134+21.922	1137+45.515	0.0613	4.124	4.1238	1.1800	2.9438	67.2866	0.97

Table 8. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	83.03	23.89	28.769	59.14	71.231
Total	83.03	23.89	28.769	59.14	71.231
Average	83.03	23.89	28.769	59.14	71.231

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 9. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0086	0.0181	0.1232	0.2148	0.8944
2	0.0246	0.0502	0.3793	0.7473	2.9445
3	0.0475	0.0980	0.7173	1.3604	5.4528
4	0.2500	0.5155	3.7852	7.2058	28.8327
5	0.0132	0.0278	0.1892	0.3300	1.3857
6	0.0910	0.1857	1.4087	2.7855	11.4508
8	0.0608	0.1257	0.9137	1.7196	7.0345
Total	0.4956	1.0209	7.5167	14.3635	57.9954

Table 10. Predicted Crash Severity by Speed Change Lane (Speed Change)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
7	0.0104	0.0213	0.1575	0.3019	1.1486

Table 11. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.04	0.0	0.50	0.6	0.54	0.7
Highway Segment	Collision with Fixed Object	6.29	7.7	16.36	20.1	22.64	27.8
Highway Segment	Collision with Other Object	0.44	0.5	3.17	3.9	3.62	4.4
Highway Segment	Other Single-vehicle Collision	1.81	2.2	2.44	3.0	4.25	5.2
Highway Segment	Collision with Parked Vehicle	0.13	0.2	0.36	0.4	0.50	0.6
Highway Segment	Total Single Vehicle Crashes	8.71	10.7	22.84	28.1	31.55	38.8
Highway Segment	Right-Angle Collision	0.46	0.6	0.63	0.8	1.09	1.3
Highway Segment	Head-on Collision	0.12	0.1	0.07	0.1	0.19	0.2
Highway Segment	Other Multi-vehicle Collision	0.46	0.6	0.84	1.0	1.30	1.6
Highway Segment	Rear-end Collision	11.02	13.5	24.25	29.8	35.27	43.3
Highway Segment	Sideswipe, Same Direction Collision	2.64	3.2	9.35	11.5	11.99	14.7
Highway Segment	Total Multiple Vehicle Crashes	14.69	18.0	35.15	43.2	49.84	61.2
Highway Segment	Total Highway Segment Crashes	23.40	28.7	57.99	71.3	81.39	100.0
	Total Crashes	23.40	28.7	57.99	71.3	81.39	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 12. Predicted Exit Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.01	0.5	0.01	0.5
Highway Segment	Collision with Fixed Object	0.10	5.9	0.24	14.5	0.33	20.4
Highway Segment	Collision with Other Object	0.01	0.5	0.03	2.1	0.04	2.6
Highway Segment	Other Single-vehicle Collision	0.02	1.5	0.03	1.6	0.05	3.1
Highway Segment	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Total Single Vehicle Crashes	0.13	7.8	0.31	18.7	0.43	26.5
Highway Segment	Right-Angle Collision	0.01	0.3	0.01	0.8	0.02	1.2
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.1	0.01	0.3
Highway Segment	Other Multi-vehicle Collision	0.01	0.5	0.02	1.1	0.03	1.6
Highway Segment	Rear-end Collision	0.27	16.4	0.65	39.6	0.92	56.0
Highway Segment	Sideswipe, Same Direction Collision	0.08	4.7	0.16	9.7	0.24	14.4
Highway Segment	Total Multiple Vehicle Crashes	0.36	22.1	0.84	51.3	1.21	73.5
Highway Segment	Total Highway Segment Crashes	0.49	29.9	1.15	70.1	1.64	100.0
	Total Crashes	0.49	29.9	1.15	70.1	1.64	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 13. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1055+87.420	1057+23.420	Information: for segment #1 (1055+87.420 to 1057+23.420), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1055+87.420	1057+23.420	Information: for segment #1 (1055+87.420 to 1057+23.420), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1055+87.420	1057+23.420	Information: for segment #1 (1055+87.420 to 1057+23.420), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1055+87.420	1057+23.420	Information: for segment #1 (1055+87.420 to 1057+23.420), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1057+23.420	1061+73.420	Information: for segment #2 (1057+23.420 to 1061+73.420), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1057+23.420	1061+73.420	Information: for segment #2 (1057+23.420 to 1061+73.420), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1057+23.420	1061+73.420	Information: for segment #2 (1057+23.420 to 1061+73.420), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1057+23.420	1061+73.420	Information: for segment #2 (1057+23.420 to 1061+73.420), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1061+73.420	1070+03.420	Information: for segment #3 (1061+73.420 to 1070+03.420), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1061+73.420	1070+03.420	Information: for segment #3 (1061+73.420 to 1070+03.420), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1061+73.420	1070+03.420	Information: for segment #3 (1061+73.420 to 1070+03.420), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1061+73.420	1070+03.420	Information: for segment #3 (1061+73.420 to 1070+03.420), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1070+03.420	1113+93.760	Information: for segment #4 (1070+03.420 to 1113+93.760), Effective median width (94.01 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1070+03.420	1113+93.760	Information: for segment #4 (1070+03.420 to 1113+93.760), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1070+03.420	1113+93.760	Information: for segment #4 (1070+03.420 to 1113+93.760), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1070+03.420	1113+93.760	Information: for segment #4 (1070+03.420 to 1113+93.760), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1070+03.420	1113+93.760	Information: for segment #4 (1070+03.420 to 1113+93.760), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1113+93.760	1115+60.130	Information: for segment #5 (1113+93.760 to 1115+60.130), Effective median width (95.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1113+93.760	1115+60.130	Information: for segment #5 (1113+93.760 to 1115+60.130), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1113+93.760	1115+60.130	Information: for segment #5 (1113+93.760 to 1115+60.130), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1113+93.760	1115+60.130	Information: for segment #5 (1113+93.760 to 1115+60.130), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1113+93.760	1115+60.130	Information: for segment #5 (1113+93.760 to 1115+60.130), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1115+60.130	1129+72.250	Information: for segment #6 (1115+60.130 to 1129+72.250), Effective median width (95.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1115+60.130	1129+72.250	Information: for segment #6 (1115+60.130 to 1129+72.250), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1115+60.130	1129+72.250	Information: for segment #6 (1115+60.130 to 1129+72.250), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1115+60.130	1129+72.250	Information: for segment #6 (1115+60.130 to 1129+72.250), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1115+60.130	1129+72.250	Information: for segment #6 (1115+60.130 to 1129+72.250), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1129+72.250	1137+45.515	Information: for segment #8 (1129+72.250 to 1137+45.515), Effective median width (95.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1129+72.250	1137+45.515	Information: for segment #8 (1129+72.250 to 1137+45.515), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1129+72.250	1137+45.515	Information: for segment #8 (1129+72.250 to 1137+45.515), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1129+72.250	1137+45.515	Information: for segment #8 (1129+72.250 to 1137+45.515), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1129+72.250	1137+45.515	Information: for segment #8 (1129+72.250 to 1137+45.515), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1115+60.130	1119+25.130	Information: for segment #7 (1115+60.130 to 1119+25.130), For Speed Change Lane the Effective median width (95.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1115+60.130	1119+25.130	Information: for segment #7 (1115+60.130 to 1119+25.130), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1113+93.760	1115+60.130	Information: for segment #5 (1113+93.760 to 1115+60.130), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1115+60.130	1129+72.250	Information: for segment #6 (1115+60.130 to 1129+72.250), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1115+60.130	1119+25.130	Information: for segment #7 (1115+60.130 to 1119+25.130), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 1:56 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 12:45:56 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL3
Highway Comment: Imported from CENTRAL3.xml
Highway Version: 1

Evaluation Title: Section 2
Evaluation Comment: Created Thu Jun 23 12:42:59 CDT 2022

Minimum Location: 1161+05.035
Maximum Location: 1188+09.855

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1161+05.035
Evaluation End Location: 1188+09.855
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_EX=1.0; FI_MV=1.0; FI_SV=1.0; PDO_EX=1.0; PDO_MV=1.0; PDO_SV=1.0;

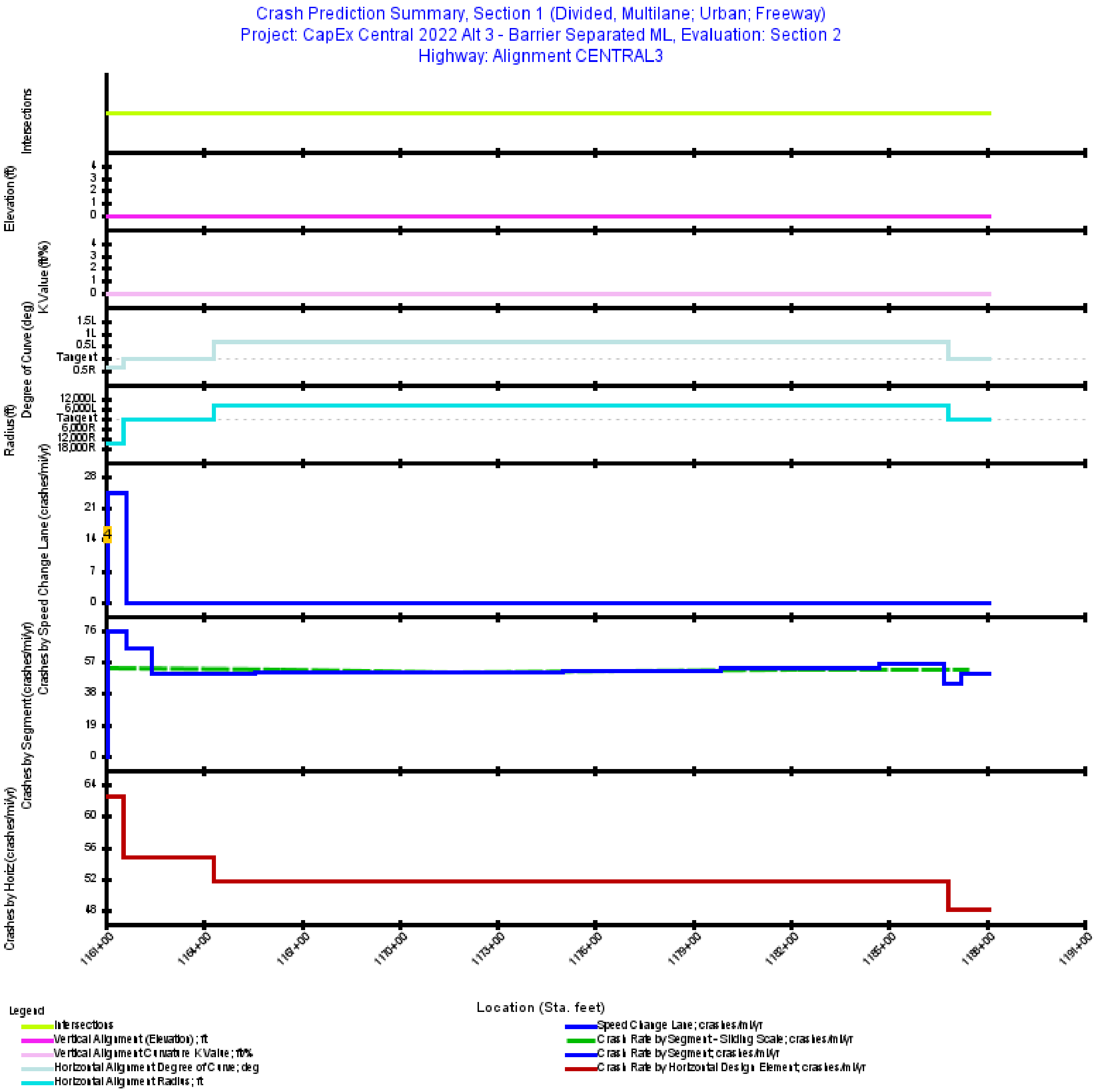

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Ten-lane Freeway	Urban	1161+05.035	1161+05.040	0.01	0.0000	2030: 189,850	106.00	Non-Traversable Median	114.00
3	Ten-lane Freeway	Urban	1161+05.040	1161+63.210	58.17	0.0110	2030: 189,850	107.22	Non-Traversable Median	115.22
5	Nine-lane Freeway	Urban	1161+63.210	1162+39.850	76.64	0.0145	2030: 173,600	110.05	Non-Traversable Median	118.05
6	Eight-lane Freeway	Urban	1162+39.850	1163+20.035	80.19	0.0152	2030: 145,650	113.34	Non-Traversable Median	121.34
7	Eight-lane Freeway	Urban	1163+20.035	1165+58.035	238.00	0.0451	2030: 145,650	120.02	Non-Traversable Median	128.02
8	Eight-lane Freeway	Urban	1165+58.035	1167+96.035	238.00	0.0451	2030: 145,650	130.02	Non-Traversable Median	138.02
9	Eight-lane Freeway	Urban	1167+96.035	1170+13.035	217.00	0.0411	2030: 145,650	137.23	Non-Traversable Median	143.01
10	Eight-lane Freeway	Urban	1170+13.035	1174+99.035	486.00	0.0920	2030: 145,650	129.99	Non-Traversable Median	137.99
11	Eight-lane Freeway	Urban	1174+99.035	1179+85.035	486.00	0.0920	2030: 145,650	119.99	Non-Traversable Median	127.99
12	Eight-lane Freeway	Urban	1179+85.035	1184+70.035	485.00	0.0919	2030: 145,650	109.99	Non-Traversable Median	117.99
13	Eight-lane Freeway	Urban	1184+70.035	1186+67.880	197.85	0.0375	2030: 145,650	102.96	Non-Traversable Median	110.96
14	Seven-lane Freeway	Urban	1186+67.880	1187+20.830	52.95	0.0100	2030: 128,000	100.38	Non-Traversable Median	108.38
15	Eight-lane Freeway	Urban	1187+20.830	1188+09.855	89.03	0.0169	2030: 134,100	98.92	Non-Traversable Median	106.92

Table 2. Evaluation Freeway - Speed Change Lanes (Speed Change)

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
2	Ten-lane Freeway Speed Change	Exit	1161+05.035	1161+05.040	0.01	0.0000	2030: 189,850	106.00	Non-Traversable Median	114.00
4	Ten-lane Freeway Speed Change	Exit	1161+05.040	1161+63.210	58.17	0.0110	2030: 189,850	107.22	Non-Traversable Median	115.22

Table 3. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**0.5068**
Average Future Road AADT (vpd)	**146,197**
Predicted Crashes	
Total Crashes	**26.41**
Fatal and Injury Crashes	**7.62**
Property-Damage-Only Crashes	**18.79**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**29**
Percent Property-Damage-Only Crashes (%)	**71**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**52.1255**
FI Crash Rate (crashes/mi/yr)	**15.0413**
PDO Crash Rate (crashes/mi/yr)	**37.0842**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**27.04**
Travel Crash Rate (crashes/million veh-mi)	**0.98**
Travel FI Crash Rate (crashes/million veh-mi)	**0.28**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.69**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Table 4. Predicted Freeway Speed Change Lane Crash Rates and Frequencies Summary (Speed Change)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Length (mi)	**0.0110**
Average Future Road AADT (vpd)	**94,925**
Predicted Crashes	
Total Crashes	**0.27**
Fatal and Injury Crashes	**0.08**
Property-Damage-Only Crashes	**0.19**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**30**
Percent Property-Damage-Only Crashes (%)	**70**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**24.4262**
FI Crash Rate (crashes/mi/yr)	**7.2950**
PDO Crash Rate (crashes/mi/yr)	**17.1312**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.38**
Travel Crash Rate (crashes/million veh-mi)	**0.70**
Travel FI Crash Rate (crashes/million veh-mi)	**0.21**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.49**

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 5. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1161+05.035	1161+05.040	0.0000	0.000	0.0000	0.0000	0.0000	0.0000	0.00
3	1161+05.040	1161+63.210	0.0055	0.418	0.4184	0.1199	0.2985	75.9591	1.10
5	1161+63.210	1162+39.850	0.0145	0.954	0.9536	0.2717	0.6820	65.7000	1.04
6	1162+39.850	1163+20.035	0.0152	0.753	0.7532	0.2176	0.5356	49.5987	0.93
7	1163+20.035	1165+58.035	0.0451	2.261	2.2612	0.6523	1.6089	50.1649	0.94
8	1165+58.035	1167+96.035	0.0451	2.284	2.2845	0.6583	1.6262	50.6814	0.95
9	1167+96.035	1170+13.035	0.0411	2.084	2.0844	0.6008	1.4836	50.7178	0.95
10	1170+13.035	1174+99.035	0.0920	4.680	4.6801	1.3496	3.3305	50.8458	0.96
11	1174+99.035	1179+85.035	0.0920	4.726	4.7262	1.3647	3.3615	51.3460	0.97
12	1179+85.035	1184+70.035	0.0919	4.872	4.8717	1.4101	3.4615	53.0358	1.00
13	1184+70.035	1186+67.880	0.0375	2.098	2.0980	0.6083	1.4897	55.9905	1.05
14	1186+67.880	1187+20.830	0.0100	0.437	0.4374	0.1244	0.3130	43.6201	0.93
15	1187+20.830	1188+09.855	0.0169	0.847	0.8466	0.2447	0.6019	50.2126	1.03
Total			0.5068	26.416	26.4155	7.6224	18.7930	52.1255	0.98

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 6. Predicted Crash Frequencies and Rates by Freeway Speed Change Lane (Speed Change)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
2	1161+05.035	1161+05.040	0.0000	0.000	0.0000	0.0000	0.0000	24.4408	0.70
4	1161+05.040	1161+63.210	0.0110	0.269	0.2691	0.0804	0.1887	24.4262	0.70
Total			0.0110	0.269	0.2691	0.0804	0.1888	24.4262	0.70

Note: *Travel Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 7. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1161+05.035	1161+54.855	0.0094	0.589	0.5888	0.1715	0.4173	62.4019	1.80
Tangent	1161+54.855	1164+31.980	0.0525	2.869	2.8692	0.8249	2.0444	54.6664	0.99
Simple Curve 2	1164+31.980	1186+80.313	0.4258	22.045	22.0452	6.3665	15.6787	51.7712	0.97
Tangent	1186+80.313	1188+09.855	0.0245	1.181	1.1813	0.3399	0.8414	48.1507	1.00

Table 8. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	26.68	7.70	28.866	18.98	71.134
Total	26.68	7.70	28.866	18.98	71.134
Average	26.68	7.70	28.866	18.98	71.134

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 9. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0028	0.0058	0.0401	0.0713	0.2985
5	0.0055	0.0112	0.0853	0.1696	0.6820
6	0.0044	0.0090	0.0683	0.1359	0.5356
7	0.0143	0.0297	0.2131	0.3953	1.6089
8	0.0155	0.0326	0.2224	0.3878	1.6262
9	0.0141	0.0298	0.2029	0.3539	1.4836
10	0.0317	0.0669	0.4559	0.7951	3.3305
11	0.0321	0.0677	0.4610	0.8040	3.3615
12	0.0331	0.0699	0.4763	0.8307	3.4615
13	0.0143	0.0302	0.2055	0.3583	1.4897
14	0.0026	0.0054	0.0398	0.0767	0.3130
15	0.0049	0.0101	0.0769	0.1528	0.6019
Total	0.1753	0.3682	2.5475	4.5315	18.7930

Table 10. Predicted Crash Severity by Speed Change Lane (Speed Change)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
2	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.0018	0.0039	0.0269	0.0478	0.1887
Total	0.0018	0.0039	0.0269	0.0478	0.1888

Table 11. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.0	0.17	0.6	0.18	0.7
Highway Segment	Collision with Fixed Object	2.06	7.8	5.37	20.3	7.43	28.1
Highway Segment	Collision with Other Object	0.14	0.6	1.04	3.9	1.19	4.5
Highway Segment	Other Single-vehicle Collision	0.59	2.2	0.80	3.0	1.40	5.3
Highway Segment	Collision with Parked Vehicle	0.04	0.2	0.12	0.5	0.16	0.6
Highway Segment	Total Single Vehicle Crashes	2.85	10.8	7.50	28.4	10.35	39.2
Highway Segment	Right-Angle Collision	0.15	0.6	0.20	0.8	0.35	1.3
Highway Segment	Head-on Collision	0.04	0.1	0.02	0.1	0.06	0.2
Highway Segment	Other Multi-vehicle Collision	0.15	0.6	0.27	1.0	0.42	1.6
Highway Segment	Rear-end Collision	3.58	13.6	7.79	29.5	11.37	43.0
Highway Segment	Sideswipe, Same Direction Collision	0.86	3.3	3.00	11.4	3.86	14.6
Highway Segment	Total Multiple Vehicle Crashes	4.77	18.1	11.29	42.7	16.07	60.8
Highway Segment	Total Highway Segment Crashes	7.62	28.9	18.79	71.1	26.41	100.0
	Total Crashes	7.62	28.9	18.79	71.1	26.41	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 12. Predicted Exit Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.00	0.5	0.00	0.5
Highway Segment	Collision with Fixed Object	0.02	5.9	0.04	14.5	0.06	20.4
Highway Segment	Collision with Other Object	0.00	0.5	0.01	2.1	0.01	2.6
Highway Segment	Other Single-vehicle Collision	0.00	1.5	0.00	1.6	0.01	3.1
Highway Segment	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Total Single Vehicle Crashes	0.02	7.8	0.05	18.7	0.07	26.5
Highway Segment	Right-Angle Collision	0.00	0.3	0.00	0.8	0.00	1.2
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.1	0.00	0.3
Highway Segment	Other Multi-vehicle Collision	0.00	0.5	0.00	1.1	0.00	1.6
Highway Segment	Rear-end Collision	0.04	16.4	0.11	39.6	0.15	56.0
Highway Segment	Sideswipe, Same Direction Collision	0.01	4.7	0.03	9.7	0.04	14.4
Highway Segment	Total Multiple Vehicle Crashes	0.06	22.1	0.14	51.4	0.20	73.5
Highway Segment	Total Highway Segment Crashes	0.08	29.9	0.19	70.1	0.27	100.0
	Total Crashes	0.08	29.9	0.19	70.1	0.27	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 13. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1161+05.035	1161+05.040	Information: for segment #1 (1161+05.035 to 1161+05.040), Effective median width (114.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1161+05.035	1161+05.040	Information: for segment #1 (1161+05.035 to 1161+05.040), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+05.035	1161+05.040	Information: for segment #1 (1161+05.035 to 1161+05.040), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+05.035	1161+05.040	Information: for segment #1 (1161+05.035 to 1161+05.040), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+05.035	1161+05.040	Information: for segment #1 (1161+05.035 to 1161+05.040), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+05.040	1161+63.210	Information: for segment #3 (1161+05.040 to 1161+63.210), Effective median width (115.22 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1161+05.040	1161+63.210	Information: for segment #3 (1161+05.040 to 1161+63.210), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+05.040	1161+63.210	Information: for segment #3 (1161+05.040 to 1161+63.210), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+05.040	1161+63.210	Information: for segment #3 (1161+05.040 to 1161+63.210), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+05.040	1161+63.210	Information: for segment #3 (1161+05.040 to 1161+63.210), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+63.210	1162+39.850	Information: for segment #5 (1161+63.210 to 1162+39.850), Effective median width (118.05 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1161+63.210	1162+39.850	Information: for segment #5 (1161+63.210 to 1162+39.850), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+63.210	1162+39.850	Information: for segment #5 (1161+63.210 to 1162+39.850), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+63.210	1162+39.850	Information: for segment #5 (1161+63.210 to 1162+39.850), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+63.210	1162+39.850	Information: for segment #5 (1161+63.210 to 1162+39.850), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1162+39.850	1163+20.035	Information: for segment #6 (1162+39.850 to 1163+20.035), Effective median width (121.34 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1162+39.850	1163+20.035	Information: for segment #6 (1162+39.850 to 1163+20.035), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1162+39.850	1163+20.035	Information: for segment #6 (1162+39.850 to 1163+20.035), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1162+39.850	1163+20.035	Information: for segment #6 (1162+39.850 to 1163+20.035), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1162+39.850	1163+20.035	Information: for segment #6 (1162+39.850 to 1163+20.035), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1163+20.035	1165+58.035	Information: for segment #7 (1163+20.035 to 1165+58.035), Effective median width (128.02 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1163+20.035	1165+58.035	Information: for segment #7 (1163+20.035 to 1165+58.035), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1163+20.035	1165+58.035	Information: for segment #7 (1163+20.035 to 1165+58.035), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1163+20.035	1165+58.035	Information: for segment #7 (1163+20.035 to 1165+58.035), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1163+20.035	1165+58.035	Information: for segment #7 (1163+20.035 to 1165+58.035), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1165+58.035	1167+96.035	Information: for segment #8 (1165+58.035 to 1167+96.035), Effective median width (138.02 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1165+58.035	1167+96.035	Information: for segment #8 (1165+58.035 to 1167+96.035), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1165+58.035	1167+96.035	Information: for segment #8 (1165+58.035 to 1167+96.035), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1165+58.035	1167+96.035	Information: for segment #8 (1165+58.035 to 1167+96.035), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1165+58.035	1167+96.035	Information: for segment #8 (1165+58.035 to 1167+96.035), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1167+96.035	1170+13.035	Information: for segment #9 (1167+96.035 to 1170+13.035), Effective median width (143.01 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1167+96.035	1170+13.035	Information: for segment #9 (1167+96.035 to 1170+13.035), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1167+96.035	1170+13.035	Information: for segment #9 (1167+96.035 to 1170+13.035), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1167+96.035	1170+13.035	Information: for segment #9 (1167+96.035 to 1170+13.035), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1167+96.035	1170+13.035	Information: for segment #9 (1167+96.035 to 1170+13.035), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1170+13.035	1174+99.035	Information: for segment #10 (1170+13.035 to 1174+99.035), Effective median width (137.99 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1170+13.035	1174+99.035	Information: for segment #10 (1170+13.035 to 1174+99.035), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1170+13.035	1174+99.035	Information: for segment #10 (1170+13.035 to 1174+99.035), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1170+13.035	1174+99.035	Information: for segment #10 (1170+13.035 to 1174+99.035), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1170+13.035	1174+99.035	Information: for segment #10 (1170+13.035 to 1174+99.035), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1174+99.035	1179+85.035	Information: for segment #11 (1174+99.035 to 1179+85.035), Effective median width (127.99 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1174+99.035	1179+85.035	Information: for segment #11 (1174+99.035 to 1179+85.035), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1174+99.035	1179+85.035	Information: for segment #11 (1174+99.035 to 1179+85.035), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1174+99.035	1179+85.035	Information: for segment #11 (1174+99.035 to 1179+85.035), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1174+99.035	1179+85.035	Information: for segment #11 (1174+99.035 to 1179+85.035), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1179+85.035	1184+70.035	Information: for segment #12 (1179+85.035 to 1184+70.035), Effective median width (117.99 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1179+85.035	1184+70.035	Information: for segment #12 (1179+85.035 to 1184+70.035), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1179+85.035	1184+70.035	Information: for segment #12 (1179+85.035 to 1184+70.035), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1179+85.035	1184+70.035	Information: for segment #12 (1179+85.035 to 1184+70.035), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1179+85.035	1184+70.035	Information: for segment #12 (1179+85.035 to 1184+70.035), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1184+70.035	1186+67.880	Information: for segment #13 (1184+70.035 to 1186+67.880), Effective median width (110.96 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1184+70.035	1186+67.880	Information: for segment #13 (1184+70.035 to 1186+67.880), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1184+70.035	1186+67.880	Information: for segment #13 (1184+70.035 to 1186+67.880), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1184+70.035	1186+67.880	Information: for segment #13 (1184+70.035 to 1186+67.880), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1184+70.035	1186+67.880	Information: for segment #13 (1184+70.035 to 1186+67.880), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1186+67.880	1187+20.830	Information: for segment #14 (1186+67.880 to 1187+20.830), Effective median width (108.38 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1186+67.880	1187+20.830	Information: for segment #14 (1186+67.880 to 1187+20.830), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1186+67.880	1187+20.830	Information: for segment #14 (1186+67.880 to 1187+20.830), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1186+67.880	1187+20.830	Information: for segment #14 (1186+67.880 to 1187+20.830), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1186+67.880	1187+20.830	Information: for segment #14 (1186+67.880 to 1187+20.830), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1187+20.830	1188+09.855	Information: for segment #15 (1187+20.830 to 1188+09.855), Effective median width (106.92 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1187+20.830	1188+09.855	Information: for segment #15 (1187+20.830 to 1188+09.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1187+20.830	1188+09.855	Information: for segment #15 (1187+20.830 to 1188+09.855), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1187+20.830	1188+09.855	Information: for segment #15 (1187+20.830 to 1188+09.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1187+20.830	1188+09.855	Information: for segment #15 (1187+20.830 to 1188+09.855), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+05.035	1161+05.040	Information: for segment #2 (1161+05.035 to 1161+05.040), For Speed Change Lane the Effective median width (114.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1161+05.035	1161+05.040	Information: for segment #2 (1161+05.035 to 1161+05.040), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+05.040	1161+63.210	Information: for segment #4 (1161+05.040 to 1161+63.210), For Speed Change Lane the Effective median width (115.22 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1161+05.040	1161+63.210	Information: for segment #4 (1161+05.040 to 1161+63.210), For Speed Change Lane the median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1161+63.210	1162+39.850	Information: for segment #5 (1161+63.210 to 1162+39.850), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1186+67.880	1187+20.830	Information: for segment #14 (1186+67.880 to 1187+20.830), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1187+20.830	1188+09.855	Warning: for segment #15 (1187+20.830 to 1188+09.855), Freeway Segment of type 8F is using unbalanced lane processing with 3 + 5 lanes. While results are provided, the HSM specifies that this approach only applies when the number of lanes varies by no more than one lane between the two travel directions.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 1:56 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 12:47:17 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment CENTRAL3
Highway Comment: Imported from CENTRAL3.xml
Highway Version: 1

Evaluation Title: Section 3
Evaluation Comment: Created Thu Jun 23 12:46:13 CDT 2022

Minimum Location: 1317+43.705
Maximum Location: 1340+47.770

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1317+43.705
Evaluation End Location: 1340+47.770
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_MV=1.0; FI_SV=1.0; PDO_MV=1.0; PDO_SV=1.0;

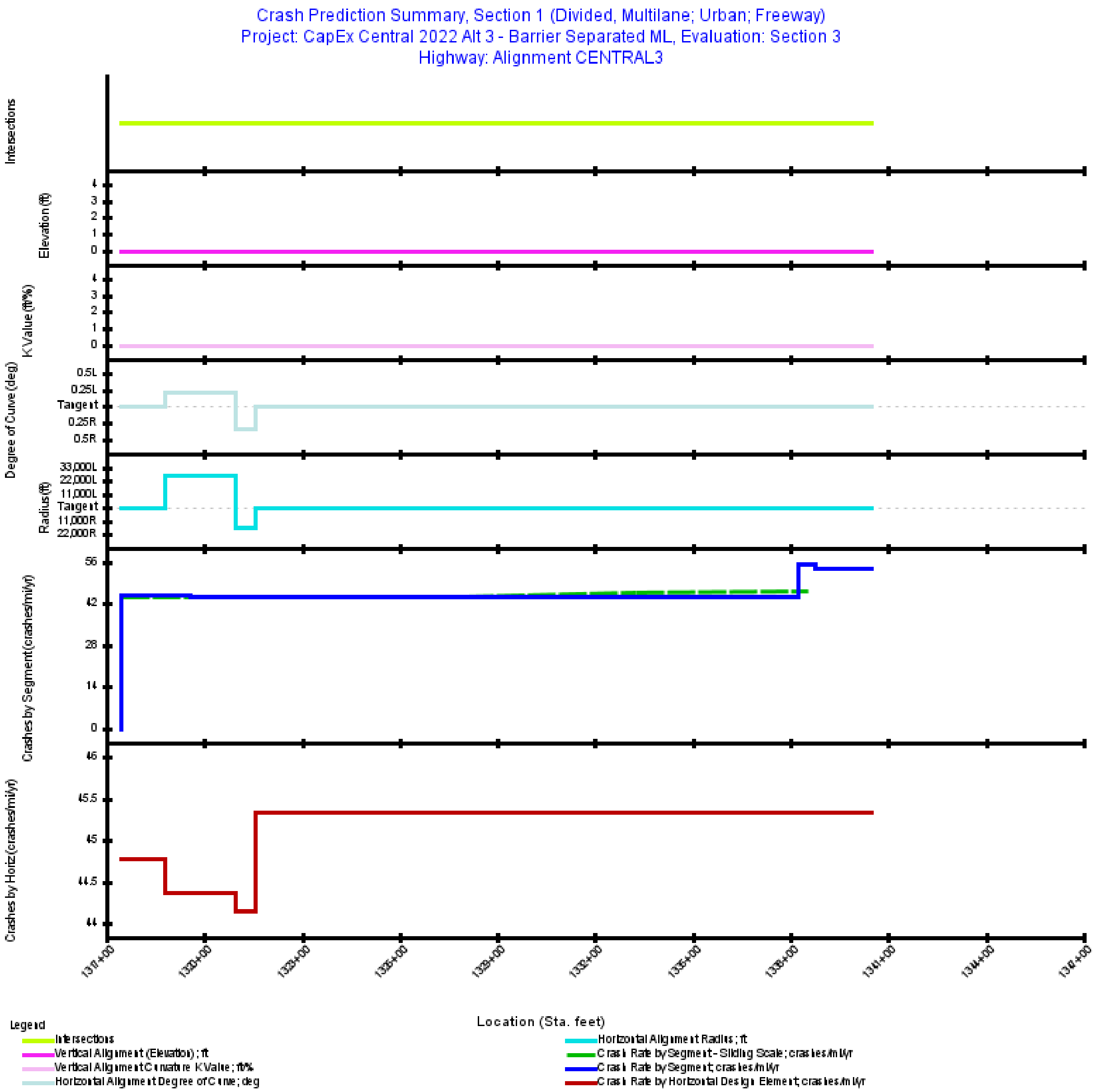

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	Eight-lane Freeway	Urban	1317+43.705	1317+43.710	0.01	0.0000	2030: 143,150	82.00	Non-Traversable Median	102.00
2	Eight-lane Freeway	Urban	1317+43.710	1319+57.705	214.00	0.0405	2030: 143,150	83.50	Non-Traversable Median	103.50
3	Eight-lane Freeway	Urban	1319+57.705	1338+21.560	1,863.86	0.3530	2030: 143,150	89.00	Non-Traversable Median	105.64
4	Nine-lane Freeway	Urban	1338+21.560	1338+76.705	55.14	0.0104	2030: 162,700	85.64	Non-Traversable Median	105.64
5	Nine-lane Freeway	Urban	1338+76.705	1340+47.770	171.07	0.0324	2030: 162,700	83.00	Non-Traversable Median	103.00

Table 2. Predicted Freeway Crash Rates and Frequencies Summary (Section 1)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Effective Length (mi)	**0.4364**
Average Future Road AADT (vpd)	**145,069**
Predicted Crashes	
Total Crashes	**19.71**
Fatal and Injury Crashes	**5.67**
Property-Damage-Only Crashes	**14.04**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**29**
Percent Property-Damage-Only Crashes (%)	**71**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**45.1769**
FI Crash Rate (crashes/mi/yr)	**13.0059**
PDO Crash Rate (crashes/mi/yr)	**32.1711**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**23.11**
Travel Crash Rate (crashes/million veh-mi)	**0.85**
Travel FI Crash Rate (crashes/million veh-mi)	**0.25**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.61**

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 3. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1317+43.705	1317+43.710	0.0000	0.000	0.0000	0.0000	0.0000	0.0000	0.00
2	1317+43.710	1319+57.705	0.0405	1.815	1.8149	0.5236	1.2913	44.7798	0.86
3	1319+57.705	1338+21.560	0.3530	15.583	15.5834	4.4863	11.0971	44.1453	0.84
4	1338+21.560	1338+76.705	0.0104	0.576	0.5758	0.1655	0.4103	55.1279	0.93
5	1338+76.705	1340+47.770	0.0324	1.740	1.7400	0.5001	1.2399	53.7054	0.90
Total			0.4364	19.714	19.7141	5.6754	14.0386	45.1769	0.85

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present. This may create Freeway segments with zero effective length and zero crashes.

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1317+43.705	1318+80.561	0.0259	1.161	1.1606	0.3348	0.8258	44.7782	0.86
Simple Curve 1	1318+80.561	1320+97.540	0.0411	1.823	1.8234	0.5253	1.2981	44.3709	0.85
Simple Curve 2	1320+97.540	1321+56.961	0.0113	0.497	0.4968	0.1430	0.3538	44.1453	0.84
Tangent	1321+56.961	1340+47.770	0.3581	16.233	16.2332	4.6722	11.5610	45.3306	0.85

Table 5. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	19.71	5.67	28.789	14.04	71.211
Total	19.71	5.67	28.789	14.04	71.211
Average	19.71	5.67	28.789	14.04	71.211

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0112	0.0231	0.1689	0.3204	1.2913
3	0.0922	0.1887	1.4205	2.7849	11.0971
4	0.0033	0.0068	0.0520	0.1033	0.4103
5	0.0101	0.0206	0.1571	0.3123	1.2399
Total	0.1169	0.2392	1.7985	3.5209	14.0386

Table 7. Predicted Freeway Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.0	0.12	0.6	0.13	0.7
Highway Segment	Collision with Fixed Object	1.55	7.9	4.08	20.7	5.63	28.6
Highway Segment	Collision with Other Object	0.11	0.6	0.79	4.0	0.90	4.6
Highway Segment	Other Single-vehicle Collision	0.45	2.3	0.61	3.1	1.06	5.4
Highway Segment	Collision with Parked Vehicle	0.03	0.2	0.09	0.5	0.12	0.6
Highway Segment	Total Single Vehicle Crashes	2.14	10.9	5.70	28.9	7.85	39.8
Highway Segment	Right-Angle Collision	0.11	0.6	0.15	0.8	0.26	1.3
Highway Segment	Head-on Collision	0.03	0.1	0.02	0.1	0.04	0.2
Highway Segment	Other Multi-vehicle Collision	0.11	0.6	0.20	1.0	0.31	1.6
Highway Segment	Rear-end Collision	2.65	13.4	5.75	29.2	8.40	42.6
Highway Segment	Sideswipe, Same Direction Collision	0.64	3.2	2.22	11.2	2.85	14.5
Highway Segment	Total Multiple Vehicle Crashes	3.53	17.9	8.34	42.3	11.87	60.2
Highway Segment	Total Highway Segment Crashes	5.67	28.8	14.04	71.2	19.71	100.0
	Total Crashes	5.67	28.8	14.04	71.2	19.71	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1317+43.705	1317+43.710	Information: for segment #1 (1317+43.705 to 1317+43.710), Effective median width (102.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1317+43.705	1317+43.710	Information: for segment #1 (1317+43.705 to 1317+43.710), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1317+43.705	1317+43.710	Information: for segment #1 (1317+43.705 to 1317+43.710), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1317+43.705	1317+43.710	Information: for segment #1 (1317+43.705 to 1317+43.710), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1317+43.705	1317+43.710	Information: for segment #1 (1317+43.705 to 1317+43.710), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1317+43.710	1319+57.705	Information: for segment #2 (1317+43.710 to 1319+57.705), Effective median width (103.50 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1317+43.710	1319+57.705	Information: for segment #2 (1317+43.710 to 1319+57.705), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1317+43.710	1319+57.705	Information: for segment #2 (1317+43.710 to 1319+57.705), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1317+43.710	1319+57.705	Information: for segment #2 (1317+43.710 to 1319+57.705), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1317+43.710	1319+57.705	Information: for segment #2 (1317+43.710 to 1319+57.705), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1319+57.705	1338+21.560	Information: for segment #3 (1319+57.705 to 1338+21.560), Effective median width (105.64 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1319+57.705	1338+21.560	Information: for segment #3 (1319+57.705 to 1338+21.560), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1319+57.705	1338+21.560	Information: for segment #3 (1319+57.705 to 1338+21.560), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1319+57.705	1338+21.560	Information: for segment #3 (1319+57.705 to 1338+21.560), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1319+57.705	1338+21.560	Information: for segment #3 (1319+57.705 to 1338+21.560), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1338+21.560	1338+76.705	Information: for segment #4 (1338+21.560 to 1338+76.705), Effective median width (105.64 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1338+21.560	1338+76.705	Information: for segment #4 (1338+21.560 to 1338+76.705), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1338+21.560	1338+76.705	Information: for segment #4 (1338+21.560 to 1338+76.705), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1338+21.560	1338+76.705	Information: for segment #4 (1338+21.560 to 1338+76.705), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1338+21.560	1338+76.705	Information: for segment #4 (1338+21.560 to 1338+76.705), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1338+76.705	1340+47.770	Information: for segment #5 (1338+76.705 to 1340+47.770), Effective median width (103.00 feet) is greater than specified boundaries (90.00 feet); adjusted in CMF calculations.
1338+76.705	1340+47.770	Information: for segment #5 (1338+76.705 to 1340+47.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1338+76.705	1340+47.770	Information: for segment #5 (1338+76.705 to 1340+47.770), Median barrier distance from edge of inside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1338+76.705	1340+47.770	Information: for segment #5 (1338+76.705 to 1340+47.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1338+76.705	1340+47.770	Information: for segment #5 (1338+76.705 to 1340+47.770), Outside barrier distance from edge of outside shoulder to barrier face (0.00 feet) is less than specified boundaries (0.75 feet); adjusted in CMF calculations.
1338+21.560	1338+76.705	Information: for segment #4 (1338+21.560 to 1338+76.705), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1338+76.705	1340+47.770	Information: for segment #5 (1338+76.705 to 1340+47.770), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:35 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:39:32 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment MLNB13
Highway Comment: Imported from MLNB13.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:39:19 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1080+39.891

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1080+39.891
Functional Class: Freeway C-D Road & System Ramp
Type of Alignment: One Direction
Model Category: C-D Road & System Ramp
Calibration Factor: CD_MV_FI=1.0; CD_MV_PDO=1.0; CD_SV_FI=1.0; CD_SV_PDO=1.0;

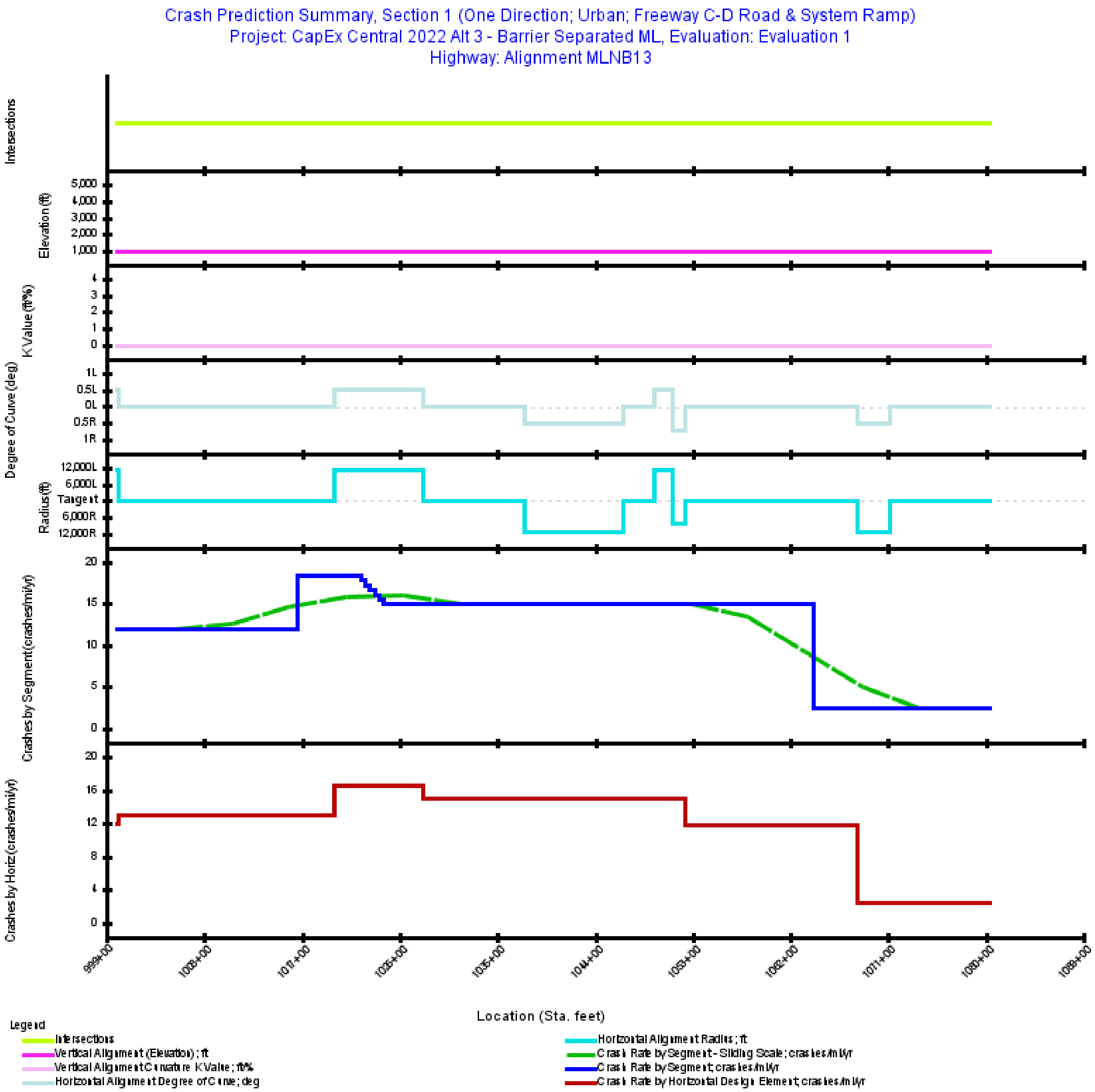

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1000+00.000	1016+65.000	1,665.00	0.3153	2030: 23,100
2	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1016+65.000	1022+38.000	573.00	0.1085	2030: 25,350
3	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1022+38.000	1022+82.000	44.00	0.0083	2030: 25,350
4	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1022+82.000	1023+26.000	44.00	0.0083	2030: 25,350
5	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1023+26.000	1023+70.000	44.00	0.0083	2030: 25,350
6	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1023+70.000	1024+14.000	44.00	0.0083	2030: 25,350
7	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1024+14.000	1024+58.000	44.00	0.0083	2030: 25,350
8	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1024+58.000	1064+10.860	3,952.86	0.7486	2030: 25,350
9	Freeway Ramp and C-D Road One-lane C-D Ramp	Urban	1064+10.860	1080+39.891	1,629.03	0.3085	2030: 8,700

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**1.5227**
Average Future Road AADT (vpd)	**21,510**
Predicted Crashes	
Total Crashes	**18.41**
Fatal and Injury Crashes	**7.19**
Property-Damage-Only Crashes	**11.21**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**39**
Percent Property-Damage-Only Crashes (%)	**61**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**12.0875**
FI Crash Rate (crashes/mi/yr)	**4.7223**
PDO Crash Rate (crashes/mi/yr)	**7.3652**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**11.96**
Travel Crash Rate (crashes/million veh-mi)	**1.54**
Travel FI Crash Rate (crashes/million veh-mi)	**0.60**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.94**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1016+65.000	0.3153	3.743	3.7425	1.4309	2.3116	11.8680	1.41
2	1016+65.000	1022+38.000	0.1085	1.998	1.9980	0.8429	1.1550	18.4105	1.99
3	1022+38.000	1022+82.000	0.0083	0.149	0.1492	0.0622	0.0870	17.9059	1.94
4	1022+82.000	1023+26.000	0.0083	0.144	0.1438	0.0589	0.0848	17.2501	1.86
5	1023+26.000	1023+70.000	0.0083	0.139	0.1385	0.0559	0.0827	16.6214	1.80
6	1023+70.000	1024+14.000	0.0083	0.134	0.1335	0.0529	0.0806	16.0186	1.73
7	1024+14.000	1024+58.000	0.0083	0.129	0.1287	0.0502	0.0785	15.4406	1.67
8	1024+58.000	1064+10.860	0.7486	11.238	11.2375	4.3257	6.9118	15.0103	1.62
9	1064+10.860	1080+39.891	0.3085	0.734	0.7343	0.3111	0.4232	2.3799	0.75
Total			1.5227	18.406	18.4058	7.1907	11.2151	12.0875	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1000+15.734	0.0030	0.035	0.0354	0.0135	0.0218	11.8680	1.41
Tangent	1000+15.734	1019+93.032	0.3745	4.851	4.8509	1.9000	2.9509	12.9534	1.50
Simple Curve 2	1019+93.032	1028+11.537	0.1550	2.553	2.5529	1.0273	1.5255	16.4680	1.78
Tangent	1028+11.537	1037+51.696	0.1781	2.673	2.6727	1.0288	1.6439	15.0103	1.62
Simple Curve 3	1037+51.696	1046+56.296	0.1713	2.572	2.5717	0.9899	1.5817	15.0103	1.62
Tangent	1046+56.296	1049+48.779	0.0554	0.832	0.8315	0.3201	0.5114	15.0103	1.62
Simple Curve 4	1049+48.779	1051+08.995	0.0303	0.456	0.4555	0.1753	0.2801	15.0103	1.62
Simple Curve 5	1051+08.995	1052+25.909	0.0221	0.332	0.3324	0.1279	0.2044	15.0103	1.62
Tangent	1052+25.909	1068+09.641	0.2999	3.548	3.5484	1.3729	2.1755	11.8300	1.40
Simple Curve 6	1068+09.641	1071+08.357	0.0566	0.135	0.1346	0.0570	0.0776	2.3799	0.75
Tangent	1071+08.357	1080+39.891	0.1764	0.420	0.4199	0.1779	0.2420	2.3799	0.75

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	18.41	7.19	39.068	11.21	60.932
Total	18.41	7.19	39.068	11.21	60.932
Average	18.41	7.19	39.068	11.21	60.932

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0209	0.0634	0.3452	1.0014	2.3116
2	0.0123	0.0374	0.2034	0.5899	1.1550
3	0.0009	0.0028	0.0150	0.0435	0.0870
4	0.0009	0.0026	0.0142	0.0412	0.0848
5	0.0008	0.0025	0.0135	0.0391	0.0827
6	0.0008	0.0023	0.0128	0.0370	0.0806
7	0.0007	0.0022	0.0121	0.0351	0.0785
8	0.0632	0.1918	1.0435	3.0271	6.9118
9	0.0050	0.0151	0.1011	0.1899	0.4232
Total	0.1056	0.3201	1.7608	5.0043	11.2151

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.0	0.04	0.2	0.05	0.2
Highway Segment	Collision with Fixed Object	1.03	5.6	1.31	7.1	2.35	12.7
Highway Segment	Collision with Other Object	0.07	0.4	0.26	1.4	0.33	1.8
Highway Segment	Other Single-vehicle Collision	0.30	1.6	0.20	1.1	0.49	2.7
Highway Segment	Collision with Parked Vehicle	0.02	0.1	0.03	0.2	0.05	0.3
Highway Segment	Total Single Vehicle Crashes	1.43	7.8	1.83	10.0	3.26	17.7
Highway Segment	Right-Angle Collision	0.18	1.0	0.17	0.9	0.35	1.9
Highway Segment	Head-on Collision	0.05	0.2	0.02	0.1	0.07	0.4
Highway Segment	Other Multi-vehicle Collision	0.18	1.0	0.23	1.2	0.40	2.2
Highway Segment	Rear-end Collision	4.32	23.5	6.47	35.2	10.79	58.6
Highway Segment	Sideswipe, Same Direction Collision	1.04	5.6	2.50	13.6	3.53	19.2
Highway Segment	Total Multiple Vehicle Crashes	5.76	31.3	9.38	51.0	15.14	82.3
Highway Segment	Total Highway Segment Crashes	7.19	39.1	11.21	60.9	18.41	100.0
	Total Crashes	7.19	39.1	11.21	60.9	18.41	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:39:56 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment MLNB23
Highway Comment: Imported from MLNB23.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:39:45 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1029+90.344

Policy for Superelevation: AASHTO 2011 U.S. Customary
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Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

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Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1029+90.344
Functional Class: Freeway C-D Road & System Ramp
Type of Alignment: One Direction
Model Category: C-D Road & System Ramp
Calibration Factor: CD_MV_FI=1.0; CD_MV_PDO=1.0; CD_SV_FI=1.0; CD_SV_PDO=1.0;

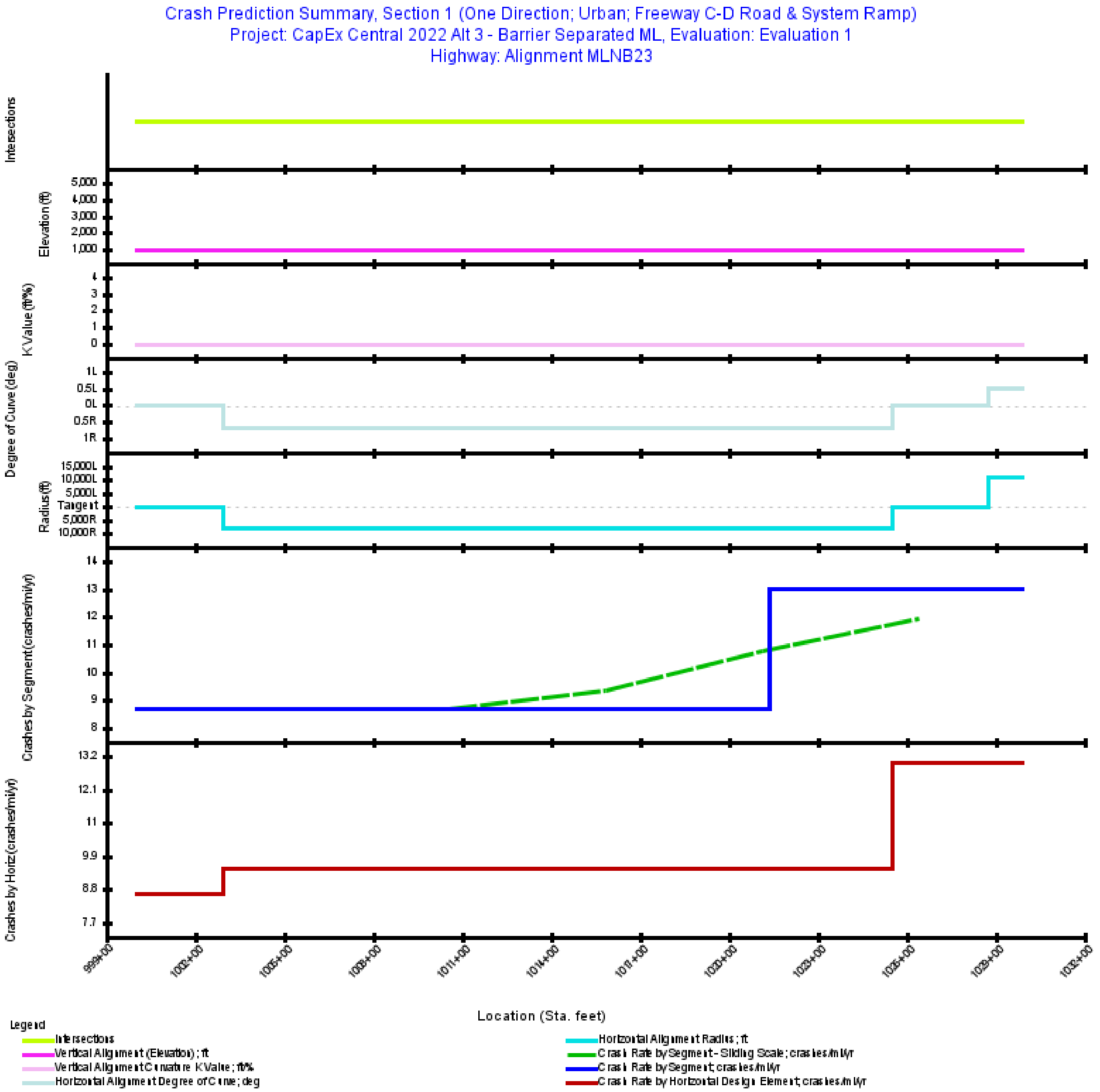

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1000+00.000	1021+33.890	2,133.89	0.4041	2030: 17,000
2	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1021+33.890	1029+90.344	856.45	0.1622	2030: 23,100

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.5664**
Average Future Road AADT (vpd)	**18,747**
Predicted Crashes	
Total Crashes	**5.62**
Fatal and Injury Crashes	**1.94**
Property-Damage-Only Crashes	**3.67**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**35**
Percent Property-Damage-Only Crashes (%)	**65**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**9.9143**
FI Crash Rate (crashes/mi/yr)	**3.4301**
PDO Crash Rate (crashes/mi/yr)	**6.4842**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**3.88**
Travel Crash Rate (crashes/million veh-mi)	**1.45**
Travel FI Crash Rate (crashes/million veh-mi)	**0.50**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.95**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1021+33.890	0.4041	3.505	3.5053	1.1690	2.3363	8.6732	1.40
2	1021+33.890	1029+90.344	0.1622	2.110	2.1097	0.7736	1.3361	13.0064	1.54
Total			0.5664	5.615	5.6150	1.9426	3.6724	9.9143	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1002+91.126	0.0551	0.478	0.4782	0.1595	0.3187	8.6732	1.40
Simple Curve 1	1002+91.126	1025+52.341	0.4283	4.058	4.0578	1.3875	2.6703	9.4751	1.43
Tangent	1025+52.341	1028+71.574	0.0605	0.786	0.7864	0.2884	0.4980	13.0064	1.54
Simple Curve 2	1028+71.574	1029+90.344	0.0225	0.293	0.2926	0.1073	0.1853	13.0064	1.54

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.62	1.94	34.597	3.67	65.403
Total	5.62	1.94	34.597	3.67	65.403
Average	5.62	1.94	34.597	3.67	65.403

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0171	0.0518	0.2820	0.8181	2.3363
2	0.0113	0.0343	0.1866	0.5414	1.3361
Total	0.0284	0.0861	0.4686	1.3595	3.6724

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.01	0.3	0.02	0.3
Highway Segment	Collision with Fixed Object	0.34	6.1	0.47	8.3	0.81	14.4
Highway Segment	Collision with Other Object	0.02	0.4	0.09	1.6	0.12	2.0
Highway Segment	Other Single-vehicle Collision	0.10	1.7	0.07	1.2	0.17	3.0
Highway Segment	Collision with Parked Vehicle	0.01	0.1	0.01	0.2	0.02	0.3
Highway Segment	Total Single Vehicle Crashes	0.47	8.4	0.65	11.6	1.12	20.0
Highway Segment	Right-Angle Collision	0.05	0.8	0.05	1.0	0.10	1.8
Highway Segment	Head-on Collision	0.01	0.2	0.01	0.1	0.02	0.3
Highway Segment	Other Multi-vehicle Collision	0.05	0.8	0.07	1.3	0.12	2.1
Highway Segment	Rear-end Collision	1.10	19.7	2.08	37.1	3.19	56.8
Highway Segment	Sideswipe, Same Direction Collision	0.27	4.7	0.80	14.3	1.07	19.0
Highway Segment	Total Multiple Vehicle Crashes	1.47	26.2	3.02	53.8	4.49	80.0
Highway Segment	Total Highway Segment Crashes	1.94	34.6	3.67	65.4	5.62	100.0
	Total Crashes	1.94	34.6	3.67	65.4	5.62	100.0

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Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:36 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Fri Jul 22 16:26:00 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment MLNB33
Highway Comment: Imported from MLNB33.xml
Highway Version: 1

Evaluation Title: 20220722
Evaluation Comment: Created Fri Jul 22 16:25:42 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1023+12.601

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
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- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1023+12.601
Functional Class: Freeway C-D Road & System Ramp
Type of Alignment: One Direction
Model Category: C-D Road & System Ramp
Calibration Factor: CD_MV_FI=1.0; CD_MV_PDO=1.0; CD_SV_FI=1.0; CD_SV_PDO=1.0;

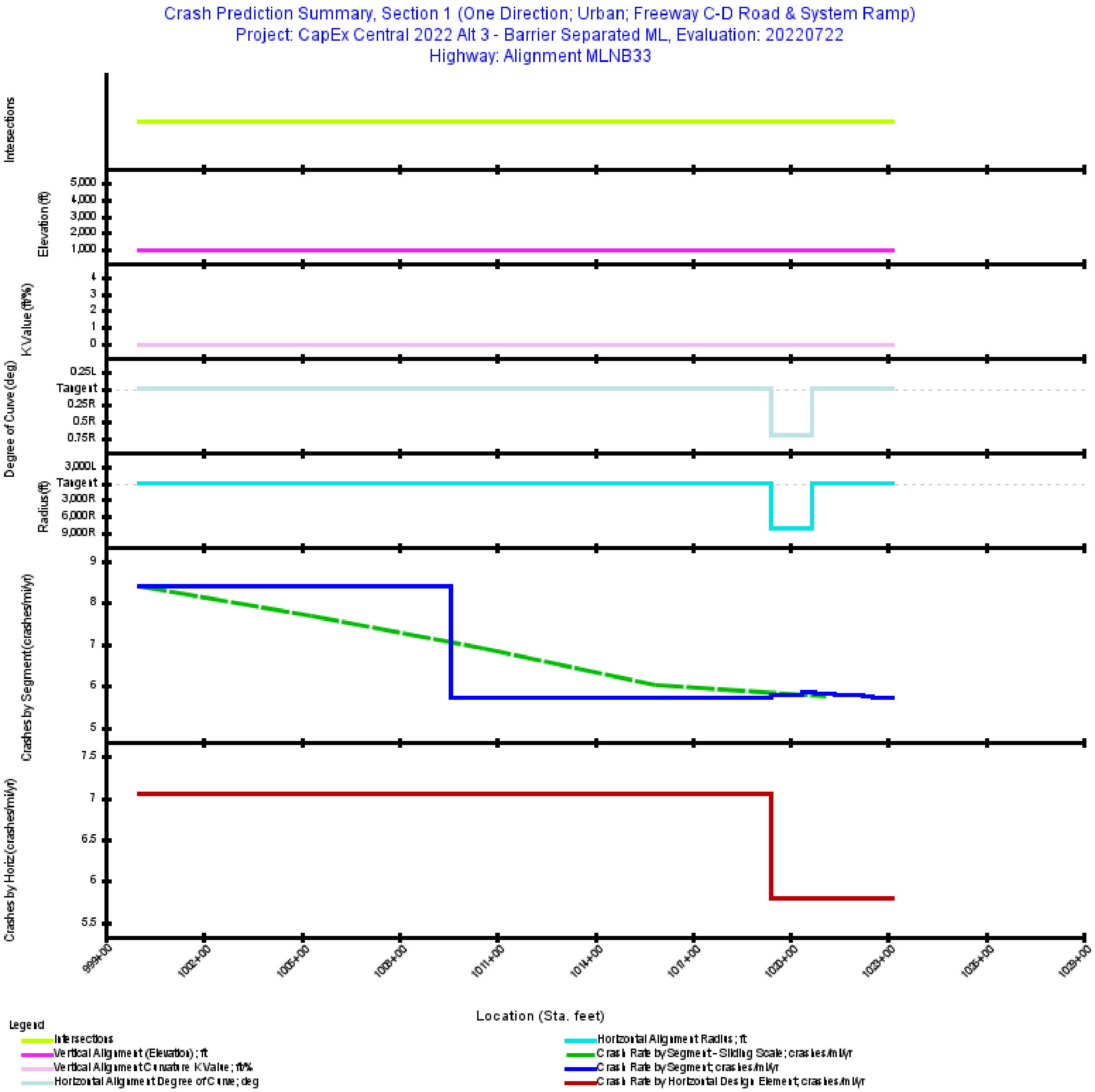

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1000+00.000	1009+56.860	956.86	0.1812	2030: 16,250
2	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1009+56.860	1019+43.210	986.35	0.1868	2030: 12,000
3	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1019+43.210	1020+36.000	92.79	0.0176	2030: 12,000
4	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1020+36.000	1020+73.660	37.66	0.0071	2030: 12,000
5	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1020+73.660	1021+34.000	60.34	0.0114	2030: 12,000
6	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1021+34.000	1022+21.000	87.00	0.0165	2030: 12,000
7	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1022+21.000	1022+53.000	32.00	0.0061	2030: 12,000
8	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1022+53.000	1023+12.601	59.60	0.0113	2030: 12,000

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.4380**
Average Future Road AADT (vpd)	**13,758**
Predicted Crashes	
Total Crashes	**3.00**
Fatal and Injury Crashes	**1.01**
Property-Damage-Only Crashes	**1.99**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**34**
Percent Property-Damage-Only Crashes (%)	**66**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**6.8499**
FI Crash Rate (crashes/mi/yr)	**2.3057**
PDO Crash Rate (crashes/mi/yr)	**4.5442**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.20**
Travel Crash Rate (crashes/million veh-mi)	**1.36**
Travel FI Crash Rate (crashes/million veh-mi)	**0.46**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.91**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1009+56.860	0.1812	1.527	1.5266	0.5341	0.9925	8.4237	1.42
2	1009+56.860	1019+43.210	0.1868	1.068	1.0682	0.3442	0.7240	5.7182	1.31
3	1019+43.210	1020+36.000	0.0176	0.102	0.1017	0.0329	0.0687	5.7858	1.32
4	1020+36.000	1020+73.660	0.0071	0.042	0.0418	0.0136	0.0281	5.8547	1.34
5	1020+73.660	1021+34.000	0.0114	0.067	0.0668	0.0218	0.0450	5.8429	1.33
6	1021+34.000	1022+21.000	0.0165	0.096	0.0955	0.0310	0.0645	5.7985	1.32
7	1022+21.000	1022+53.000	0.0061	0.035	0.0349	0.0113	0.0236	5.7630	1.32
8	1022+53.000	1023+12.601	0.0113	0.065	0.0647	0.0209	0.0438	5.7358	1.31
Total			0.4380	3.000	3.0002	1.0099	1.9903	6.8499	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1019+43.207	0.3680	2.595	2.5948	0.8783	1.7164	7.0504	1.36
Simple Curve 1	1019+43.207	1020+66.965	0.0234	0.136	0.1360	0.0441	0.0919	5.8030	1.32
Tangent	1020+66.965	1023+12.601	0.0465	0.269	0.2694	0.0874	0.1820	5.7911	1.32

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	3.00	1.01	33.660	1.99	66.340
Total	3.00	1.01	33.660	1.99	66.340
Average	3.00	1.01	33.660	1.99	66.340

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0078	0.0237	0.1288	0.3738	0.9925
2	0.0050	0.0153	0.0830	0.2409	0.7240
3	0.0005	0.0015	0.0079	0.0230	0.0687
4	0.0002	0.0006	0.0033	0.0095	0.0281
5	0.0003	0.0010	0.0053	0.0152	0.0450
6	0.0005	0.0014	0.0075	0.0217	0.0645
7	0.0002	0.0005	0.0027	0.0079	0.0236
8	0.0003	0.0009	0.0050	0.0146	0.0438
Total	0.0148	0.0448	0.2436	0.7067	1.9903

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.01	0.3	0.01	0.3
Highway Segment	Collision with Fixed Object	0.21	7.0	0.29	9.7	0.50	16.7
Highway Segment	Collision with Other Object	0.01	0.5	0.06	1.9	0.07	2.4
Highway Segment	Other Single-vehicle Collision	0.06	2.0	0.04	1.4	0.10	3.5
Highway Segment	Collision with Parked Vehicle	0.00	0.1	0.01	0.2	0.01	0.4
Highway Segment	Total Single Vehicle Crashes	0.29	9.7	0.41	13.5	0.70	23.2
Highway Segment	Right-Angle Collision	0.02	0.7	0.03	0.9	0.05	1.7
Highway Segment	Head-on Collision	0.01	0.2	0.00	0.1	0.01	0.3
Highway Segment	Other Multi-vehicle Collision	0.02	0.7	0.04	1.3	0.06	2.0
Highway Segment	Rear-end Collision	0.54	18.0	1.09	36.4	1.63	54.4
Highway Segment	Sideswipe, Same Direction Collision	0.13	4.3	0.42	14.0	0.55	18.4
Highway Segment	Total Multiple Vehicle Crashes	0.72	24.0	1.58	52.8	2.30	76.8
Highway Segment	Total Highway Segment Crashes	1.01	33.7	1.99	66.3	3.00	100.0
	Total Crashes	1.01	33.7	1.99	66.3	3.00	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

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Evaluation Date: Fri Jul 22 16:24:11 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment MLSB13
Highway Comment: Imported from MLSB13.xml
Highway Version: 1

Evaluation Title: 20220722
Evaluation Comment: Created Fri Jul 22 16:18:54 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1082+76.220

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1082+76.220
Functional Class: Freeway C-D Road & System Ramp
Type of Alignment: One Direction
Model Category: C-D Road & System Ramp
Calibration Factor: CD_MV_FI=1.0; CD_MV_PDO=1.0; CD_SV_FI=1.0; CD_SV_PDO=1.0;

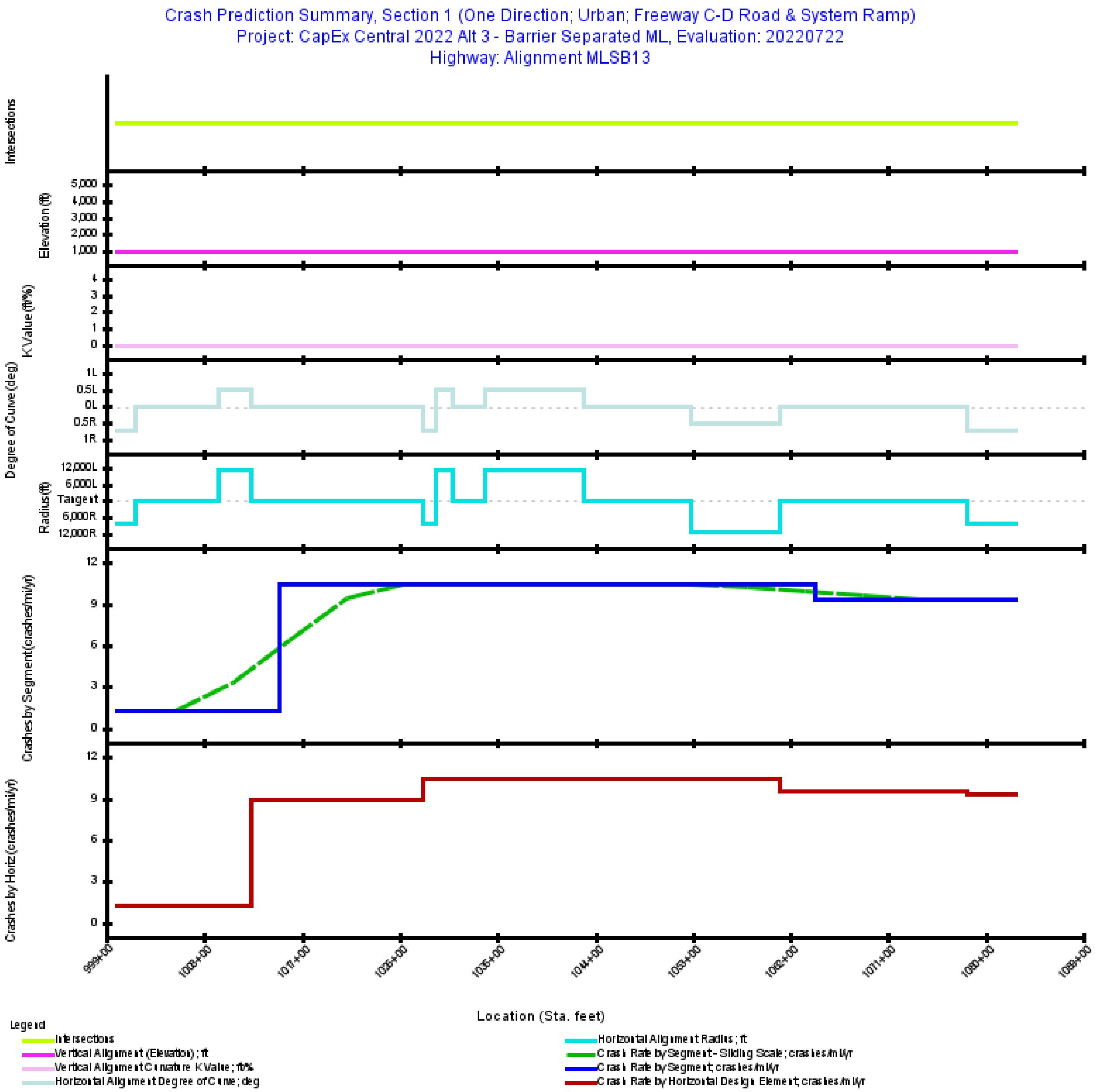

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane C-D Ramp	Urban	1000+00.000	1014+90.710	1,490.71	0.2823	2030: 4,300
2	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1014+90.710	1064+24.070	4,933.36	0.9343	2030: 19,500
3	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1064+24.070	1082+76.220	1,852.15	0.3508	2030: 18,050

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**1.5675**
Average Future Road AADT (vpd)	**16,438**
Predicted Crashes	
Total Crashes	**13.32**
Fatal and Injury Crashes	**4.65**
Property-Damage-Only Crashes	**8.68**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**35**
Percent Property-Damage-Only Crashes (%)	**65**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**8.5006**
FI Crash Rate (crashes/mi/yr)	**2.9663**
PDO Crash Rate (crashes/mi/yr)	**5.5343**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**9.40**
Travel Crash Rate (crashes/million veh-mi)	**1.42**
Travel FI Crash Rate (crashes/million veh-mi)	**0.49**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.92**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1014+90.710	0.2823	0.346	0.3462	0.1580	0.1882	1.2261	0.78
2	1014+90.710	1064+24.070	0.9343	9.702	9.7023	3.3850	6.3173	10.3840	1.46
3	1064+24.070	1082+76.220	0.3508	3.276	3.2759	1.1066	2.1693	9.3387	1.42
Total			1.5675	13.324	13.3243	4.6496	8.6748	8.5006	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+67.810	0.0318	0.039	0.0390	0.0178	0.0212	1.2261	0.78
Tangent	1001+67.810	1009+31.886	0.1447	0.177	0.1774	0.0810	0.0965	1.2261	0.78
Simple Curve 2	1009+31.886	1012+30.871	0.0566	0.069	0.0694	0.0317	0.0377	1.2261	0.78
Tangent	1012+30.871	1028+14.603	0.2999	2.664	2.6640	0.9359	1.7281	8.8815	1.35
Simple Curve 3	1028+14.603	1029+31.518	0.0221	0.230	0.2299	0.0802	0.1497	10.3840	1.46
Simple Curve 4	1029+31.518	1030+91.734	0.0303	0.315	0.3151	0.1099	0.2052	10.3840	1.46
Tangent	1030+91.734	1033+84.217	0.0554	0.575	0.5752	0.2007	0.3745	10.3840	1.46
Simple Curve 5	1033+84.217	1042+89.958	0.1715	1.781	1.7813	0.6215	1.1598	10.3840	1.46
Tangent	1042+89.958	1052+83.895	0.1882	1.955	1.9547	0.6820	1.2728	10.3840	1.46
Simple Curve 6	1052+83.895	1061+02.400	0.1550	1.610	1.6097	0.5616	1.0481	10.3840	1.46
Tangent	1061+02.400	1078+34.956	0.3281	3.128	3.1280	1.0637	2.0644	9.5328	1.43
Simple Curve 7	1078+34.956	1082+76.220	0.0836	0.780	0.7805	0.2636	0.5168	9.3387	1.42

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	13.32	4.65	34.895	8.68	65.105
Total	13.32	4.65	34.895	8.68	65.105
Average	13.32	4.65	34.895	8.68	65.105

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0025	0.0077	0.0514	0.0964	0.1882
2	0.0495	0.1501	0.8166	2.3688	6.3173
3	0.0162	0.0491	0.2670	0.7744	2.1693
Total	0.0682	0.2068	1.1349	3.2397	8.6748

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.0	0.04	0.3	0.04	0.3
Highway Segment	Collision with Fixed Object	0.84	6.3	1.13	8.5	1.98	14.8
Highway Segment	Collision with Other Object	0.06	0.4	0.22	1.7	0.28	2.1
Highway Segment	Other Single-vehicle Collision	0.24	1.8	0.17	1.3	0.41	3.1
Highway Segment	Collision with Parked Vehicle	0.02	0.1	0.03	0.2	0.04	0.3
Highway Segment	Total Single Vehicle Crashes	1.17	8.8	1.58	11.9	2.75	20.6
Highway Segment	Right-Angle Collision	0.11	0.8	0.13	1.0	0.24	1.8
Highway Segment	Head-on Collision	0.03	0.2	0.01	0.1	0.04	0.3
Highway Segment	Other Multi-vehicle Collision	0.11	0.8	0.17	1.3	0.28	2.1
Highway Segment	Rear-end Collision	2.61	19.6	4.89	36.7	7.50	56.3
Highway Segment	Sideswipe, Same Direction Collision	0.63	4.7	1.89	14.2	2.51	18.9
Highway Segment	Total Multiple Vehicle Crashes	3.48	26.1	7.09	53.2	10.57	79.4
Highway Segment	Total Highway Segment Crashes	4.65	34.9	8.68	65.1	13.32	100.0
	Total Crashes	4.65	34.9	8.68	65.1	13.32	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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This software product is provided "as-is," without warranty of any kind-either expressed or implied (but not limited to the implied warranties of merchantability and fitness for a particular purpose). The FHWA do not warrant that the functions contained in the software will meet the end-user's requirements or that the operation of the software will be uninterrupted and error-free.

Under no circumstances will the FHWA be liable to the end-user for any damages or claimed lost profits, lost savings, or other incidental or consequential damages rising out of the use or inability to use the software (even if these organizations have been advised of the possibility of such damages), or for any claim by any other party.

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The use of the IHSDM software is being done strictly on a voluntary basis. In exchange for provision of IHSDM, the user agrees that the Federal Highway Administration (FHWA), U.S. Department of Transportation and any other agency of the Federal Government shall not be responsible for any errors, damage or other liability that may result from any and all use of the software, including installation and testing of the software. The user further agrees to hold the FHWA and the Federal Government harmless from any resulting liability. The user agrees that this hold harmless provision shall flow to any person to whom or any entity to which the user provides the IHSDM software. It is the user's full responsibility to inform any person to whom or any entity to which it provides the IHSDM software of this hold harmless provision.

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Report Overview

Report Generated: Aug 25, 2022 2:37 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:47:33 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment MLSB23
Highway Comment: Imported from MLSB23.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:47:24 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1024+19.377

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1024+19.377
Functional Class: Freeway C-D Road & System Ramp
Type of Alignment: One Direction
Model Category: C-D Road & System Ramp
Calibration Factor: CD_MV_FI=1.0; CD_MV_PDO=1.0; CD_SV_FI=1.0; CD_SV_PDO=1.0;

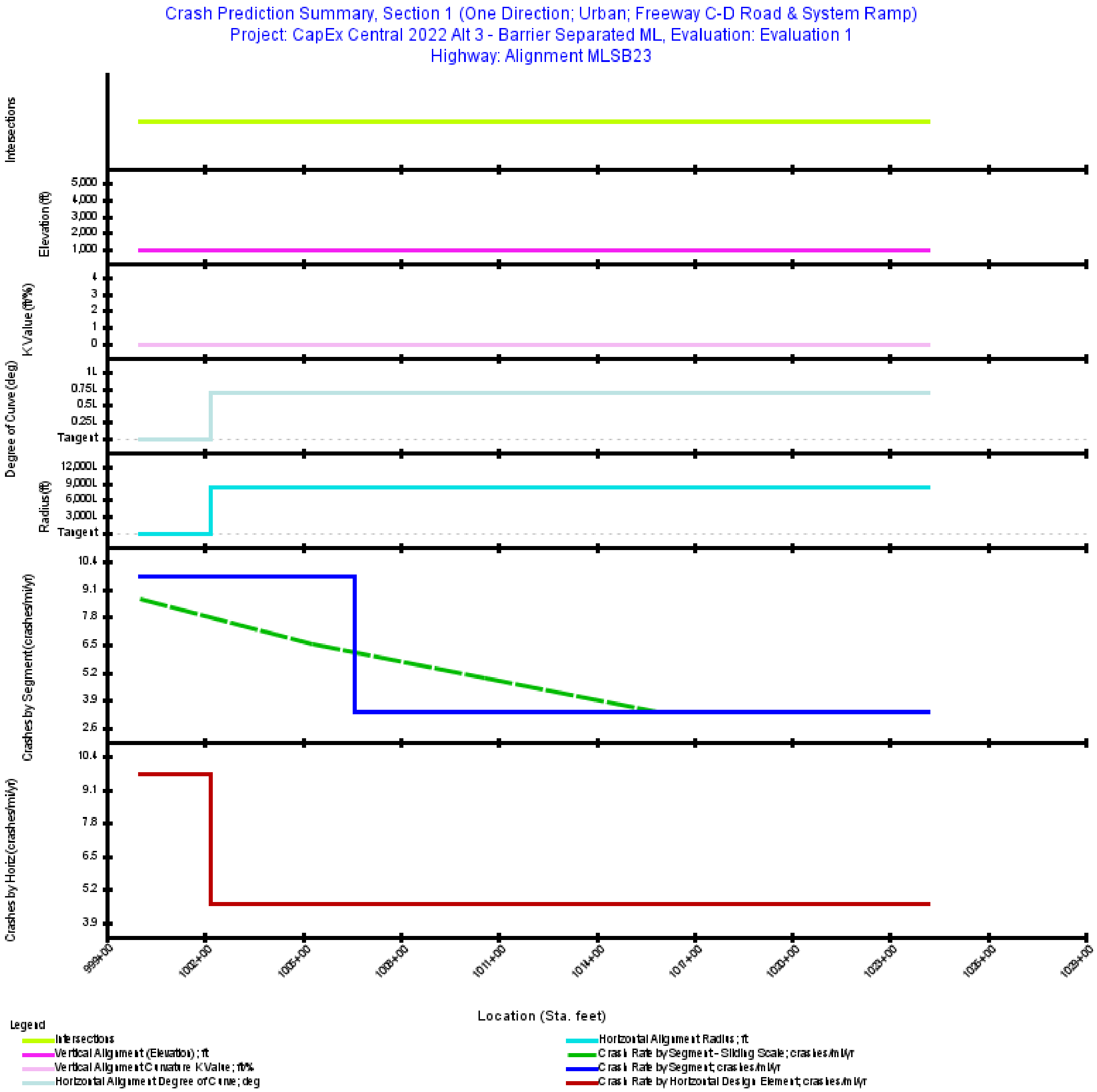

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1000+00.000	1006+60.210	660.21	0.1250	2030: 18,050
2	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1006+60.210	1024+19.377	1,759.17	0.3332	2030: 7,400

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.4582**
Average Future Road AADT (vpd)	**10,306**
Predicted Crashes	
Total Crashes	**2.35**
Fatal and Injury Crashes	**0.82**
Property-Damage-Only Crashes	**1.53**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**35**
Percent Property-Damage-Only Crashes (%)	**65**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.1230**
FI Crash Rate (crashes/mi/yr)	**1.7876**
PDO Crash Rate (crashes/mi/yr)	**3.3354**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.72**
Travel Crash Rate (crashes/million veh-mi)	**1.36**
Travel FI Crash Rate (crashes/million veh-mi)	**0.47**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.89**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1006+60.210	0.1250	1.218	1.2175	0.4434	0.7741	9.7370	1.48
2	1006+60.210	1024+19.377	0.3332	1.130	1.1299	0.3757	0.7542	3.3913	1.26
Total			0.4582	2.347	2.3474	0.8191	1.5283	5.1230	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1002+16.177	0.0409	0.399	0.3987	0.1452	0.2535	9.7370	1.48
Simple Curve 1	1002+16.177	1024+19.377	0.4173	1.949	1.9488	0.6739	1.2748	4.6702	1.30

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.35	0.82	34.894	1.53	65.106
Total	2.35	0.82	34.894	1.53	65.106
Average	2.35	0.82	34.894	1.53	65.106

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0065	0.0197	0.1070	0.3103	0.7741
2	0.0055	0.0167	0.0906	0.2629	0.7542
Total	0.0120	0.0363	0.1976	0.5732	1.5283

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	0.01	0.3	0.01	0.4
Highway Segment	Collision with Fixed Object	0.18	7.5	0.25	10.5	0.42	18.0
Highway Segment	Collision with Other Object	0.01	0.5	0.05	2.0	0.06	2.6
Highway Segment	Other Single-vehicle Collision	0.05	2.2	0.04	1.6	0.09	3.7
Highway Segment	Collision with Parked Vehicle	0.00	0.2	0.01	0.2	0.01	0.4
Highway Segment	Total Single Vehicle Crashes	0.24	10.4	0.34	14.6	0.59	25.0
Highway Segment	Right-Angle Collision	0.02	0.8	0.02	0.9	0.04	1.7
Highway Segment	Head-on Collision	0.01	0.2	0.00	0.1	0.01	0.3
Highway Segment	Other Multi-vehicle Collision	0.02	0.8	0.03	1.2	0.05	2.0
Highway Segment	Rear-end Collision	0.43	18.4	0.82	34.8	1.25	53.2
Highway Segment	Sideswipe, Same Direction Collision	0.10	4.4	0.32	13.4	0.42	17.8
Highway Segment	Total Multiple Vehicle Crashes	0.57	24.5	1.18	50.5	1.76	75.0
Highway Segment	Total Highway Segment Crashes	0.82	34.9	1.53	65.1	2.35	100.0
	Total Crashes	0.82	34.9	1.53	65.1	2.35	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:37 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:48:07 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment MLSB33
Highway Comment: Imported from MLSB33.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:47:57 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1022+95.560

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1022+95.560
Functional Class: Freeway C-D Road & System Ramp
Type of Alignment: One Direction
Model Category: C-D Road & System Ramp
Calibration Factor: CD_MV_FI=1.0; CD_MV_PDO=1.0; CD_SV_FI=1.0; CD_SV_PDO=1.0;

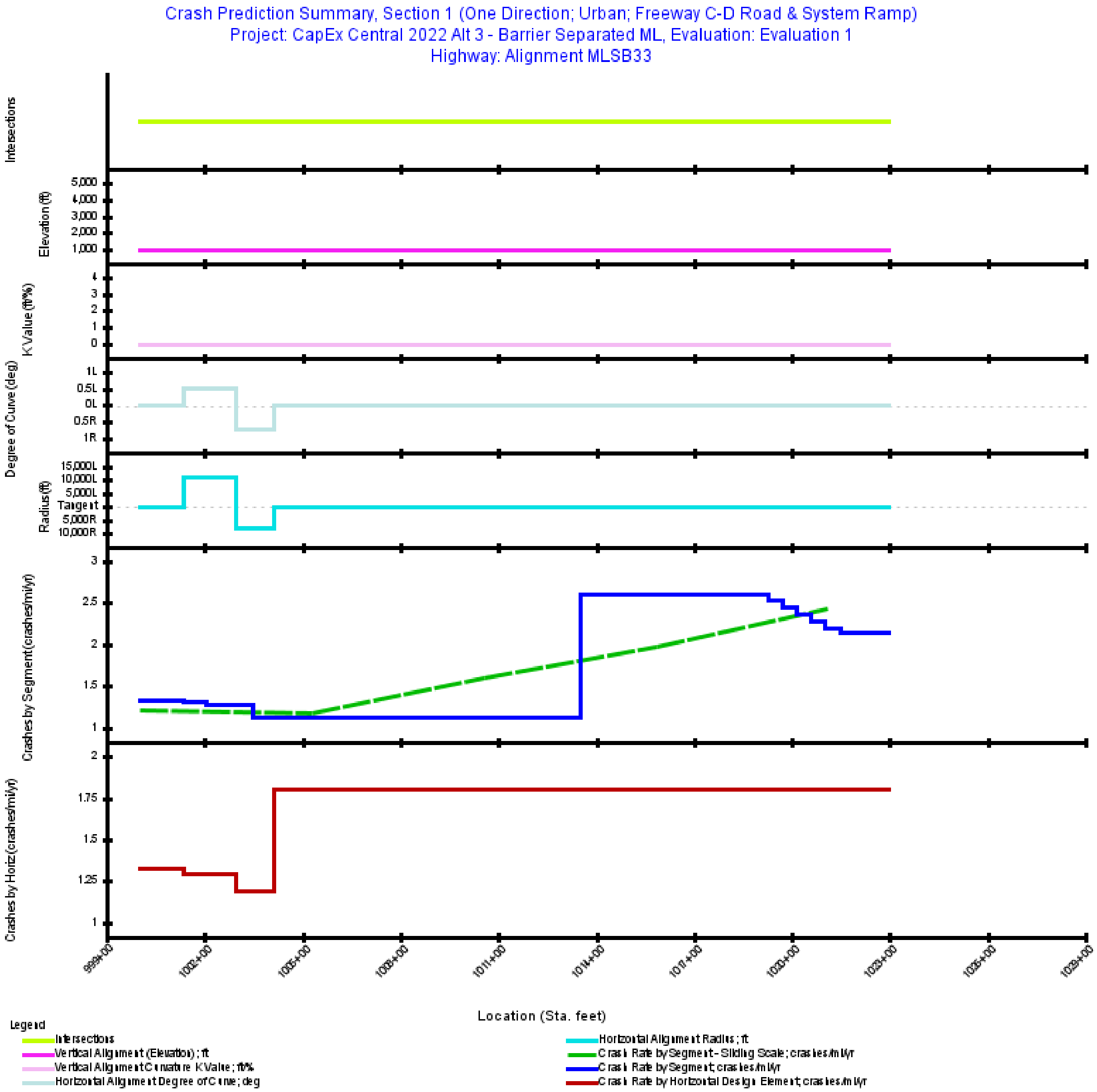

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1000+00.000	1001+37.800	137.80	0.0261	2030: 2,600
2	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1001+37.800	1002+07.000	69.20	0.0131	2030: 2,600
3	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1002+07.000	1003+46.000	139.00	0.0263	2030: 2,600
4	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1003+46.000	1013+54.000	1,008.00	0.1909	2030: 2,600
5	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1013+54.000	1019+27.000	573.00	0.1085	2030: 4,650
6	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1019+27.000	1019+71.000	44.00	0.0083	2030: 4,650
7	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1019+71.000	1020+15.000	44.00	0.0083	2030: 4,650
8	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1020+15.000	1020+59.000	44.00	0.0083	2030: 4,650
9	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1020+59.000	1021+03.000	44.00	0.0083	2030: 4,650
10	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1021+03.000	1021+47.000	44.00	0.0083	2030: 4,650
11	Freeway Ramp and C-D Road Two-lane C-D Ramp	Urban	1021+47.000	1022+95.560	148.56	0.0281	2030: 4,650

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.4348**
Average Future Road AADT (vpd)	**3,441**
Predicted Crashes	
Total Crashes	**0.74**
Fatal and Injury Crashes	**0.29**
Property-Damage-Only Crashes	**0.45**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**40**
Percent Property-Damage-Only Crashes (%)	**60**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**1.7084**
FI Crash Rate (crashes/mi/yr)	**0.6791**
PDO Crash Rate (crashes/mi/yr)	**1.0293**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.55**
Travel Crash Rate (crashes/million veh-mi)	**1.36**
Travel FI Crash Rate (crashes/million veh-mi)	**0.54**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.82**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1001+37.800	0.0261	0.035	0.0345	0.0142	0.0203	1.3227	1.39
2	1001+37.800	1002+07.000	0.0131	0.017	0.0172	0.0071	0.0101	1.3131	1.38
3	1002+07.000	1003+46.000	0.0263	0.034	0.0336	0.0136	0.0200	1.2775	1.35
4	1003+46.000	1013+54.000	0.1909	0.216	0.2157	0.0898	0.1259	1.1297	1.19
5	1013+54.000	1019+27.000	0.1085	0.283	0.2832	0.1118	0.1714	2.6096	1.54
6	1019+27.000	1019+71.000	0.0083	0.021	0.0211	0.0082	0.0129	2.5376	1.50
7	1019+71.000	1020+15.000	0.0083	0.020	0.0204	0.0078	0.0126	2.4464	1.44
8	1020+15.000	1020+59.000	0.0083	0.020	0.0197	0.0074	0.0123	2.3590	1.39
9	1020+59.000	1021+03.000	0.0083	0.019	0.0190	0.0070	0.0119	2.2750	1.34
10	1021+03.000	1021+47.000	0.0083	0.018	0.0183	0.0067	0.0116	2.1945	1.29
11	1021+47.000	1022+95.560	0.0281	0.060	0.0601	0.0216	0.0385	2.1363	1.26
Total			0.4348	0.743	0.7428	0.2952	0.4475	1.7084	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1001+37.797	0.0261	0.035	0.0345	0.0142	0.0203	1.3227	1.39
Simple Curve 1	1001+37.797	1002+97.026	0.0302	0.039	0.0390	0.0159	0.0231	1.2930	1.36
Simple Curve 2	1002+97.026	1004+14.234	0.0222	0.026	0.0264	0.0109	0.0156	1.1914	1.25
Tangent	1004+14.234	1022+95.560	0.3563	0.643	0.6428	0.2543	0.3886	1.8041	1.32

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.74	0.29	39.750	0.45	60.250
Total	0.74	0.29	39.750	0.45	60.250
Average	0.74	0.29	39.750	0.45	60.250

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0002	0.0006	0.0034	0.0100	0.0203
2	0.0001	0.0003	0.0017	0.0049	0.0101
3	0.0002	0.0006	0.0033	0.0095	0.0200
4	0.0013	0.0040	0.0217	0.0628	0.1259
5	0.0016	0.0050	0.0270	0.0783	0.1714
6	0.0001	0.0004	0.0020	0.0058	0.0129
7	0.0001	0.0003	0.0019	0.0055	0.0126
8	0.0001	0.0003	0.0018	0.0052	0.0123
9	0.0001	0.0003	0.0017	0.0049	0.0119
10	0.0001	0.0003	0.0016	0.0047	0.0116
11	0.0003	0.0010	0.0052	0.0151	0.0385
Total	0.0043	0.0131	0.0712	0.2066	0.4475

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.00	0.5	0.00	0.5
Highway Segment	Collision with Fixed Object	0.09	11.7	0.11	15.2	0.20	26.9
Highway Segment	Collision with Other Object	0.01	0.8	0.02	3.0	0.03	3.8
Highway Segment	Other Single-vehicle Collision	0.03	3.4	0.02	2.3	0.04	5.6
Highway Segment	Collision with Parked Vehicle	0.00	0.2	0.00	0.3	0.00	0.6
Highway Segment	Total Single Vehicle Crashes	0.12	16.1	0.16	21.3	0.28	37.4
Highway Segment	Right-Angle Collision	0.01	0.7	0.01	0.7	0.01	1.4
Highway Segment	Head-on Collision	0.00	0.2	0.00	0.1	0.00	0.3
Highway Segment	Other Multi-vehicle Collision	0.01	0.7	0.01	0.9	0.01	1.7
Highway Segment	Rear-end Collision	0.13	17.7	0.20	26.9	0.33	44.6
Highway Segment	Sideswipe, Same Direction Collision	0.03	4.2	0.08	10.4	0.11	14.6
Highway Segment	Total Multiple Vehicle Crashes	0.17	23.6	0.29	39.0	0.47	62.6
Highway Segment	Total Highway Segment Crashes	0.29	39.8	0.45	60.2	0.74	100.0
	Total Crashes	0.29	39.8	0.45	60.2	0.74	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

I-35 Modified Build Alternative 3 Model Freeway Ramps

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 1:59 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:02:29 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBX2903
Highway Comment: Imported from RGPNBX2903.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:02:18 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1021+94.891

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1021+94.891
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

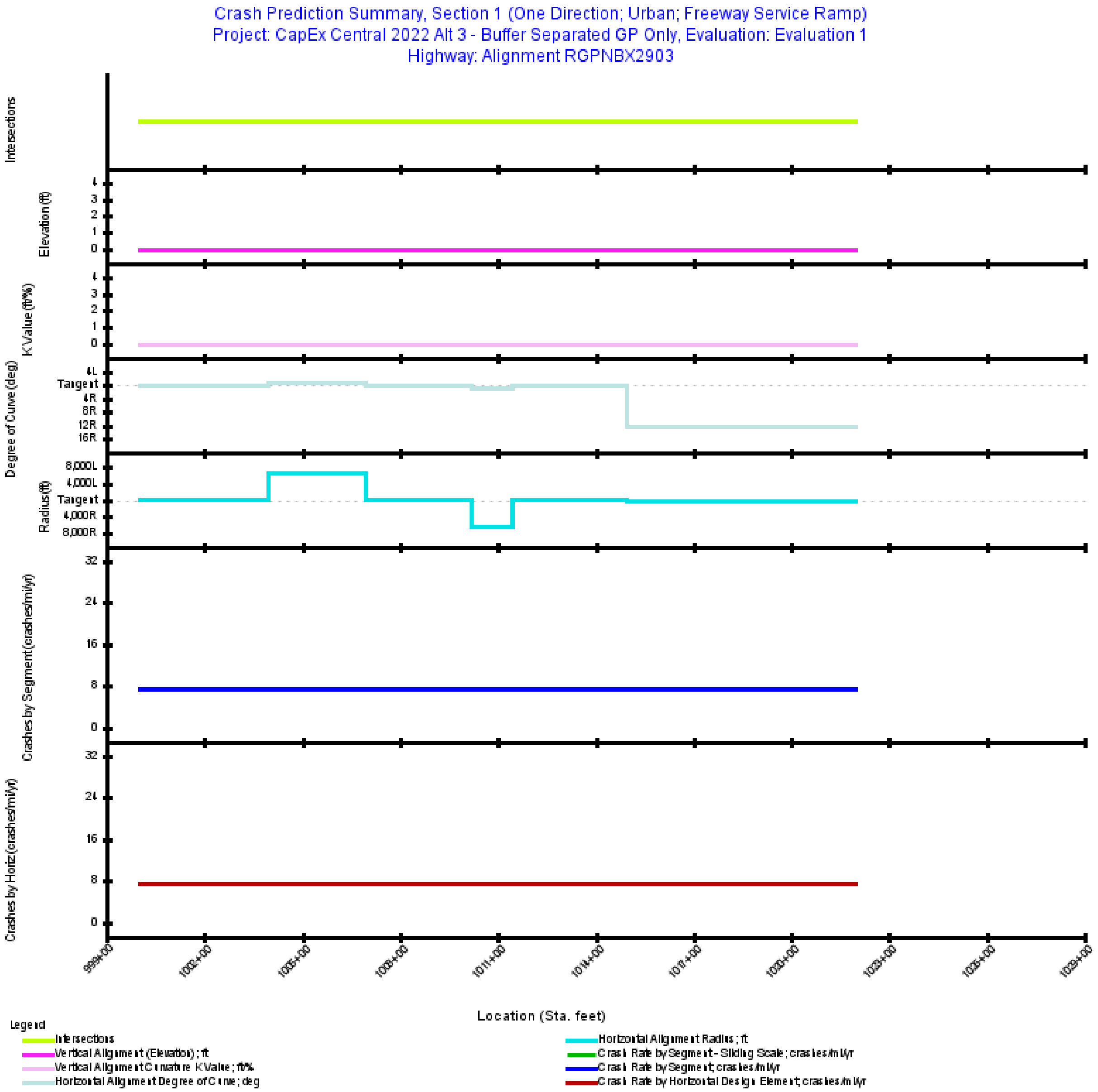

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1021+94.891	2,194.89	0.4157	2030: 12,850

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.4157**
Average Future Road AADT (vpd)	**12,850**
Predicted Crashes	
Total Crashes	**3.07**
Fatal and Injury Crashes	**1.40**
Property-Damage-Only Crashes	**1.67**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**46**
Percent Property-Damage-Only Crashes (%)	**54**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**7.3872**
FI Crash Rate (crashes/mi/yr)	**3.3616**
PDO Crash Rate (crashes/mi/yr)	**4.0256**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.95**
Travel Crash Rate (crashes/million veh-mi)	**1.57**
Travel FI Crash Rate (crashes/million veh-mi)	**0.72**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.86**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1021+94.891	0.4157	3.071	3.0708	1.3974	1.6734	7.3872	1.57
Total			0.4157	3.071	3.0708	1.3974	1.6734	7.3872	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1003+96.760	0.0751	0.555	0.5551	0.2526	0.3025	7.3872	1.57
Simple Curve 1	1003+96.760	1006+93.456	0.0562	0.415	0.4151	0.1889	0.2262	7.3872	1.57
Tangent	1006+93.456	1010+20.583	0.0620	0.458	0.4577	0.2083	0.2494	7.3872	1.57
Simple Curve 2	1010+20.583	1011+42.726	0.0231	0.171	0.1709	0.0778	0.0931	7.3872	1.57
Tangent	1011+42.726	1014+96.588	0.0670	0.495	0.4951	0.2253	0.2698	7.3872	1.57
Simple Curve 3	1014+96.588	1021+94.891	0.1323	0.977	0.9770	0.4446	0.5324	7.3872	1.57

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	3.07	1.40	45.506	1.67	54.494
Total	3.07	1.40	45.506	1.67	54.494
Average	3.07	1.40	45.506	1.67	54.494

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0340	0.1031	0.4486	0.8118	1.6734

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.2	0.03	1.1	0.04	1.3
Highway Segment	Collision with Fixed Object	0.97	31.6	1.09	35.6	2.06	67.2
Highway Segment	Collision with Other Object	0.07	2.2	0.21	6.9	0.28	9.1
Highway Segment	Other Single-vehicle Collision	0.28	9.1	0.16	5.3	0.44	14.4
Highway Segment	Collision with Parked Vehicle	0.02	0.7	0.02	0.8	0.04	1.5
Highway Segment	Total Single Vehicle Crashes	1.34	43.7	1.53	49.7	2.87	93.5
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.01	0.2
Highway Segment	Rear-end Collision	0.04	1.3	0.10	3.3	0.14	4.6
Highway Segment	Sideswipe, Same Direction Collision	0.01	0.3	0.04	1.3	0.05	1.6
Highway Segment	Total Multiple Vehicle Crashes	0.05	1.8	0.15	4.8	0.20	6.5
Highway Segment	Total Highway Segment Crashes	1.40	45.5	1.67	54.5	3.07	100.0
	Total Crashes	1.40	45.5	1.67	54.5	3.07	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1021+94.891	Warning: for segment #1 (1000+00.000 to 1021+94.891), The ramp type for Ramp Alignment RGPNBX2903 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 1:59 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:00:27 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBNBARB3
Highway Comment: Imported from RGPNBNBARB3.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:00:17 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1006+39.809

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1006+39.809
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

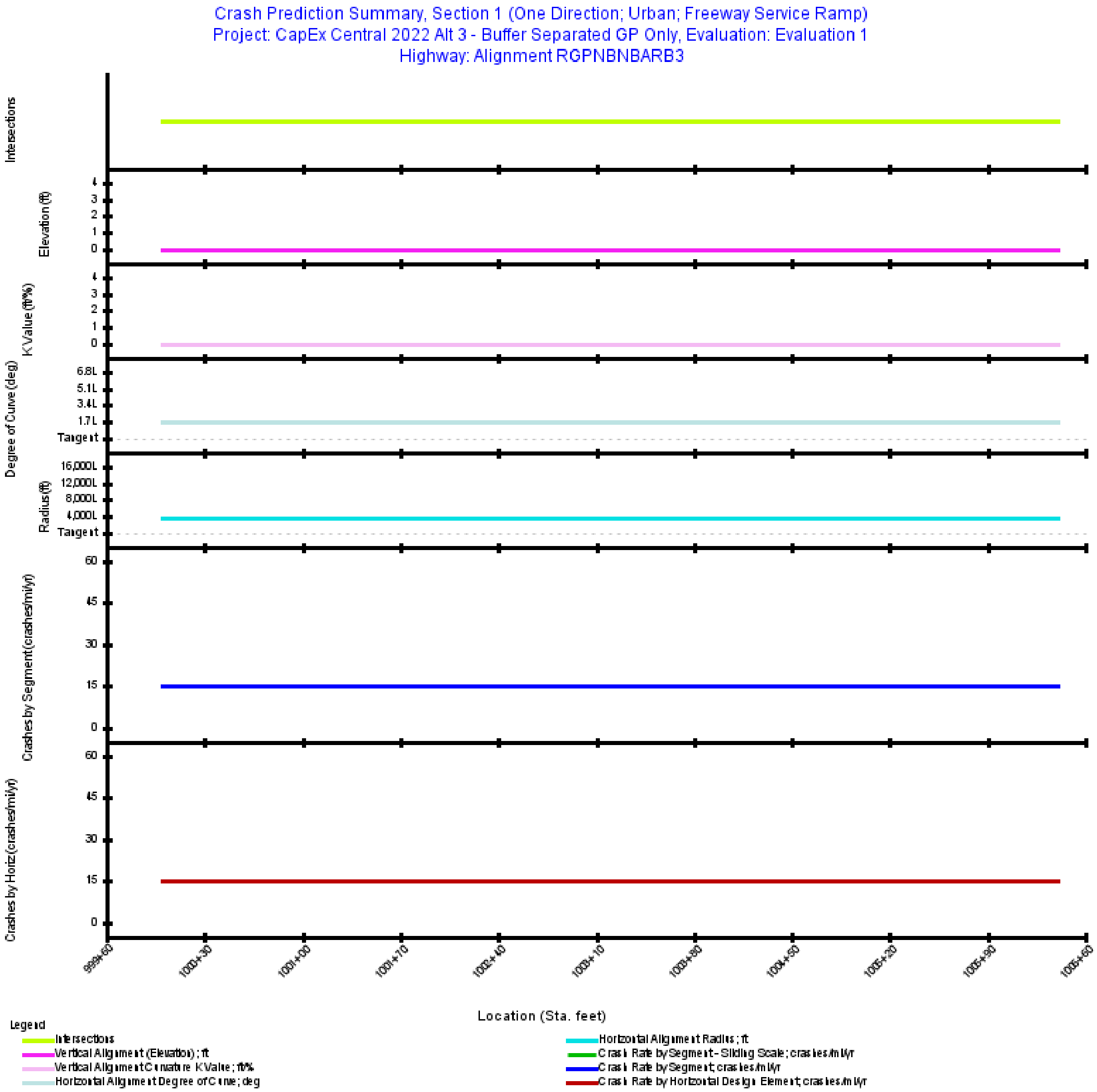

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1006+39.809	639.81	0.1212	2030: 36,100

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1212**
Average Future Road AADT (vpd)	**36,100**
Predicted Crashes	
Total Crashes	**1.81**
Fatal and Injury Crashes	**0.99**
Property-Damage-Only Crashes	**0.82**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**55**
Percent Property-Damage-Only Crashes (%)	**45**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**14.9773**
FI Crash Rate (crashes/mi/yr)	**8.1719**
PDO Crash Rate (crashes/mi/yr)	**6.8054**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.60**
Travel Crash Rate (crashes/million veh-mi)	**1.14**
Travel FI Crash Rate (crashes/million veh-mi)	**0.62**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.52**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	**Start Location (Sta. ft)**	**End Location (Sta. ft)**	**Length (mi)**	**Total Predicted Crashes for Evaluation Period**	**Predicted Total Crash Frequency (crashes/yr)**	**Predicted FI Crash Frequency (crashes/yr)**	**Predicted PDO Crash Frequency (crashes/yr)**	**Predicted Crash Rate (crashes/mi/yr)**	**Predicted Travel Crash Rate (crashes/million veh-mi)**
1	1000+00.000	1006+39.809	0.1212	1.815	1.8149	0.9902	0.8246	14.9773	1.14
Total			0.1212	1.815	1.8149	0.9902	0.8246	14.9773	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1006+39.809	0.1212	1.815	1.8149	0.9902	0.8246	14.9773	1.14

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.81	0.99	54.562	0.82	45.438
Total	1.81	0.99	54.562	0.82	45.438
Average	1.81	0.99	54.562	0.82	45.438

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0173	0.0526	0.3469	0.5734	0.8246

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.5	0.01	0.6
Highway Segment	Collision with Fixed Object	0.31	17.1	0.31	17.1	0.62	34.2
Highway Segment	Collision with Other Object	0.02	1.2	0.06	3.3	0.08	4.5
Highway Segment	Other Single-vehicle Collision	0.09	4.9	0.05	2.6	0.14	7.5
Highway Segment	Collision with Parked Vehicle	0.01	0.4	0.01	0.4	0.01	0.7
Highway Segment	Total Single Vehicle Crashes	0.43	23.7	0.43	23.9	0.86	47.6
Highway Segment	Right-Angle Collision	0.02	1.0	0.01	0.4	0.02	1.3
Highway Segment	Head-on Collision	0.00	0.2	0.00	0.0	0.01	0.3
Highway Segment	Other Multi-vehicle Collision	0.02	1.0	0.01	0.5	0.03	1.5
Highway Segment	Rear-end Collision	0.42	23.2	0.27	14.9	0.69	38.0
Highway Segment	Sideswipe, Same Direction Collision	0.10	5.6	0.10	5.7	0.20	11.3
Highway Segment	Total Multiple Vehicle Crashes	0.56	30.9	0.39	21.5	0.95	52.4
Highway Segment	Total Highway Segment Crashes	0.99	54.6	0.82	45.4	1.81	100.0
	Total Crashes	0.99	54.6	0.82	45.4	1.81	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1006+39.809	Warning: for segment #1 (1000+00.000 to 1006+39.809), The ramp type for Ramp Alignment RGPNBNBARB3 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1006+39.809	Warning: for segment #1 (1000+00.000 to 1006+39.809), traffic volume (36,100 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Under no circumstances will the FHWA be liable to the end-user for any damages or claimed lost profits, lost savings, or other incidental or consequential damages rising out of the use or inability to use the software (even if these organizations have been advised of the possibility of such damages), or for any claim by any other party.

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Report Overview

Report Generated: Aug 25, 2022 2:00 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:02:53 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBX413
Highway Comment: Imported from RGPNBX413.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:02:43 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1013+82.343

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1013+82.343
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

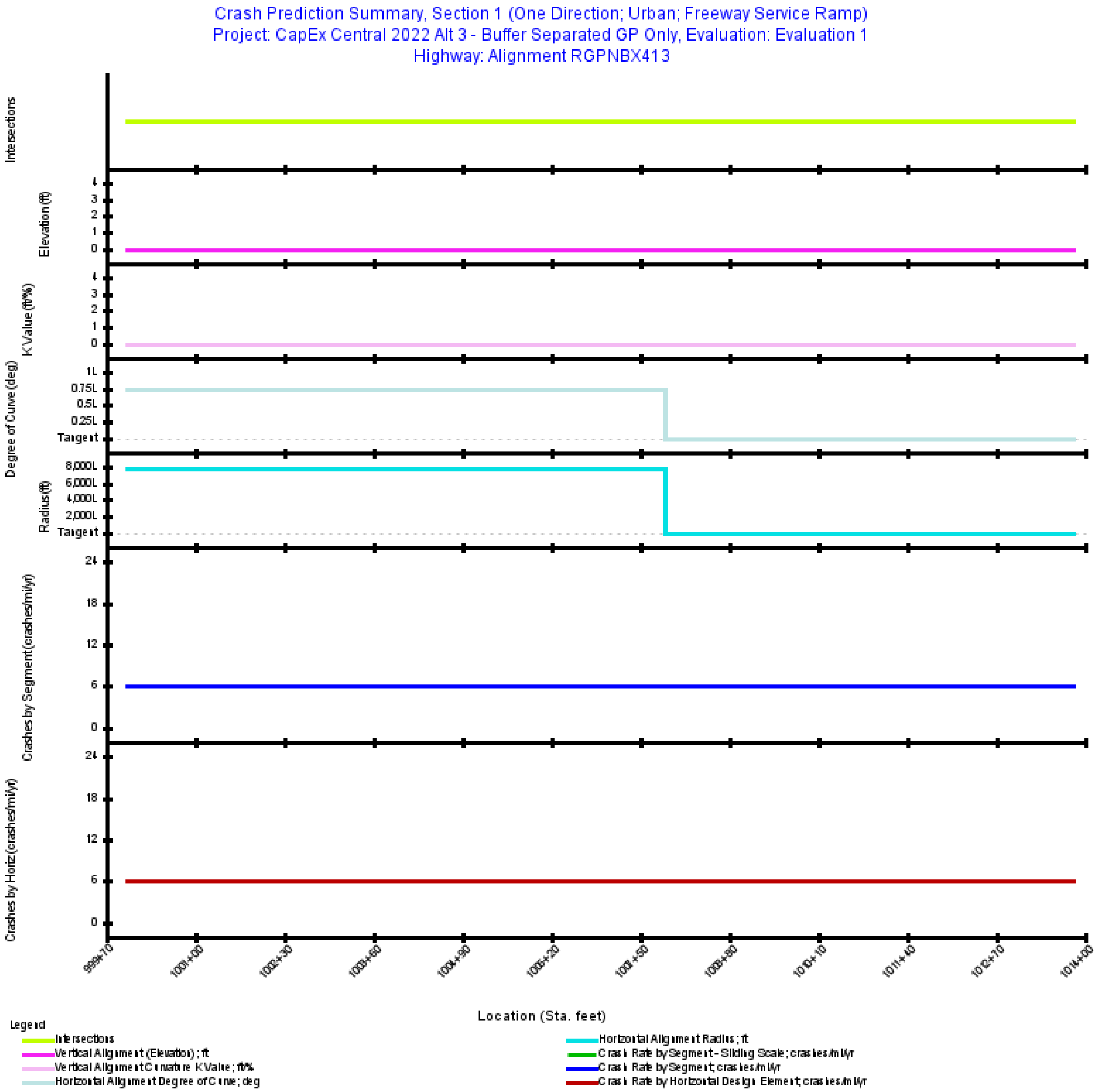

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1013+82.343	1,382.34	0.2618	2030: 18,500

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2618**
Average Future Road AADT (vpd)	**18,500**
Predicted Crashes	
Total Crashes	**1.55**
Fatal and Injury Crashes	**0.75**
Property-Damage-Only Crashes	**0.80**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**49**
Percent Property-Damage-Only Crashes (%)	**51**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.9172**
FI Crash Rate (crashes/mi/yr)	**2.8702**
PDO Crash Rate (crashes/mi/yr)	**3.0471**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.77**
Travel Crash Rate (crashes/million veh-mi)	**0.88**
Travel FI Crash Rate (crashes/million veh-mi)	**0.42**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.45**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1013+82.343	0.2618	1.549	1.5492	0.7514	0.7978	5.9172	0.88
Total			0.2618	1.549	1.5492	0.7514	0.7978	5.9172	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1007+86.152	0.1489	0.881	0.8810	0.4273	0.4537	5.9172	0.88
Tangent	1007+86.152	1013+82.343	0.1129	0.668	0.6681	0.3241	0.3441	5.9172	0.88

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.55	0.75	48.505	0.80	51.495
Total	1.55	0.75	48.505	0.80	51.495
Average	1.55	0.75	48.505	0.80	51.495

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0193	0.0585	0.2523	0.4213	0.7978

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.02	1.1
Highway Segment	Collision with Fixed Object	0.51	32.6	0.48	31.1	0.99	63.7
Highway Segment	Collision with Other Object	0.04	2.3	0.09	6.0	0.13	8.3
Highway Segment	Other Single-vehicle Collision	0.15	9.4	0.07	4.7	0.22	14.0
Highway Segment	Collision with Parked Vehicle	0.01	0.7	0.01	0.7	0.02	1.4
Highway Segment	Total Single Vehicle Crashes	0.70	45.2	0.67	43.5	1.37	88.6
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.2	0.01	0.3
Highway Segment	Rear-end Collision	0.04	2.5	0.09	5.5	0.12	8.0
Highway Segment	Sideswipe, Same Direction Collision	0.01	0.6	0.03	2.1	0.04	2.7
Highway Segment	Total Multiple Vehicle Crashes	0.05	3.3	0.12	8.0	0.18	11.4
Highway Segment	Total Highway Segment Crashes	0.75	48.5	0.80	51.5	1.55	100.0
	Total Crashes	0.75	48.5	0.80	51.5	1.55	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1013+82.343	Warning: for segment #1 (1000+00.000 to 1013+82.343), The ramp type for Ramp Alignment RGPNBX413 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1013+82.343	Warning: for segment #1 (1000+00.000 to 1013+82.343), traffic volume (18,500 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:01 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:03:18 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBXHALF3
Highway Comment: Imported from RGPNBXHALF3.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:03:07 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1015+25.834

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1015+25.834
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

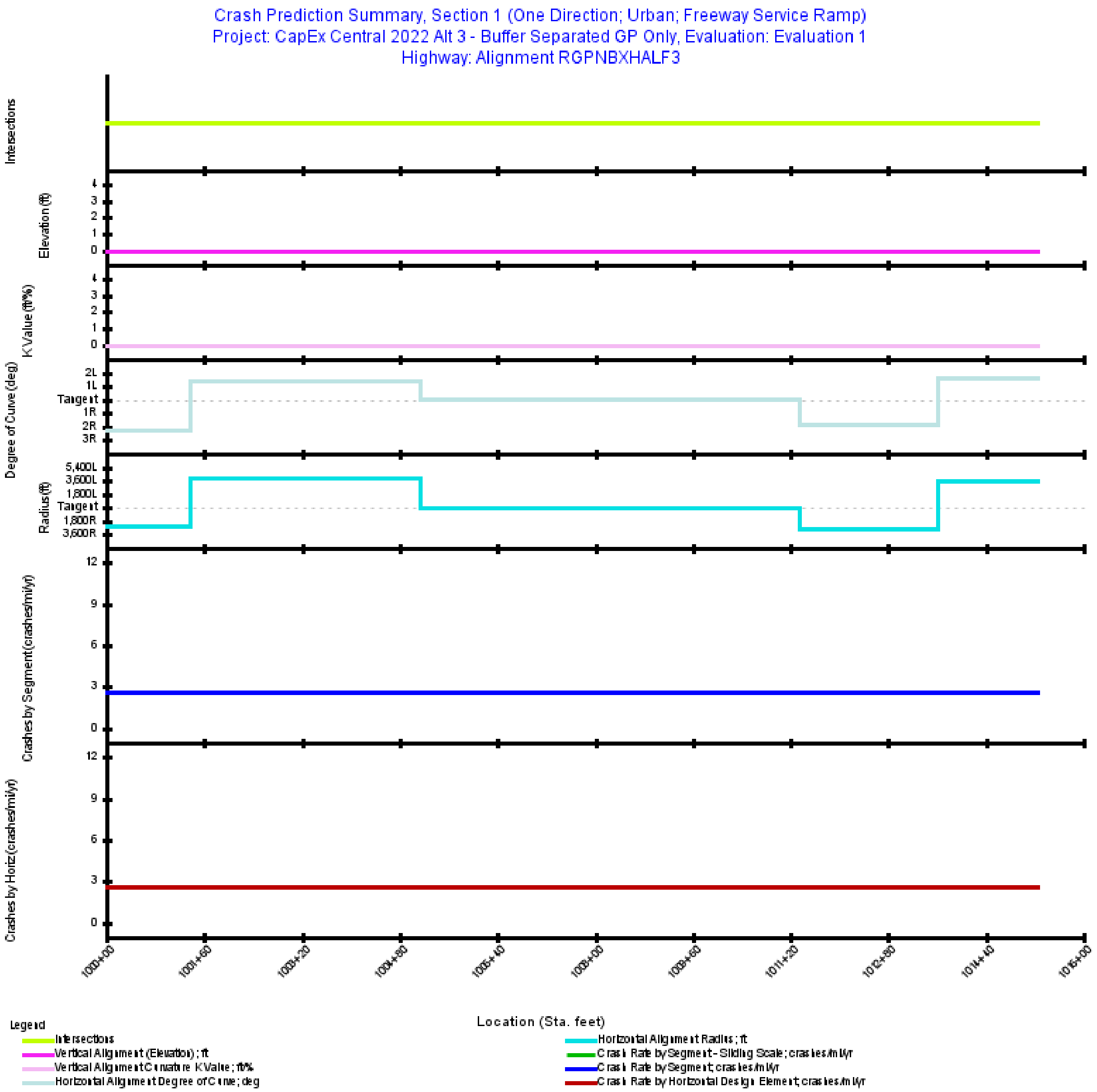

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1015+25.834	1,525.83	0.2890	2030: 5,800

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2890**
Average Future Road AADT (vpd)	**5,800**
Predicted Crashes	
Total Crashes	**0.75**
Fatal and Injury Crashes	**0.37**
Property-Damage-Only Crashes	**0.39**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**49**
Percent Property-Damage-Only Crashes (%)	**51**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**2.6071**
FI Crash Rate (crashes/mi/yr)	**1.2702**
PDO Crash Rate (crashes/mi/yr)	**1.3369**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.61**
Travel Crash Rate (crashes/million veh-mi)	**1.23**
Travel FI Crash Rate (crashes/million veh-mi)	**0.60**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.63**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1015+25.834	0.2890	0.753	0.7534	0.3671	0.3863	2.6071	1.23
Total			0.2890	0.753	0.7534	0.3671	0.3863	2.6071	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+36.942	0.0259	0.068	0.0676	0.0329	0.0347	2.6071	1.23
Simple Curve 2	1001+36.942	1005+14.712	0.0715	0.186	0.1865	0.0909	0.0957	2.6071	1.23
Tangent	1005+14.712	1011+35.668	0.1176	0.307	0.3066	0.1494	0.1572	2.6071	1.23
Simple Curve 3	1011+35.668	1013+61.460	0.0428	0.112	0.1115	0.0543	0.0572	2.6071	1.23
Simple Curve 4	1013+61.460	1015+25.834	0.0311	0.081	0.0812	0.0395	0.0416	2.6071	1.23

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.75	0.37	48.721	0.39	51.279
Total	0.75	0.37	48.721	0.39	51.279
Average	0.75	0.37	48.721	0.39	51.279

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0093	0.0281	0.1214	0.2083	0.3863

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.26	33.9	0.25	33.6	0.51	67.5
Highway Segment	Collision with Other Object	0.02	2.4	0.05	6.5	0.07	8.9
Highway Segment	Other Single-vehicle Collision	0.07	9.8	0.04	5.0	0.11	14.8
Highway Segment	Collision with Parked Vehicle	0.01	0.7	0.01	0.8	0.01	1.5
Highway Segment	Total Single Vehicle Crashes	0.35	46.9	0.35	46.9	0.71	93.8
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Rear-end Collision	0.01	1.3	0.02	3.0	0.03	4.4
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.3	0.01	1.2	0.01	1.5
Highway Segment	Total Multiple Vehicle Crashes	0.01	1.8	0.03	4.4	0.05	6.2
Highway Segment	Total Highway Segment Crashes	0.37	48.7	0.39	51.3	0.75	100.0
	Total Crashes	0.37	48.7	0.39	51.3	0.75	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1015+25.834	Warning: for segment #1 (1000+00.000 to 1015+25.834), The ramp type for Ramp Alignment RGPNBXHALF3 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Under no circumstances will the FHWA be liable to the end-user for any damages or claimed lost profits, lost savings, or other incidental or consequential damages rising out of the use or inability to use the software (even if these organizations have been advised of the possibility of such damages), or for any claim by any other party.

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Report Overview

Report Generated: Aug 25, 2022 2:01 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:00:51 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBNMLK3
Highway Comment: Imported from RGPNBNMLK3.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:00:41 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1010+93.490

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1010+93.490
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

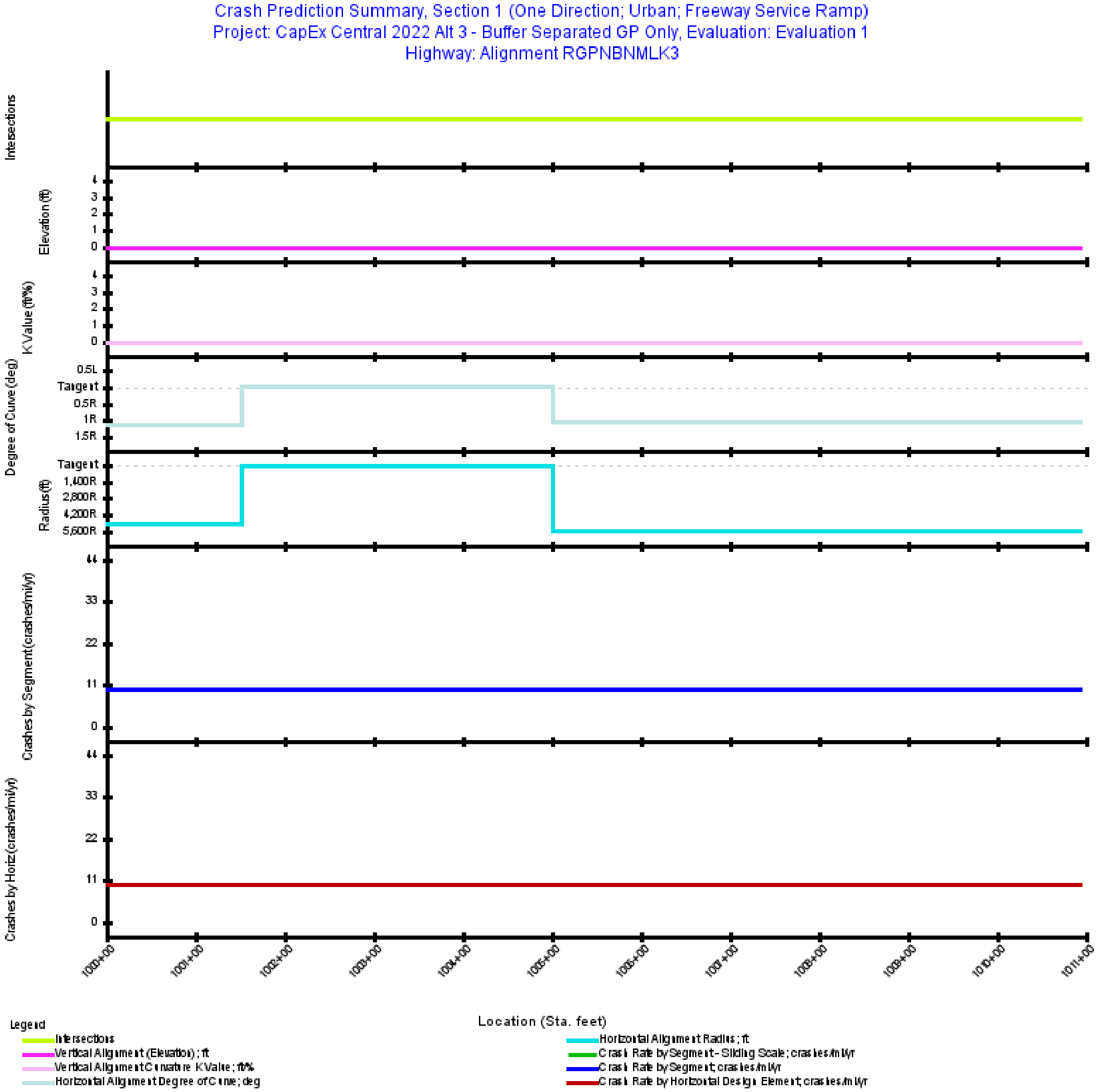

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1010+93.490	1,093.49	0.2071	2030: 27,950

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2071**
Average Future Road AADT (vpd)	**27,950**
Predicted Crashes	
Total Crashes	**2.08**
Fatal and Injury Crashes	**1.01**
Property-Damage-Only Crashes	**1.08**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**10.0591**
FI Crash Rate (crashes/mi/yr)	**4.8567**
PDO Crash Rate (crashes/mi/yr)	**5.2024**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.11**
Travel Crash Rate (crashes/million veh-mi)	**0.99**
Travel FI Crash Rate (crashes/million veh-mi)	**0.48**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.51**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1010+93.490	0.2071	2.083	2.0833	1.0058	1.0774	10.0591	0.99
Total			0.2071	2.083	2.0833	1.0058	1.0774	10.0591	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+52.211	0.0288	0.290	0.2900	0.1400	0.1500	10.0591	0.99
Tangent	1001+52.211	1005+00.346	0.0659	0.663	0.6632	0.3202	0.3430	10.0591	0.99
Simple Curve 2	1005+00.346	1010+93.490	0.1123	1.130	1.1300	0.5456	0.5844	10.0591	0.99

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.08	1.01	48.282	1.08	51.718
Total	2.08	1.01	48.282	1.08	51.718
Average	2.08	1.01	48.282	1.08	51.718

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0172	0.0520	0.3446	0.5921	1.0774

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.6	0.01	0.7
Highway Segment	Collision with Fixed Object	0.41	19.5	0.43	20.6	0.83	40.1
Highway Segment	Collision with Other Object	0.03	1.4	0.08	4.0	0.11	5.4
Highway Segment	Other Single-vehicle Collision	0.12	5.6	0.06	3.1	0.18	8.7
Highway Segment	Collision with Parked Vehicle	0.01	0.4	0.01	0.5	0.02	0.9
Highway Segment	Total Single Vehicle Crashes	0.56	27.0	0.60	28.8	1.16	55.8
Highway Segment	Right-Angle Collision	0.01	0.7	0.01	0.4	0.02	1.1
Highway Segment	Head-on Collision	0.00	0.2	0.00	0.0	0.01	0.2
Highway Segment	Other Multi-vehicle Collision	0.01	0.7	0.01	0.6	0.03	1.2
Highway Segment	Rear-end Collision	0.33	16.0	0.33	15.8	0.66	31.8
Highway Segment	Sideswipe, Same Direction Collision	0.08	3.8	0.13	6.1	0.21	9.9
Highway Segment	Total Multiple Vehicle Crashes	0.44	21.3	0.48	23.0	0.92	44.2
Highway Segment	Total Highway Segment Crashes	1.01	48.3	1.08	51.7	2.08	100.0
	Total Crashes	1.01	48.3	1.08	51.7	2.08	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1010+93.490	Warning: for segment #1 (1000+00.000 to 1010+93.490), The ramp type for Ramp Alignment RGPNBNMLK3 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1010+93.490	Warning: for segment #1 (1000+00.000 to 1010+93.490), traffic volume (27,950 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:07 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:52:43 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBXML3
Highway Comment: Imported from RGPNBXML3.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:52:33 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1018+72.085

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1018+72.085
Functional Class: Freeway C-D Road & System Ramp
Type of Alignment: One Direction
Model Category: C-D Road & System Ramp
Calibration Factor: CD_MV_FI=1.0; CD_MV_PDO=1.0; CD_SV_FI=1.0; CD_SV_PDO=1.0;

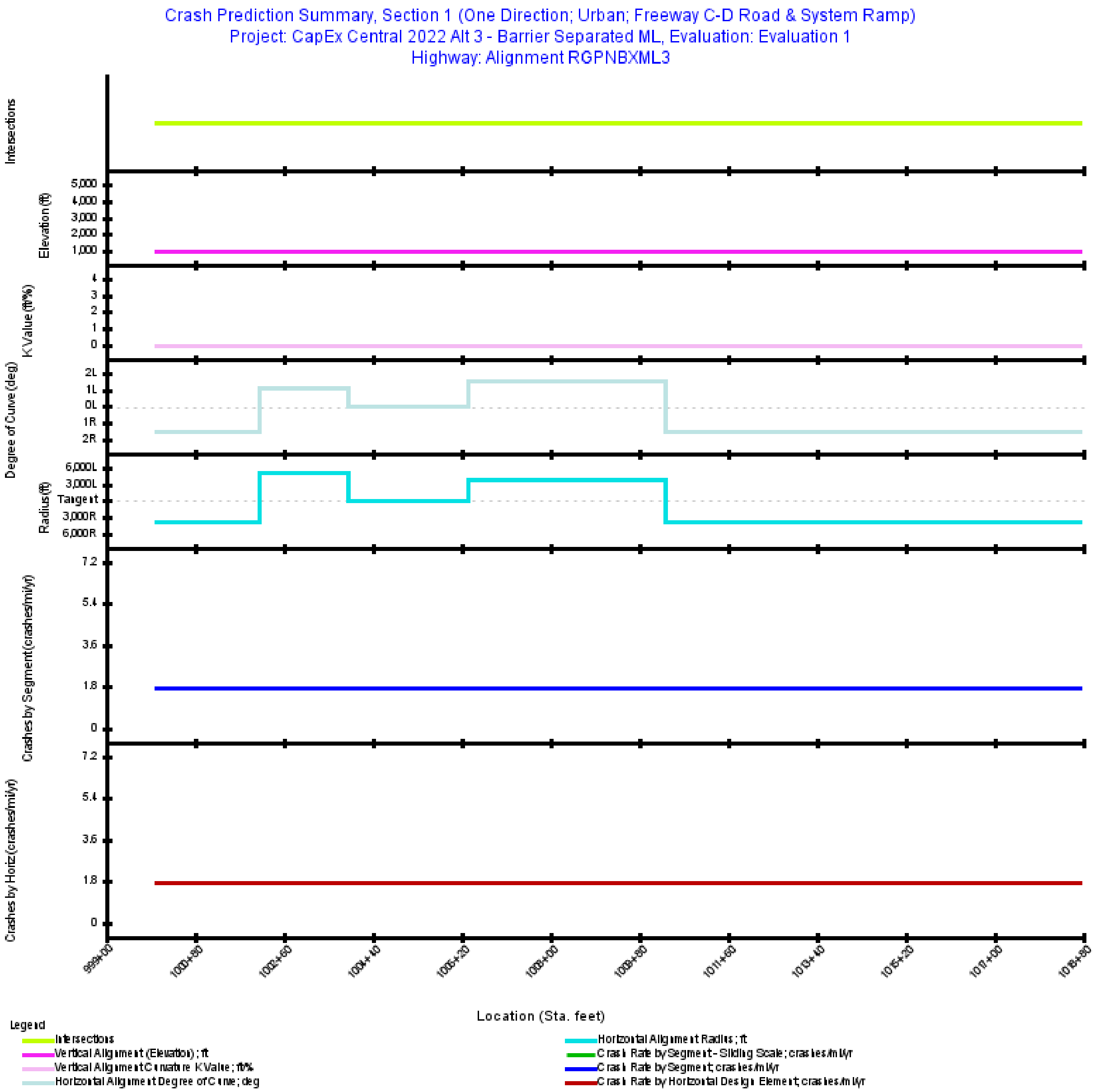

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane C-D Ramp	Urban	1000+00.000	1018+72.085	1,872.09	0.3546	2030: 6,100

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.3546**
Average Future Road AADT (vpd)	**6,100**
Predicted Crashes	
Total Crashes	**0.62**
Fatal and Injury Crashes	**0.27**
Property-Damage-Only Crashes	**0.35**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**43**
Percent Property-Damage-Only Crashes (%)	**57**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**1.7380**
FI Crash Rate (crashes/mi/yr)	**0.7477**
PDO Crash Rate (crashes/mi/yr)	**0.9903**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.79**
Travel Crash Rate (crashes/million veh-mi)	**0.78**
Travel FI Crash Rate (crashes/million veh-mi)	**0.34**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.45**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1018+72.085	0.3546	0.616	0.6162	0.2651	0.3511	1.7380	0.78
Total			0.3546	0.616	0.6162	0.2651	0.3511	1.7380	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1002+10.992	0.0400	0.070	0.0695	0.0299	0.0396	1.7380	0.78
Simple Curve 2	1002+10.992	1003+90.225	0.0339	0.059	0.0590	0.0254	0.0336	1.7380	0.78
Tangent	1003+90.225	1006+33.517	0.0461	0.080	0.0801	0.0345	0.0456	1.7380	0.78
Simple Curve 3	1006+33.517	1010+33.582	0.0758	0.132	0.1317	0.0567	0.0750	1.7380	0.78
Simple Curve 4	1010+33.582	1018+72.085	0.1588	0.276	0.2760	0.1187	0.1573	1.7380	0.78

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.62	0.27	43.020	0.35	56.980
Total	0.62	0.27	43.020	0.35	56.980
Average	0.62	0.27	43.020	0.35	56.980

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0045	0.0135	0.0898	0.1573	0.3511

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.00	0.5	0.00	0.6
Highway Segment	Collision with Fixed Object	0.10	16.2	0.10	16.9	0.20	33.1
Highway Segment	Collision with Other Object	0.01	1.1	0.02	3.3	0.03	4.4
Highway Segment	Other Single-vehicle Collision	0.03	4.7	0.02	2.5	0.04	7.2
Highway Segment	Collision with Parked Vehicle	0.00	0.3	0.00	0.4	0.00	0.7
Highway Segment	Total Single Vehicle Crashes	0.14	22.5	0.14	23.6	0.28	46.0
Highway Segment	Right-Angle Collision	0.00	0.6	0.00	0.6	0.01	1.2
Highway Segment	Head-on Collision	0.00	0.2	0.00	0.1	0.00	0.2
Highway Segment	Other Multi-vehicle Collision	0.00	0.6	0.01	0.8	0.01	1.4
Highway Segment	Rear-end Collision	0.10	15.4	0.14	23.1	0.24	38.5
Highway Segment	Sideswipe, Same Direction Collision	0.02	3.7	0.06	8.9	0.08	12.6
Highway Segment	Total Multiple Vehicle Crashes	0.13	20.6	0.21	33.4	0.33	54.0
Highway Segment	Total Highway Segment Crashes	0.27	43.0	0.35	57.0	0.62	100.0
	Total Crashes	0.27	43.0	0.35	57.0	0.62	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

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Evaluation Date: Thu Jun 23 11:00:03 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBN73
Highway Comment: Imported from RGPNBN73.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:59:53 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1012+01.804

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1012+01.804
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

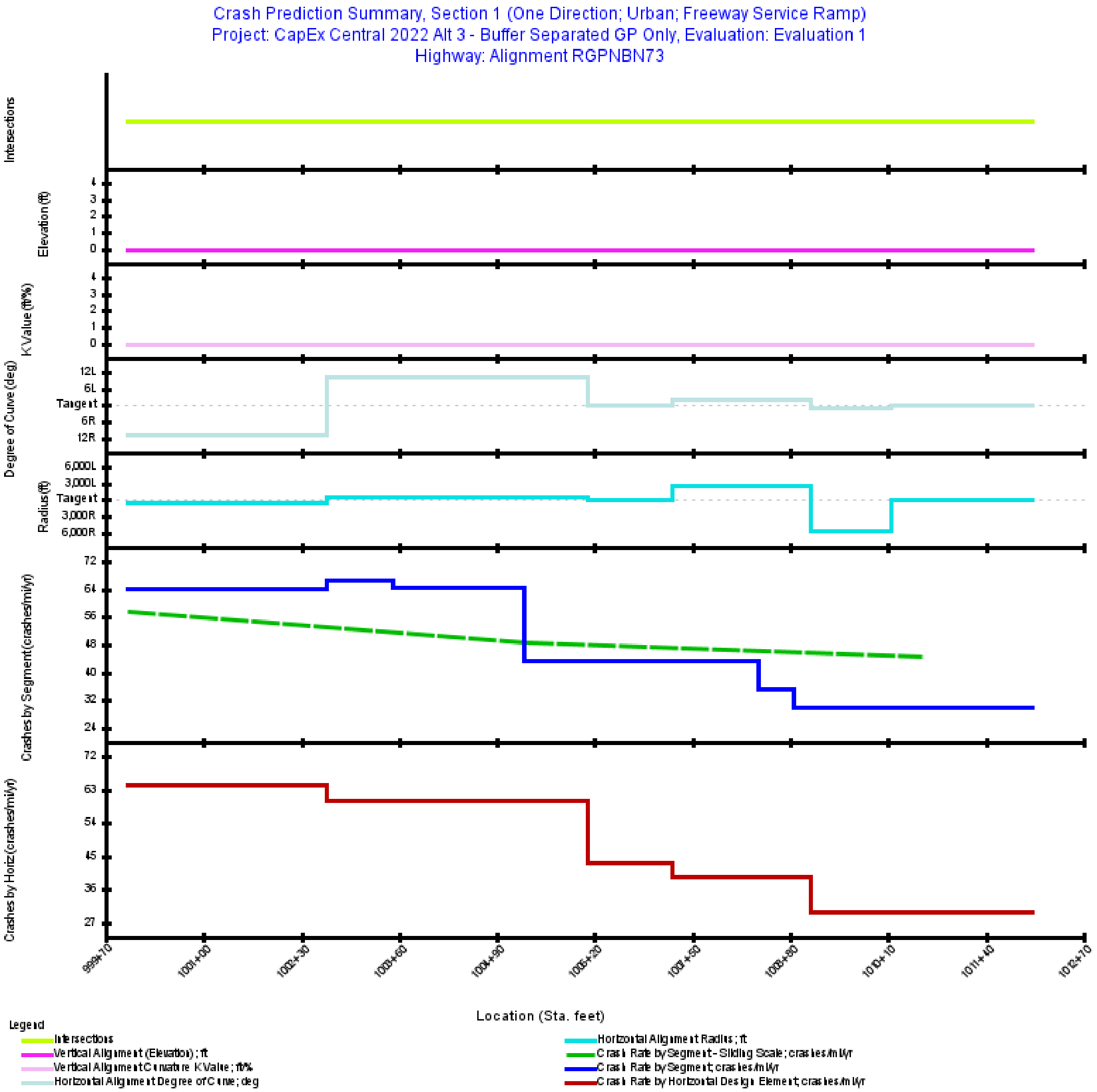

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane Ramp Entrance	Urban	1000+00.000	1002+63.100	263.10	0.0498	2030: 39,200
2	Freeway Ramp and C-D Road Two-lane Ramp Entrance	Urban	1002+63.100	1003+51.000	87.90	0.0166	2030: 39,200
3	Freeway Ramp and C-D Road Two-lane Ramp Entrance	Urban	1003+51.000	1005+26.000	175.00	0.0331	2030: 39,200
4	Freeway Ramp and C-D Road Two-lane Ramp Entrance	Urban	1005+26.000	1008+37.000	311.00	0.0589	2030: 39,200
5	Freeway Ramp and C-D Road Two-lane Ramp Entrance	Urban	1008+37.000	1008+85.000	48.00	0.0091	2030: 39,200
6	Freeway Ramp and C-D Road Two-lane Ramp Entrance	Urban	1008+85.000	1012+01.804	316.80	0.0600	2030: 39,200

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2276**
Average Future Road AADT (vpd)	**39,200**
Predicted Crashes	
Total Crashes	**11.10**
Fatal and Injury Crashes	**5.96**
Property-Damage-Only Crashes	**5.13**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**54**
Percent Property-Damage-Only Crashes (%)	**46**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**48.7587**
FI Crash Rate (crashes/mi/yr)	**26.1985**
PDO Crash Rate (crashes/mi/yr)	**22.5601**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**3.26**
Travel Crash Rate (crashes/million veh-mi)	**3.41**
Travel FI Crash Rate (crashes/million veh-mi)	**1.83**
Travel PDO Crash Rate (crashes/million veh-mi)	**1.58**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1002+63.100	0.0498	3.190	3.1898	1.7151	1.4747	64.0134	4.47
2	1002+63.100	1003+51.000	0.0166	1.109	1.1093	0.5972	0.5121	66.6319	4.66
3	1003+51.000	1005+26.000	0.0331	2.142	2.1416	1.1418	0.9998	64.6144	4.52
4	1005+26.000	1008+37.000	0.0589	2.540	2.5401	1.3725	1.1675	43.1238	3.01
5	1008+37.000	1008+85.000	0.0091	0.321	0.3208	0.1737	0.1471	35.2825	2.47
6	1008+85.000	1012+01.804	0.0600	1.797	1.7968	0.9629	0.8339	29.9457	2.09
Total			0.2276	11.098	11.0982	5.9632	5.1350	48.7587	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1000+84.973	0.0161	1.030	1.0302	0.5539	0.4763	64.0134	4.47
Simple Curve 2	1000+84.973	1002+63.102	0.0337	2.160	2.1596	1.1612	0.9984	64.0134	4.47
Simple Curve 3	1002+63.102	1006+09.929	0.0657	3.936	3.9363	2.1093	1.8270	59.9252	4.19
Tangent	1006+09.929	1007+23.534	0.0215	0.928	0.9279	0.5014	0.4265	43.1238	3.01
Simple Curve 4	1007+23.534	1009+07.721	0.0349	1.376	1.3763	0.7435	0.6329	39.4546	2.76
Simple Curve 5	1009+07.721	1010+14.086	0.0201	0.603	0.6032	0.3233	0.2800	29.9457	2.09
Tangent	1010+14.086	1012+01.804	0.0356	1.065	1.0646	0.5706	0.4941	29.9457	2.09

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	11.10	5.96	53.731	5.13	46.269
Total	11.10	5.96	53.731	5.13	46.269
Average	11.10	5.96	53.731	5.13	46.269

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0265	0.0804	0.4340	1.1742	1.4747
2	0.0087	0.0265	0.1441	0.4179	0.5121
3	0.0167	0.0506	0.2754	0.7990	0.9998
4	0.0201	0.0609	0.3311	0.9605	1.1675
5	0.0025	0.0077	0.0419	0.1215	0.1471
6	0.0151	0.0458	0.2469	0.6551	0.8339
Total	0.0897	0.2719	1.4733	4.1283	5.1350

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.1	0.06	0.5	0.07	0.6
Highway Segment	Collision with Fixed Object	1.47	13.2	1.86	16.7	3.32	29.9
Highway Segment	Collision with Other Object	0.10	0.9	0.36	3.2	0.46	4.2
Highway Segment	Other Single-vehicle Collision	0.42	3.8	0.28	2.5	0.70	6.3
Highway Segment	Collision with Parked Vehicle	0.03	0.3	0.04	0.4	0.07	0.6
Highway Segment	Total Single Vehicle Crashes	2.03	18.3	2.59	23.4	4.62	41.7
Highway Segment	Right-Angle Collision	0.12	1.1	0.05	0.4	0.17	1.5
Highway Segment	Head-on Collision	0.03	0.3	0.01	0.0	0.04	0.3
Highway Segment	Other Multi-vehicle Collision	0.12	1.1	0.06	0.6	0.18	1.6
Highway Segment	Rear-end Collision	2.95	26.6	1.75	15.8	4.70	42.4
Highway Segment	Sideswipe, Same Direction Collision	0.71	6.4	0.68	6.1	1.38	12.5
Highway Segment	Total Multiple Vehicle Crashes	3.93	35.4	2.54	22.9	6.47	58.3
Highway Segment	Total Highway Segment Crashes	5.96	53.7	5.13	46.3	11.10	100.0
	Total Crashes	5.96	53.7	5.13	46.3	11.10	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1002+63.100	Warning: for segment #1 (1000+00.000 to 1002+63.100), The ramp type for Ramp Alignment RGPNBN73 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+63.100	1003+51.000	Warning: for segment #2 (1002+63.100 to 1003+51.000), The ramp type for Ramp Alignment RGPNBN73 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+51.000	1005+26.000	Warning: for segment #3 (1003+51.000 to 1005+26.000), The ramp type for Ramp Alignment RGPNBN73 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1005+26.000	1008+37.000	Warning: for segment #4 (1005+26.000 to 1008+37.000), The ramp type for Ramp Alignment RGPNBN73 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1008+37.000	1008+85.000	Warning: for segment #5 (1008+37.000 to 1008+85.000), The ramp type for Ramp Alignment RGPNBN73 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1008+85.000	1012+01.804	Warning: for segment #6 (1008+85.000 to 1012+01.804), The ramp type for Ramp Alignment RGPNBN73 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1002+63.100	Warning: for segment #1 (1000+00.000 to 1002+63.100), traffic volume (39,200 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2EN
1002+63.100	1003+51.000	Warning: for segment #2 (1002+63.100 to 1003+51.000), traffic volume (39,200 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2EN
1003+51.000	1005+26.000	Warning: for segment #3 (1003+51.000 to 1005+26.000), traffic volume (39,200 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2EN
1005+26.000	1008+37.000	Warning: for segment #4 (1005+26.000 to 1008+37.000), traffic volume (39,200 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2EN
1008+37.000	1008+85.000	Warning: for segment #5 (1008+37.000 to 1008+85.000), traffic volume (39,200 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2EN
1008+85.000	1012+01.804	Warning: for segment #6 (1008+85.000 to 1012+01.804), traffic volume (39,200 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2EN

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBX153
Highway Comment: Imported from RGPNBX153.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:01:54 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1030+56.915

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1030+56.915
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

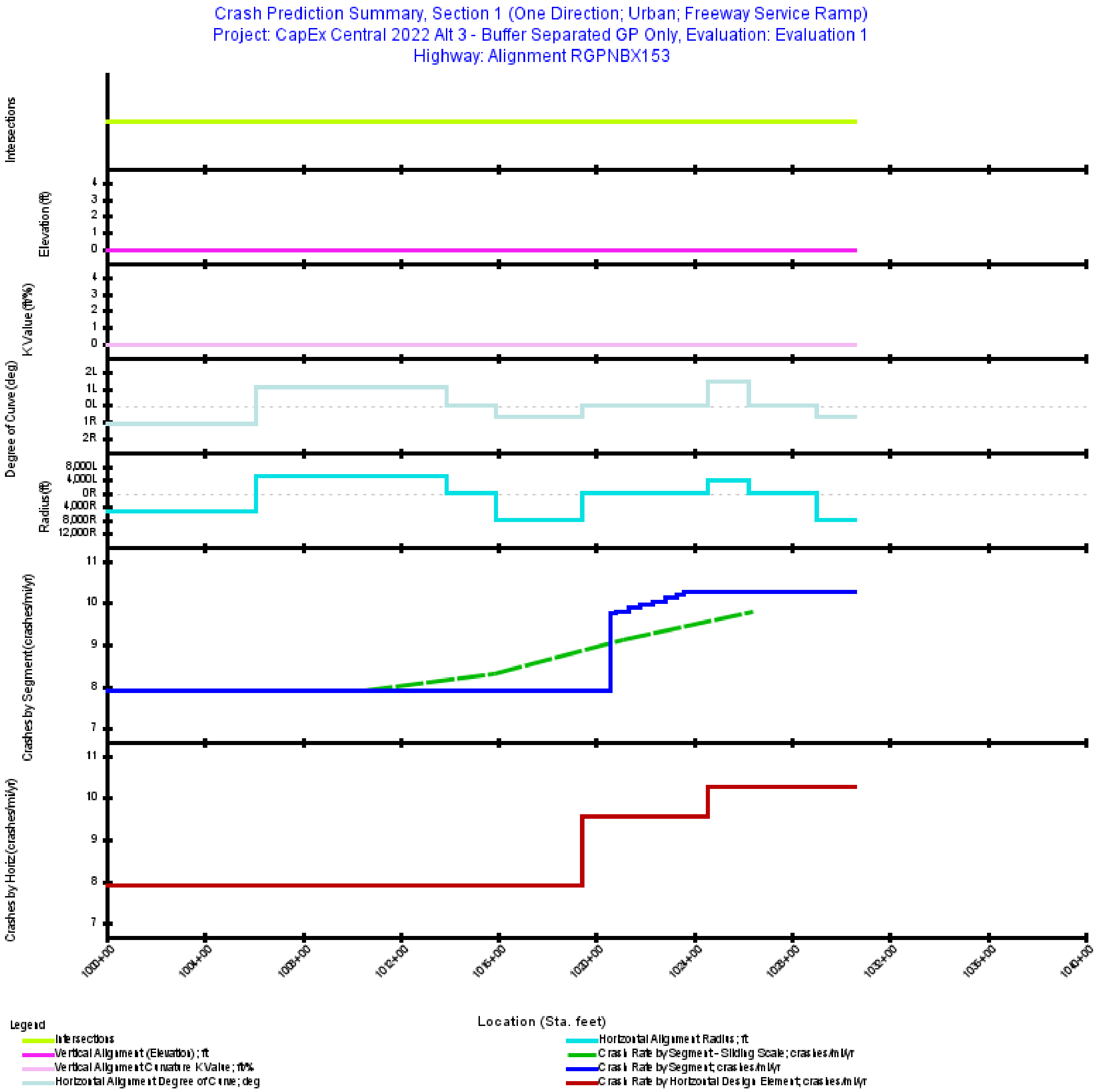

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1020+55.670	2,055.67	0.3893	2030: 23,750
2	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1020+55.670	1020+81.000	25.33	0.0048	2030: 23,750
3	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1020+81.000	1021+31.000	50.00	0.0095	2030: 23,750
4	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1021+31.000	1021+81.000	50.00	0.0095	2030: 23,750
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6	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1022+31.000	1022+81.000	50.00	0.0095	2030: 23,750
7	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1022+81.000	1023+31.000	50.00	0.0095	2030: 23,750
8	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1023+31.000	1023+55.760	24.76	0.0047	2030: 23,750
9	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1023+55.760	1030+56.915	701.15	0.1328	2030: 23,750

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.5790**
Average Future Road AADT (vpd)	**23,750**
Predicted Crashes	
Total Crashes	**5.01**
Fatal and Injury Crashes	**2.21**
Property-Damage-Only Crashes	**2.80**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**44**
Percent Property-Damage-Only Crashes (%)	**56**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**8.6499**
FI Crash Rate (crashes/mi/yr)	**3.8140**
PDO Crash Rate (crashes/mi/yr)	**4.8359**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**5.02**
Travel Crash Rate (crashes/million veh-mi)	**1.00**
Travel FI Crash Rate (crashes/million veh-mi)	**0.44**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.56**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1020+55.670	0.3893	3.076	3.0757	1.5031	1.5726	7.9001	0.91
2	1020+55.670	1020+81.000	0.0048	0.047	0.0468	0.0159	0.0309	9.7481	1.12
3	1020+81.000	1021+31.000	0.0095	0.093	0.0929	0.0319	0.0610	9.8057	1.13
4	1021+31.000	1021+81.000	0.0095	0.094	0.0936	0.0326	0.0610	9.8837	1.14
5	1021+81.000	1022+31.000	0.0095	0.094	0.0944	0.0334	0.0610	9.9635	1.15
6	1022+31.000	1022+81.000	0.0095	0.095	0.0951	0.0342	0.0610	10.0451	1.16
7	1022+81.000	1023+31.000	0.0095	0.096	0.0959	0.0349	0.0610	10.1286	1.17
8	1023+31.000	1023+55.760	0.0047	0.048	0.0478	0.0176	0.0302	10.1923	1.18
9	1023+55.760	1030+56.915	0.1328	1.366	1.3658	0.5046	0.8612	10.2853	1.19
Total			0.5790	5.008	5.0080	2.2082	2.7998	8.6499	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1006+09.302	0.1154	0.912	0.9117	0.4455	0.4661	7.9001	0.91
Simple Curve 2	1006+09.302	1013+86.865	0.1473	1.163	1.1634	0.5685	0.5949	7.9001	0.91
Tangent	1013+86.865	1015+92.892	0.0390	0.308	0.3083	0.1506	0.1576	7.9001	0.91
Simple Curve 3	1015+92.892	1019+41.316	0.0660	0.521	0.5213	0.2548	0.2666	7.9001	0.91
Tangent	1019+41.316	1024+58.829	0.0980	0.938	0.9383	0.3583	0.5800	9.5729	1.10
Simple Curve 4	1024+58.829	1026+20.720	0.0307	0.315	0.3154	0.1165	0.1989	10.2853	1.19
Tangent	1026+20.720	1029+00.368	0.0530	0.545	0.5447	0.2013	0.3435	10.2853	1.19
Simple Curve 5	1029+00.368	1030+56.915	0.0296	0.305	0.3050	0.1127	0.1923	10.2853	1.19

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.01	2.21	44.093	2.80	55.907
Total	5.01	2.21	44.093	2.80	55.907
Average	5.01	2.21	44.093	2.80	55.907

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0368	0.1116	0.4850	0.8697	1.5726
2	0.0003	0.0010	0.0037	0.0108	0.0309
3	0.0007	0.0021	0.0075	0.0216	0.0610
4	0.0007	0.0021	0.0076	0.0221	0.0610
5	0.0007	0.0022	0.0078	0.0227	0.0610
6	0.0007	0.0022	0.0080	0.0232	0.0610
7	0.0008	0.0023	0.0082	0.0237	0.0610
8	0.0004	0.0012	0.0041	0.0119	0.0302
9	0.0110	0.0332	0.1180	0.3424	0.8612
Total	0.0521	0.1580	0.6500	1.3481	2.7998

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.2	0.05	1.0	0.06	1.1
Highway Segment	Collision with Fixed Object	1.42	28.4	1.58	31.5	3.00	59.9
Highway Segment	Collision with Other Object	0.10	2.0	0.31	6.1	0.41	8.1
Highway Segment	Other Single-vehicle Collision	0.41	8.2	0.24	4.7	0.65	12.9
Highway Segment	Collision with Parked Vehicle	0.03	0.6	0.04	0.7	0.07	1.3
Highway Segment	Total Single Vehicle Crashes	1.97	39.3	2.20	44.0	4.17	83.3
Highway Segment	Right-Angle Collision	0.01	0.1	0.01	0.2	0.02	0.4
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.01	0.1	0.01	0.3	0.02	0.4
Highway Segment	Rear-end Collision	0.18	3.6	0.41	8.2	0.59	11.8
Highway Segment	Sideswipe, Same Direction Collision	0.04	0.9	0.16	3.2	0.20	4.0
Highway Segment	Total Multiple Vehicle Crashes	0.24	4.8	0.60	11.9	0.84	16.7
Highway Segment	Total Highway Segment Crashes	2.21	44.1	2.80	55.9	5.01	100.0
	Total Crashes	2.21	44.1	2.80	55.9	5.01	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1020+55.670	Warning: for segment #1 (1000+00.000 to 1020+55.670), The ramp type for Ramp Alignment RGPNBX153 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1020+55.670	1020+81.000	Warning: for segment #2 (1020+55.670 to 1020+81.000), The ramp type for Ramp Alignment RGPNBX153 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1020+81.000	1021+31.000	Warning: for segment #3 (1020+81.000 to 1021+31.000), The ramp type for Ramp Alignment RGPNBX153 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1021+31.000	1021+81.000	Warning: for segment #4 (1021+31.000 to 1021+81.000), The ramp type for Ramp Alignment RGPNBX153 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1021+81.000	1022+31.000	Warning: for segment #5 (1021+81.000 to 1022+31.000), The ramp type for Ramp Alignment RGPNBX153 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1022+31.000	1022+81.000	Warning: for segment #6 (1022+31.000 to 1022+81.000), The ramp type for Ramp Alignment RGPNBX153 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1022+81.000	1023+31.000	Warning: for segment #7 (1022+81.000 to 1023+31.000), The ramp type for Ramp Alignment RGPNBX153 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1023+31.000	1023+55.760	Warning: for segment #8 (1023+31.000 to 1023+55.760), The ramp type for Ramp Alignment RGPNBX153 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1023+55.760	1030+56.915	Warning: for segment #9 (1023+55.760 to 1030+56.915), The ramp type for Ramp Alignment RGPNBX153 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1020+55.670	Warning: for segment #1 (1000+00.000 to 1020+55.670), traffic volume (23,750 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX
1020+55.670	1020+81.000	Warning: for segment #2 (1020+55.670 to 1020+81.000), traffic volume (23,750 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 2EX
1020+81.000	1021+31.000	Warning: for segment #3 (1020+81.000 to 1021+31.000), traffic volume (23,750 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 2EX
1021+31.000	1021+81.000	Warning: for segment #4 (1021+31.000 to 1021+81.000), traffic volume (23,750 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 2EX
1021+81.000	1022+31.000	Warning: for segment #5 (1021+81.000 to 1022+31.000), traffic volume (23,750 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 2EX
1022+31.000	1022+81.000	Warning: for segment #6 (1022+31.000 to 1022+81.000), traffic volume (23,750 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 2EX
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Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:10 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:01:15 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBNRVS3
Highway Comment: Imported from RGPNBNRVS3.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:01:05 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1003+64.250

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Freeway Ramp Evaluation

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Evaluation Start Location: 1000+00.000
Evaluation End Location: 1003+64.250
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

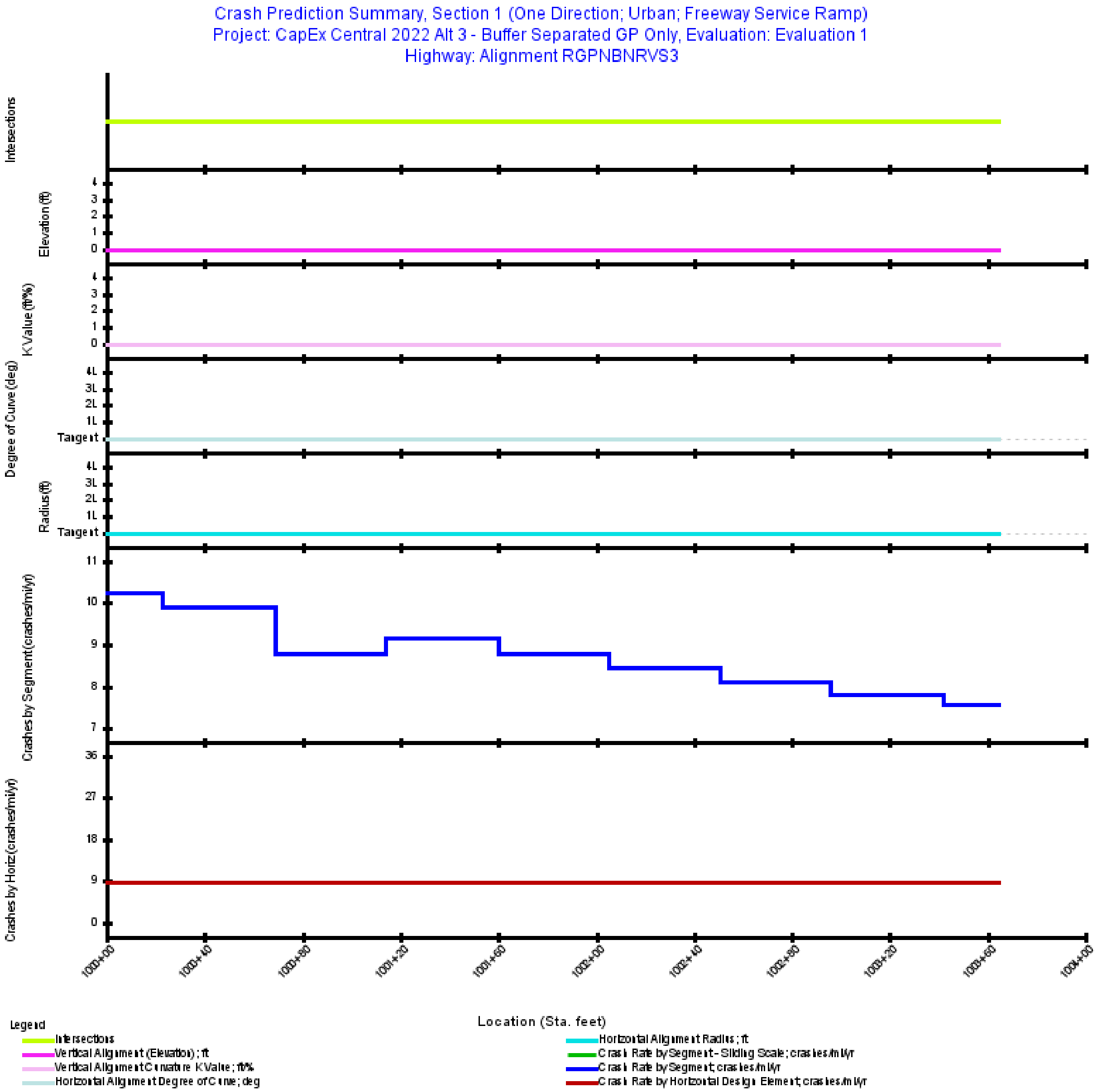

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1000+23.000	23.00	0.0044	2030: 25,500
2	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+23.000	1000+69.000	46.00	0.0087	2030: 25,500
3	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+69.000	1001+14.000	45.00	0.0085	2030: 25,500
4	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1001+14.000	1001+60.000	46.00	0.0087	2030: 25,500
5	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1001+60.000	1002+05.000	45.00	0.0085	2030: 25,500
6	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+05.000	1002+51.000	46.00	0.0087	2030: 25,500
7	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+51.000	1002+96.000	45.00	0.0085	2030: 25,500
8	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1002+96.000	1003+42.000	46.00	0.0087	2030: 25,500
9	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1003+42.000	1003+64.250	22.25	0.0042	2030: 25,500

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0690**
Average Future Road AADT (vpd)	**25,500**
Predicted Crashes	
Total Crashes	**0.60**
Fatal and Injury Crashes	**0.31**
Property-Damage-Only Crashes	**0.29**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**52**
Percent Property-Damage-Only Crashes (%)	**48**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**8.7272**
FI Crash Rate (crashes/mi/yr)	**4.5173**
PDO Crash Rate (crashes/mi/yr)	**4.2100**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.64**
Travel Crash Rate (crashes/million veh-mi)	**0.94**
Travel FI Crash Rate (crashes/million veh-mi)	**0.48**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.45**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1000+23.000	0.0044	0.044	0.0445	0.0242	0.0204	10.2254	1.10
2	1000+23.000	1000+69.000	0.0087	0.086	0.0864	0.0464	0.0400	9.9124	1.06
3	1000+69.000	1001+14.000	0.0085	0.075	0.0747	0.0395	0.0352	8.7635	0.94
4	1001+14.000	1001+60.000	0.0087	0.080	0.0796	0.0417	0.0379	9.1371	0.98
5	1001+60.000	1002+05.000	0.0085	0.075	0.0748	0.0386	0.0362	8.7751	0.94
6	1002+05.000	1002+51.000	0.0087	0.073	0.0734	0.0374	0.0360	8.4290	0.91
7	1002+51.000	1002+96.000	0.0085	0.069	0.0690	0.0347	0.0343	8.0982	0.87
8	1002+96.000	1003+42.000	0.0087	0.068	0.0678	0.0336	0.0342	7.7819	0.84
9	1003+42.000	1003+64.250	0.0042	0.032	0.0318	0.0156	0.0162	7.5538	0.81
Total			0.0690	0.602	0.6021	0.3116	0.2904	8.7272	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1003+64.250	0.0690	0.602	0.6021	0.3116	0.2904	8.7272	0.94

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.60	0.31	51.761	0.29	48.239
Total	0.60	0.31	51.761	0.29	48.239
Average	0.60	0.31	51.761	0.29	48.239

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0004	0.0014	0.0089	0.0135	0.0204
2	0.0009	0.0026	0.0171	0.0258	0.0400
3	0.0008	0.0023	0.0151	0.0213	0.0352
4	0.0008	0.0023	0.0153	0.0232	0.0379
5	0.0007	0.0022	0.0142	0.0215	0.0362
6	0.0007	0.0021	0.0138	0.0208	0.0360
7	0.0006	0.0020	0.0128	0.0193	0.0343
8	0.0006	0.0019	0.0124	0.0187	0.0342
9	0.0003	0.0009	0.0057	0.0087	0.0162
Total	0.0058	0.0177	0.1153	0.1728	0.2904

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.00	0.6	0.00	0.7
Highway Segment	Collision with Fixed Object	0.13	22.2	0.12	19.6	0.25	41.8
Highway Segment	Collision with Other Object	0.01	1.6	0.02	3.8	0.03	5.4
Highway Segment	Other Single-vehicle Collision	0.04	6.4	0.02	2.9	0.06	9.3
Highway Segment	Collision with Parked Vehicle	0.00	0.5	0.00	0.4	0.01	0.9
Highway Segment	Total Single Vehicle Crashes	0.18	30.8	0.17	27.3	0.35	58.1
Highway Segment	Right-Angle Collision	0.00	0.7	0.00	0.4	0.01	1.0
Highway Segment	Head-on Collision	0.00	0.2	0.00	0.0	0.00	0.2
Highway Segment	Other Multi-vehicle Collision	0.00	0.7	0.00	0.5	0.01	1.2
Highway Segment	Rear-end Collision	0.10	15.7	0.09	14.4	0.18	30.1
Highway Segment	Sideswipe, Same Direction Collision	0.02	3.8	0.03	5.6	0.06	9.3
Highway Segment	Total Multiple Vehicle Crashes	0.13	21.0	0.13	20.9	0.25	41.9
Highway Segment	Total Highway Segment Crashes	0.31	51.8	0.29	48.2	0.60	100.0
	Total Crashes	0.31	51.8	0.29	48.2	0.60	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1000+23.000	Warning: for segment #1 (1000+00.000 to 1000+23.000), The ramp type for Ramp Alignment RGPNBNRVS3 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+23.000	1000+69.000	Warning: for segment #2 (1000+23.000 to 1000+69.000), The ramp type for Ramp Alignment RGPNBNRVS3 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+69.000	1001+14.000	Warning: for segment #3 (1000+69.000 to 1001+14.000), The ramp type for Ramp Alignment RGPNBNRVS3 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1001+14.000	1001+60.000	Warning: for segment #4 (1001+14.000 to 1001+60.000), The ramp type for Ramp Alignment RGPNBNRVS3 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1001+60.000	1002+05.000	Warning: for segment #5 (1001+60.000 to 1002+05.000), The ramp type for Ramp Alignment RGPNBNRVS3 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+05.000	1002+51.000	Warning: for segment #6 (1002+05.000 to 1002+51.000), The ramp type for Ramp Alignment RGPNBNRVS3 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+51.000	1002+96.000	Warning: for segment #7 (1002+51.000 to 1002+96.000), The ramp type for Ramp Alignment RGPNBNRVS3 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1002+96.000	1003+42.000	Warning: for segment #8 (1002+96.000 to 1003+42.000), The ramp type for Ramp Alignment RGPNBNRVS3 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1003+42.000	1003+64.250	Warning: for segment #9 (1003+42.000 to 1003+64.250), The ramp type for Ramp Alignment RGPNBNRVS3 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1000+23.000	Warning: for segment #1 (1000+00.000 to 1000+23.000), traffic volume (25,500 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1000+23.000	1000+69.000	Warning: for segment #2 (1000+23.000 to 1000+69.000), traffic volume (25,500 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1000+69.000	1001+14.000	Warning: for segment #3 (1000+69.000 to 1001+14.000), traffic volume (25,500 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1001+14.000	1001+60.000	Warning: for segment #4 (1001+14.000 to 1001+60.000), traffic volume (25,500 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1001+60.000	1002+05.000	Warning: for segment #5 (1001+60.000 to 1002+05.000), traffic volume (25,500 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1002+05.000	1002+51.000	Warning: for segment #6 (1002+05.000 to 1002+51.000), traffic volume (25,500 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1002+51.000	1002+96.000	Warning: for segment #7 (1002+51.000 to 1002+96.000), traffic volume (25,500 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1002+96.000	1003+42.000	Warning: for segment #8 (1002+96.000 to 1003+42.000), traffic volume (25,500 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN
1003+42.000	1003+64.250	Warning: for segment #9 (1003+42.000 to 1003+64.250), traffic volume (25,500 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:10 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:03:42 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBXHLY3
Highway Comment: Imported from RGPNBXHLY3.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:03:31 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1008+42.869

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1008+42.869
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

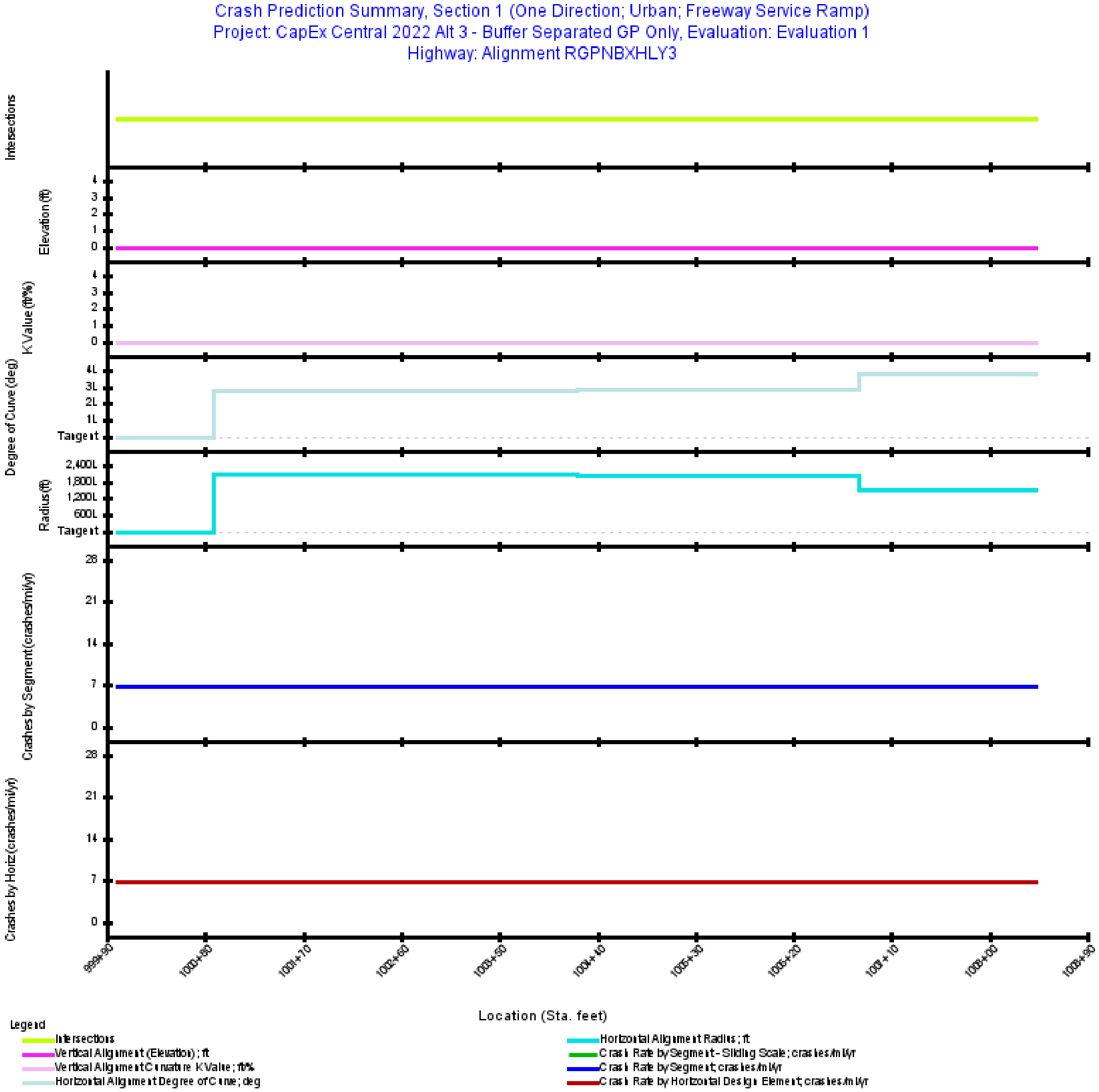

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1008+42.869	842.87	0.1596	2030: 19,950

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1596**
Average Future Road AADT (vpd)	**19,950**
Predicted Crashes	
Total Crashes	**1.07**
Fatal and Injury Crashes	**0.52**
Property-Damage-Only Crashes	**0.56**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**6.7150**
FI Crash Rate (crashes/mi/yr)	**3.2292**
PDO Crash Rate (crashes/mi/yr)	**3.4858**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.16**
Travel Crash Rate (crashes/million veh-mi)	**0.92**
Travel FI Crash Rate (crashes/million veh-mi)	**0.44**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.48**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1008+42.869	0.1596	1.072	1.0719	0.5155	0.5564	6.7150	0.92
Total			0.1596	1.072	1.0719	0.5155	0.5564	6.7150	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1000+87.420	0.0166	0.111	0.1112	0.0535	0.0577	6.7150	0.92
Simple Curve 1	1000+87.420	1004+22.130	0.0634	0.426	0.4257	0.2047	0.2210	6.7150	0.92
Simple Curve 2	1004+22.130	1006+80.808	0.0490	0.329	0.3290	0.1582	0.1708	6.7150	0.92
Simple Curve 3	1006+80.808	1008+42.869	0.0307	0.206	0.2061	0.0991	0.1070	6.7150	0.92

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.07	0.52	48.090	0.56	51.910
Total	1.07	0.52	48.090	0.56	51.910
Average	1.07	0.52	48.090	0.56	51.910

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0135	0.0409	0.1756	0.2856	0.5564

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.35	32.3	0.34	31.7	0.69	63.9
Highway Segment	Collision with Other Object	0.02	2.3	0.07	6.1	0.09	8.4
Highway Segment	Other Single-vehicle Collision	0.10	9.3	0.05	4.7	0.15	14.0
Highway Segment	Collision with Parked Vehicle	0.01	0.7	0.01	0.7	0.01	1.4
Highway Segment	Total Single Vehicle Crashes	0.48	44.7	0.47	44.2	0.95	88.9
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.2	0.00	0.3
Highway Segment	Rear-end Collision	0.03	2.5	0.06	5.3	0.08	7.9
Highway Segment	Sideswipe, Same Direction Collision	0.01	0.6	0.02	2.0	0.03	2.7
Highway Segment	Total Multiple Vehicle Crashes	0.04	3.4	0.08	7.7	0.12	11.1
Highway Segment	Total Highway Segment Crashes	0.52	48.1	0.56	51.9	1.07	100.0
	Total Crashes	0.52	48.1	0.56	51.9	1.07	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1008+42.869	Warning: for segment #1 (1000+00.000 to 1008+42.869), The ramp type for Ramp Alignment RGPNBXHLY3 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1008+42.869	Warning: for segment #1 (1000+00.000 to 1008+42.869), traffic volume (19,950 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:04:30 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBXWODL3
Highway Comment: Imported from RGPNBXWODL3.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:04:19 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1011+81.406

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1011+81.406
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

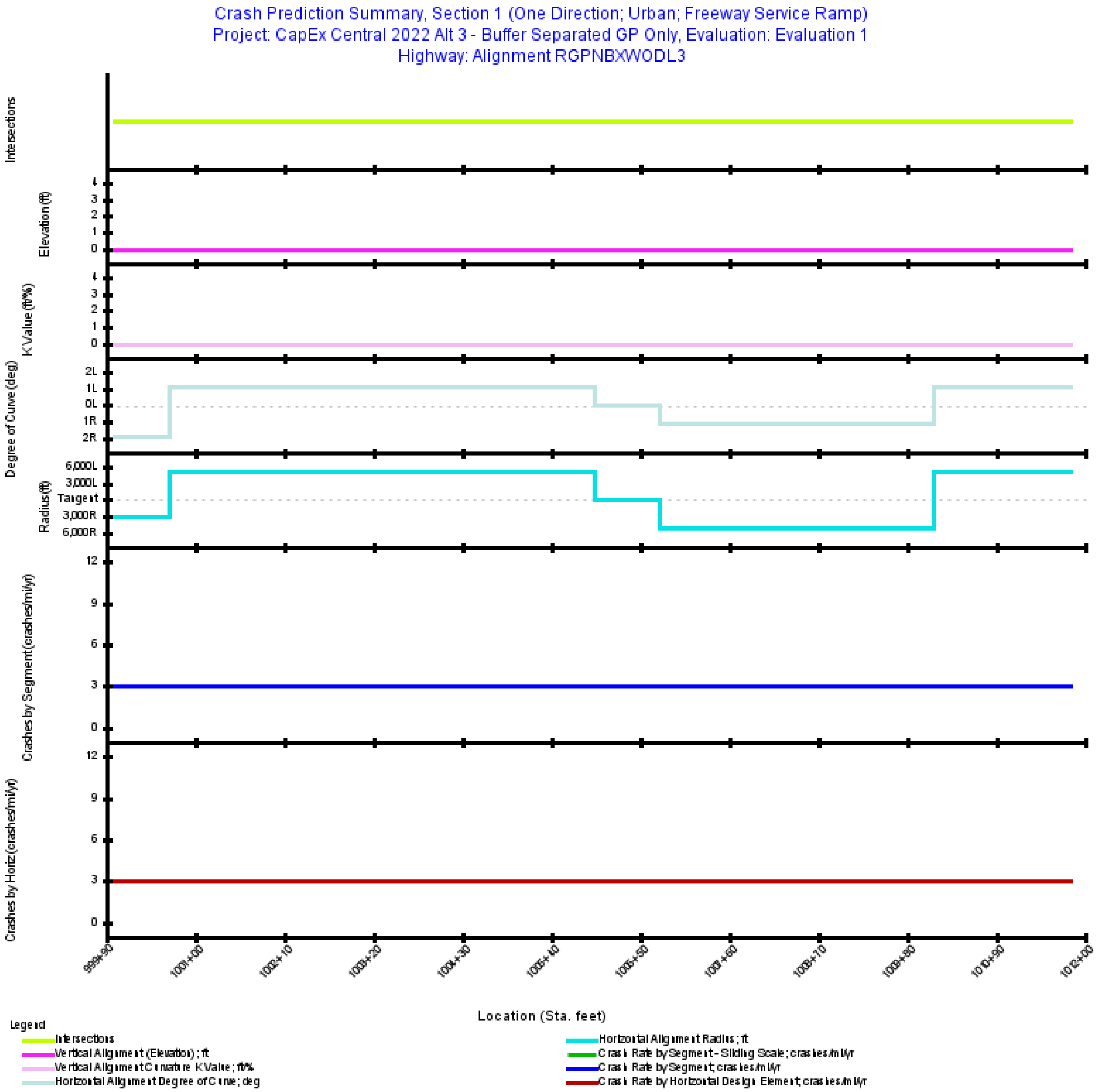

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1011+81.406	1,181.41	0.2238	2030: 7,350

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2238**
Average Future Road AADT (vpd)	**7,350**
Predicted Crashes	
Total Crashes	**0.67**
Fatal and Injury Crashes	**0.32**
Property-Damage-Only Crashes	**0.34**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**49**
Percent Property-Damage-Only Crashes (%)	**51**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**2.9730**
FI Crash Rate (crashes/mi/yr)	**1.4450**
PDO Crash Rate (crashes/mi/yr)	**1.5280**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.60**
Travel Crash Rate (crashes/million veh-mi)	**1.11**
Travel FI Crash Rate (crashes/million veh-mi)	**0.54**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.57**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1011+81.406	0.2238	0.665	0.6652	0.3233	0.3419	2.9730	1.11
Total			0.2238	0.665	0.6652	0.3233	0.3419	2.9730	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1000+68.121	0.0129	0.038	0.0384	0.0186	0.0197	2.9730	1.11
Simple Curve 2	1000+68.121	1005+93.362	0.0995	0.296	0.2957	0.1437	0.1520	2.9730	1.11
Tangent	1005+93.362	1006+73.817	0.0152	0.045	0.0453	0.0220	0.0233	2.9730	1.11
Simple Curve 3	1006+73.817	1010+11.731	0.0640	0.190	0.1903	0.0925	0.0978	2.9730	1.11
Simple Curve 4	1010+11.731	1011+81.406	0.0321	0.096	0.0955	0.0464	0.0491	2.9730	1.11

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.67	0.32	48.603	0.34	51.397
Total	0.67	0.32	48.603	0.34	51.397
Average	0.67	0.32	48.603	0.34	51.397

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0083	0.0252	0.1088	0.1809	0.3419

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.22	33.7	0.22	33.2	0.45	67.0
Highway Segment	Collision with Other Object	0.02	2.4	0.04	6.5	0.06	8.8
Highway Segment	Other Single-vehicle Collision	0.07	9.7	0.03	5.0	0.10	14.7
Highway Segment	Collision with Parked Vehicle	0.01	0.7	0.01	0.7	0.01	1.4
Highway Segment	Total Single Vehicle Crashes	0.31	46.7	0.31	46.4	0.62	93.1
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Rear-end Collision	0.01	1.4	0.02	3.4	0.03	4.9
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.3	0.01	1.3	0.01	1.7
Highway Segment	Total Multiple Vehicle Crashes	0.01	1.9	0.03	5.0	0.05	6.9
Highway Segment	Total Highway Segment Crashes	0.32	48.6	0.34	51.4	0.67	100.0
	Total Crashes	0.32	48.6	0.34	51.4	0.67	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1011+81.406	Warning: for segment #1 (1000+00.000 to 1011+81.406), The ramp type for Ramp Alignment RGPNBXWODL3 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:11 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:01:40 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBNWODW2
Highway Comment: Imported from RGPNBNWODW2.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:01:29 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1022+41.323

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1022+41.323
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

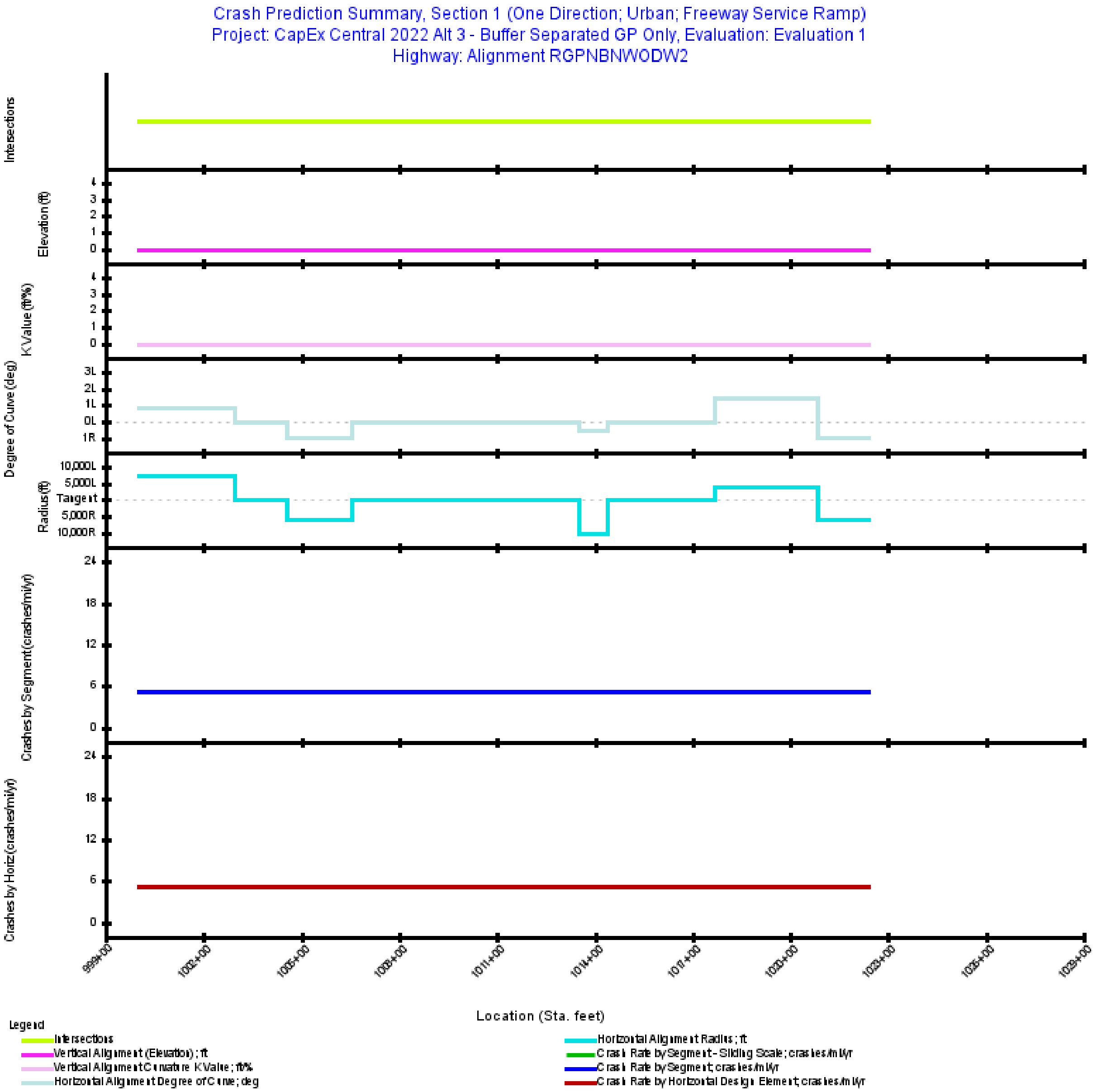

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1022+41.323	2,241.32	0.4245	2030: 14,100

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.4245**
Average Future Road AADT (vpd)	**14,100**
Predicted Crashes	
Total Crashes	**2.20**
Fatal and Injury Crashes	**0.98**
Property-Damage-Only Crashes	**1.22**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**45**
Percent Property-Damage-Only Crashes (%)	**55**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.1827**
FI Crash Rate (crashes/mi/yr)	**2.3090**
PDO Crash Rate (crashes/mi/yr)	**2.8737**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.18**
Travel Crash Rate (crashes/million veh-mi)	**1.01**
Travel FI Crash Rate (crashes/million veh-mi)	**0.45**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.56**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1022+41.323	0.4245	2.200	2.2000	0.9802	1.2199	5.1827	1.01
Total			0.4245	2.200	2.2000	0.9802	1.2199	5.1827	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1002+98.217	0.0565	0.293	0.2927	0.1304	0.1623	5.1827	1.01
Tangent	1002+98.217	1004+56.235	0.0299	0.155	0.1551	0.0691	0.0860	5.1827	1.01
Simple Curve 2	1004+56.235	1006+53.990	0.0375	0.194	0.1941	0.0865	0.1076	5.1827	1.01
Tangent	1006+53.990	1013+53.076	0.1324	0.686	0.6862	0.3057	0.3805	5.1827	1.01
Simple Curve 3	1013+53.076	1014+37.871	0.0161	0.083	0.0832	0.0371	0.0462	5.1827	1.01
Tangent	1014+37.871	1017+68.231	0.0626	0.324	0.3243	0.1445	0.1798	5.1827	1.01
Simple Curve 4	1017+68.231	1020+86.035	0.0602	0.312	0.3119	0.1390	0.1730	5.1827	1.01
Simple Curve 5	1020+86.035	1022+41.323	0.0294	0.152	0.1524	0.0679	0.0845	5.1827	1.01

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.20	0.98	44.552	1.22	55.448
Total	2.20	0.98	44.552	1.22	55.448
Average	2.20	0.98	44.552	1.22	55.448

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0164	0.0496	0.3297	0.5845	1.2199

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.02	0.8	0.02	0.9
Highway Segment	Collision with Fixed Object	0.53	24.0	0.57	25.7	1.09	49.7
Highway Segment	Collision with Other Object	0.04	1.7	0.11	5.0	0.15	6.7
Highway Segment	Other Single-vehicle Collision	0.15	6.9	0.09	3.8	0.24	10.7
Highway Segment	Collision with Parked Vehicle	0.01	0.5	0.01	0.6	0.02	1.1
Highway Segment	Total Single Vehicle Crashes	0.73	33.2	0.79	35.9	1.52	69.1
Highway Segment	Right-Angle Collision	0.01	0.4	0.01	0.4	0.01	0.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.01	0.4	0.01	0.5	0.02	0.8
Highway Segment	Rear-end Collision	0.19	8.5	0.30	13.5	0.48	22.0
Highway Segment	Sideswipe, Same Direction Collision	0.04	2.0	0.11	5.2	0.16	7.2
Highway Segment	Total Multiple Vehicle Crashes	0.25	11.4	0.43	19.5	0.68	30.9
Highway Segment	Total Highway Segment Crashes	0.98	44.6	1.22	55.4	2.20	100.0
	Total Crashes	0.98	44.6	1.22	55.4	2.20	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1022+41.323	Warning: for segment #1 (1000+00.000 to 1022+41.323), The ramp type for Ramp Alignment RGPNBNWODW2 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:04:05 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBXOLF2
Highway Comment: Imported from RGPNBXOLF2.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:03:55 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1004+21.621

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1004+21.621
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

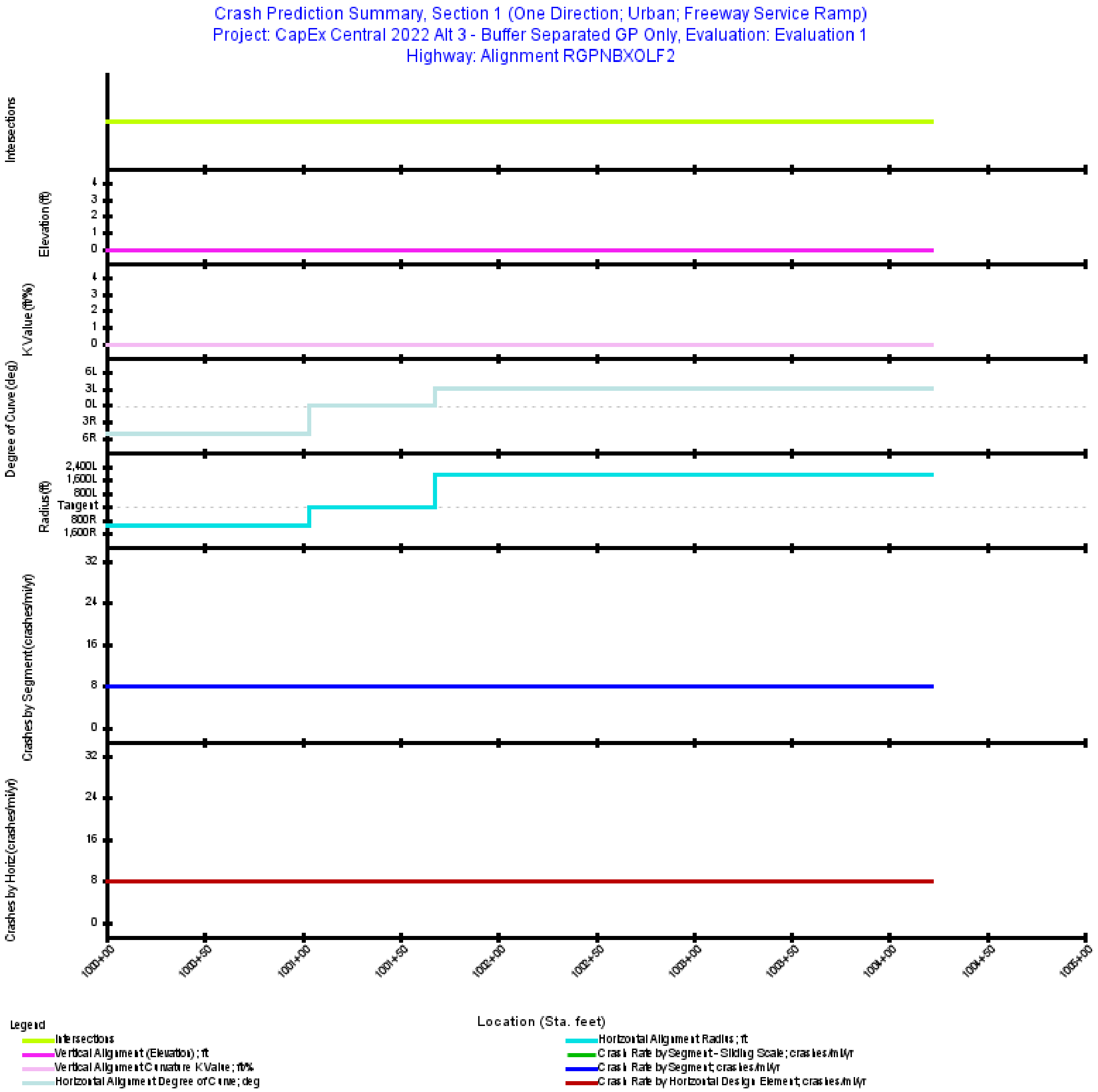

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1004+21.621	421.62	0.0799	2030: 24,050

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0799**
Average Future Road AADT (vpd)	**24,050**
Predicted Crashes	
Total Crashes	**0.63**
Fatal and Injury Crashes	**0.30**
Property-Damage-Only Crashes	**0.33**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**7.8761**
FI Crash Rate (crashes/mi/yr)	**3.7874**
PDO Crash Rate (crashes/mi/yr)	**4.0888**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.70**
Travel Crash Rate (crashes/million veh-mi)	**0.90**
Travel FI Crash Rate (crashes/million veh-mi)	**0.43**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.47**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1004+21.621	0.0799	0.629	0.6289	0.3024	0.3265	7.8761	0.90
Total			0.0799	0.629	0.6289	0.3024	0.3265	7.8761	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+03.265	0.0196	0.154	0.1540	0.0741	0.0800	7.8761	0.90
Tangent	1001+03.265	1001+68.100	0.0123	0.097	0.0967	0.0465	0.0502	7.8761	0.90
Simple Curve 2	1001+68.100	1004+21.621	0.0480	0.378	0.3782	0.1819	0.1963	7.8761	0.90

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.63	0.30	48.087	0.33	51.913
Total	0.63	0.30	48.087	0.33	51.913
Average	0.63	0.30	48.087	0.33	51.913

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0080	0.0244	0.1045	0.1655	0.3265

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.1
Highway Segment	Collision with Fixed Object	0.20	31.7	0.20	31.3	0.40	63.1
Highway Segment	Collision with Other Object	0.01	2.2	0.04	6.1	0.05	8.3
Highway Segment	Other Single-vehicle Collision	0.06	9.1	0.03	4.7	0.09	13.8
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.7	0.01	1.4
Highway Segment	Total Single Vehicle Crashes	0.28	43.9	0.28	43.8	0.55	87.7
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.3
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.2	0.00	0.3
Highway Segment	Rear-end Collision	0.02	3.1	0.04	5.6	0.06	8.7
Highway Segment	Sideswipe, Same Direction Collision	0.01	0.8	0.01	2.2	0.02	2.9
Highway Segment	Total Multiple Vehicle Crashes	0.03	4.2	0.05	8.1	0.08	12.3
Highway Segment	Total Highway Segment Crashes	0.30	48.1	0.33	51.9	0.63	100.0
	Total Crashes	0.30	48.1	0.33	51.9	0.63	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1004+21.621	Warning: for segment #1 (1000+00.000 to 1004+21.621), The ramp type for Ramp Alignment RGPNBXOLF2 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1004+21.621	Warning: for segment #1 (1000+00.000 to 1004+21.621), traffic volume (24,050 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:12 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 10:59:39 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPNBN712
Highway Comment: Imported from RGPNBN712.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 10:59:29 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1010+50.147

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1010+50.147
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

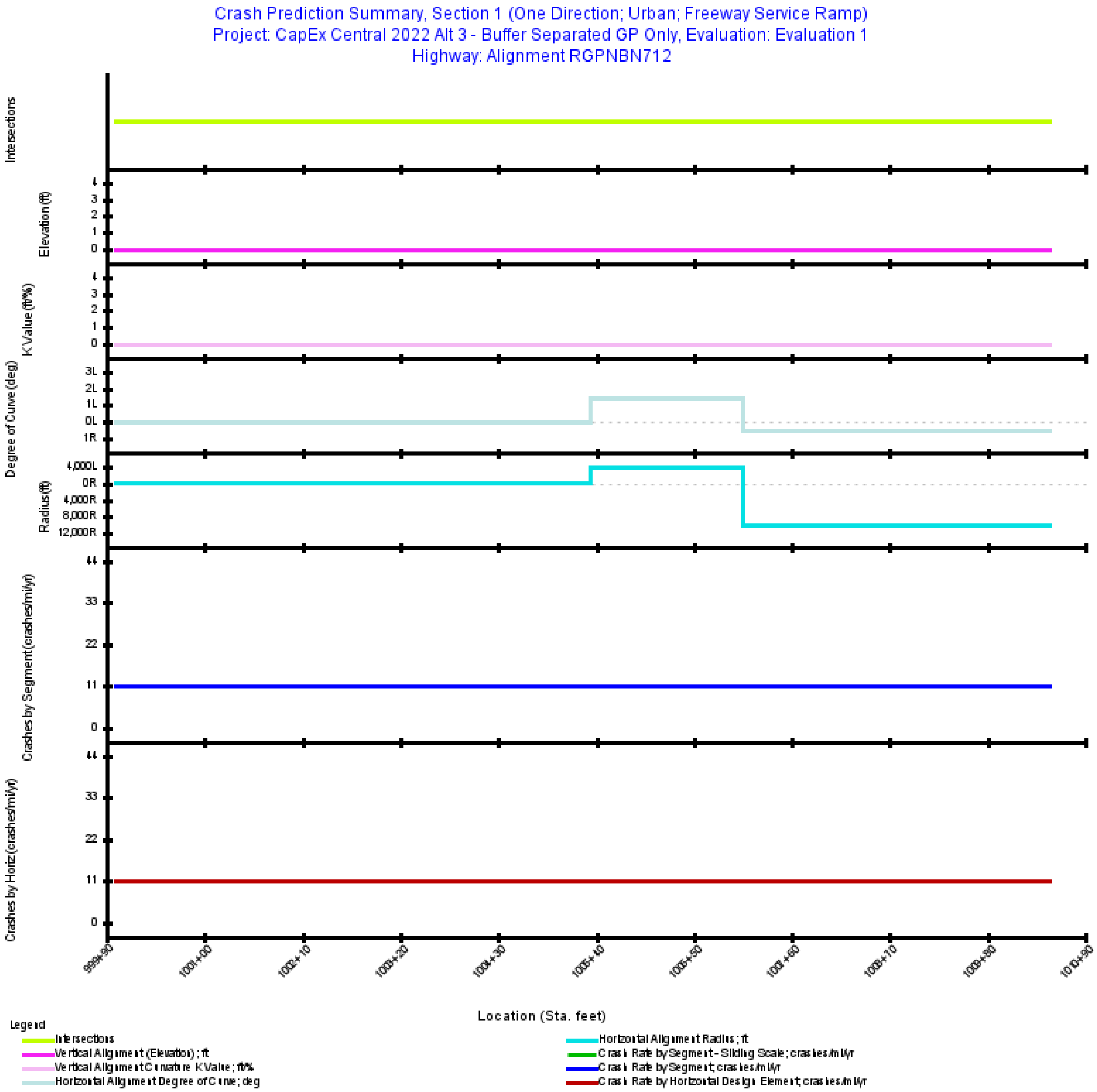

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane Ramp Entrance	Urban	1000+00.000	1010+50.147	1,050.15	0.1989	2030: 21,000

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1989**
Average Future Road AADT (vpd)	**21,000**
Predicted Crashes	
Total Crashes	**2.17**
Fatal and Injury Crashes	**0.83**
Property-Damage-Only Crashes	**1.33**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**38**
Percent Property-Damage-Only Crashes (%)	**62**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**10.8900**
FI Crash Rate (crashes/mi/yr)	**4.1790**
PDO Crash Rate (crashes/mi/yr)	**6.7109**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.52**
Travel Crash Rate (crashes/million veh-mi)	**1.42**
Travel FI Crash Rate (crashes/million veh-mi)	**0.55**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.88**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1010+50.147	0.1989	2.166	2.1659	0.8312	1.3347	10.8900	1.42
Total			0.1989	2.166	2.1659	0.8312	1.3347	10.8900	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1005+34.189	0.1012	1.102	1.1018	0.4228	0.6790	10.8900	1.42
Simple Curve 1	1005+34.189	1007+04.505	0.0323	0.351	0.3513	0.1348	0.2165	10.8900	1.42
Simple Curve 2	1007+04.505	1010+50.147	0.0655	0.713	0.7129	0.2736	0.4393	10.8900	1.42

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.17	0.83	38.375	1.33	61.625
Total	2.17	0.83	38.375	1.33	61.625
Average	2.17	0.83	38.375	1.33	61.625

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0133	0.0405	0.2171	0.5602	1.3347

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.6	0.01	0.7
Highway Segment	Collision with Fixed Object	0.32	14.9	0.45	20.5	0.77	35.4
Highway Segment	Collision with Other Object	0.02	1.1	0.09	4.0	0.11	5.0
Highway Segment	Other Single-vehicle Collision	0.09	4.3	0.07	3.1	0.16	7.4
Highway Segment	Collision with Parked Vehicle	0.01	0.3	0.01	0.5	0.02	0.8
Highway Segment	Total Single Vehicle Crashes	0.45	20.6	0.62	28.7	1.07	49.3
Highway Segment	Right-Angle Collision	0.01	0.6	0.01	0.6	0.03	1.1
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.1	0.01	0.2
Highway Segment	Other Multi-vehicle Collision	0.01	0.6	0.02	0.8	0.03	1.3
Highway Segment	Rear-end Collision	0.29	13.3	0.49	22.7	0.78	36.0
Highway Segment	Sideswipe, Same Direction Collision	0.07	3.2	0.19	8.8	0.26	12.0
Highway Segment	Total Multiple Vehicle Crashes	0.38	17.7	0.71	32.9	1.10	50.7
Highway Segment	Total Highway Segment Crashes	0.83	38.4	1.33	61.6	2.17	100.0
	Total Crashes	0.83	38.4	1.33	61.6	2.17	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1010+50.147	Warning: for segment #1 (1000+00.000 to 1010+50.147), The ramp type for Ramp Alignment RGPNBN712 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:13 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:05:18 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBN2903
Highway Comment: Imported from RGPSBN2903.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:05:08 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1014+43.974

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1014+43.974
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

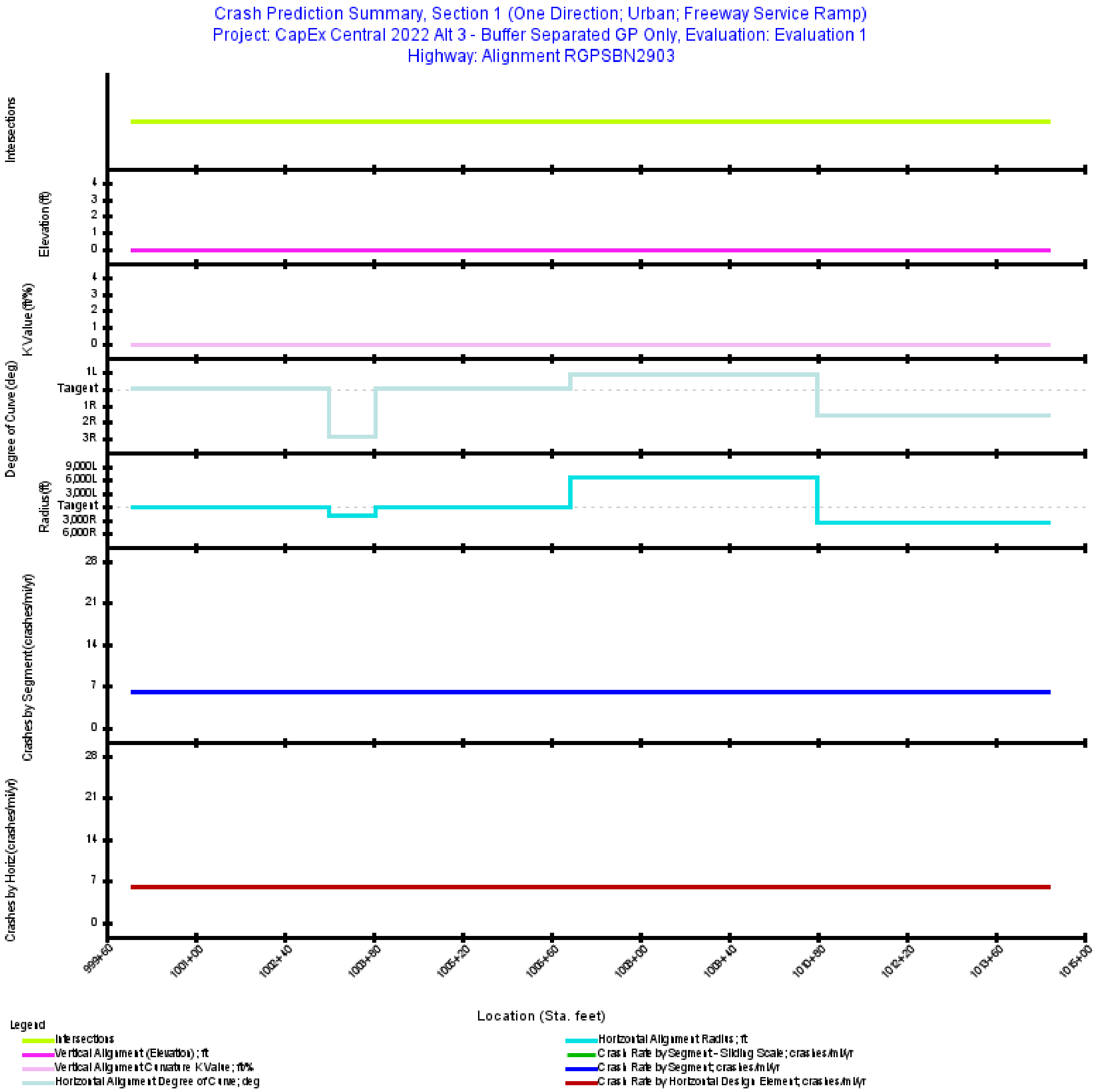

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1014+43.974	1,443.97	0.2735	2030: 18,000

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2735**
Average Future Road AADT (vpd)	**18,000**
Predicted Crashes	
Total Crashes	**1.66**
Fatal and Injury Crashes	**0.73**
Property-Damage-Only Crashes	**0.94**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**44**
Percent Property-Damage-Only Crashes (%)	**56**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**6.0852**
FI Crash Rate (crashes/mi/yr)	**2.6538**
PDO Crash Rate (crashes/mi/yr)	**3.4314**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.80**
Travel Crash Rate (crashes/million veh-mi)	**0.93**
Travel FI Crash Rate (crashes/million veh-mi)	**0.40**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.52**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1014+43.974	0.2735	1.664	1.6642	0.7258	0.9384	6.0852	0.93
Total			0.2735	1.664	1.6642	0.7258	0.9384	6.0852	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1003+09.382	0.0586	0.357	0.3566	0.1555	0.2011	6.0852	0.93
Simple Curve 1	1003+09.382	1003+83.003	0.0139	0.085	0.0848	0.0370	0.0478	6.0852	0.93
Tangent	1003+83.003	1006+90.862	0.0583	0.355	0.3548	0.1547	0.2001	6.0852	0.93
Simple Curve 2	1006+90.862	1010+78.886	0.0735	0.447	0.4472	0.1950	0.2522	6.0852	0.93
Simple Curve 3	1010+78.886	1014+43.974	0.0691	0.421	0.4208	0.1835	0.2373	6.0852	0.93

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.66	0.73	43.611	0.94	56.389
Total	1.66	0.73	43.611	0.94	56.389
Average	1.66	0.73	43.611	0.94	56.389

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0121	0.0367	0.2438	0.4332	0.9384

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.8	0.01	0.9
Highway Segment	Collision with Fixed Object	0.37	22.1	0.41	25.0	0.78	47.0
Highway Segment	Collision with Other Object	0.03	1.6	0.08	4.8	0.11	6.4
Highway Segment	Other Single-vehicle Collision	0.11	6.4	0.06	3.7	0.17	10.1
Highway Segment	Collision with Parked Vehicle	0.01	0.5	0.01	0.6	0.02	1.0
Highway Segment	Total Single Vehicle Crashes	0.51	30.6	0.58	34.9	1.09	65.4
Highway Segment	Right-Angle Collision	0.01	0.4	0.01	0.4	0.01	0.8
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.01	0.4	0.01	0.5	0.01	0.9
Highway Segment	Rear-end Collision	0.16	9.8	0.25	14.9	0.41	24.6
Highway Segment	Sideswipe, Same Direction Collision	0.04	2.3	0.10	5.7	0.13	8.1
Highway Segment	Total Multiple Vehicle Crashes	0.22	13.0	0.36	21.5	0.57	34.6
Highway Segment	Total Highway Segment Crashes	0.73	43.6	0.94	56.4	1.66	100.0
	Total Crashes	0.73	43.6	0.94	56.4	1.66	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1014+43.974	Warning: for segment #1 (1000+00.000 to 1014+43.974), The ramp type for Ramp Alignment RGPSBN2903 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:13 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:07:19 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBX493
Highway Comment: Imported from RGPSBX493.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:07:09 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1008+84.641

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1008+84.641
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

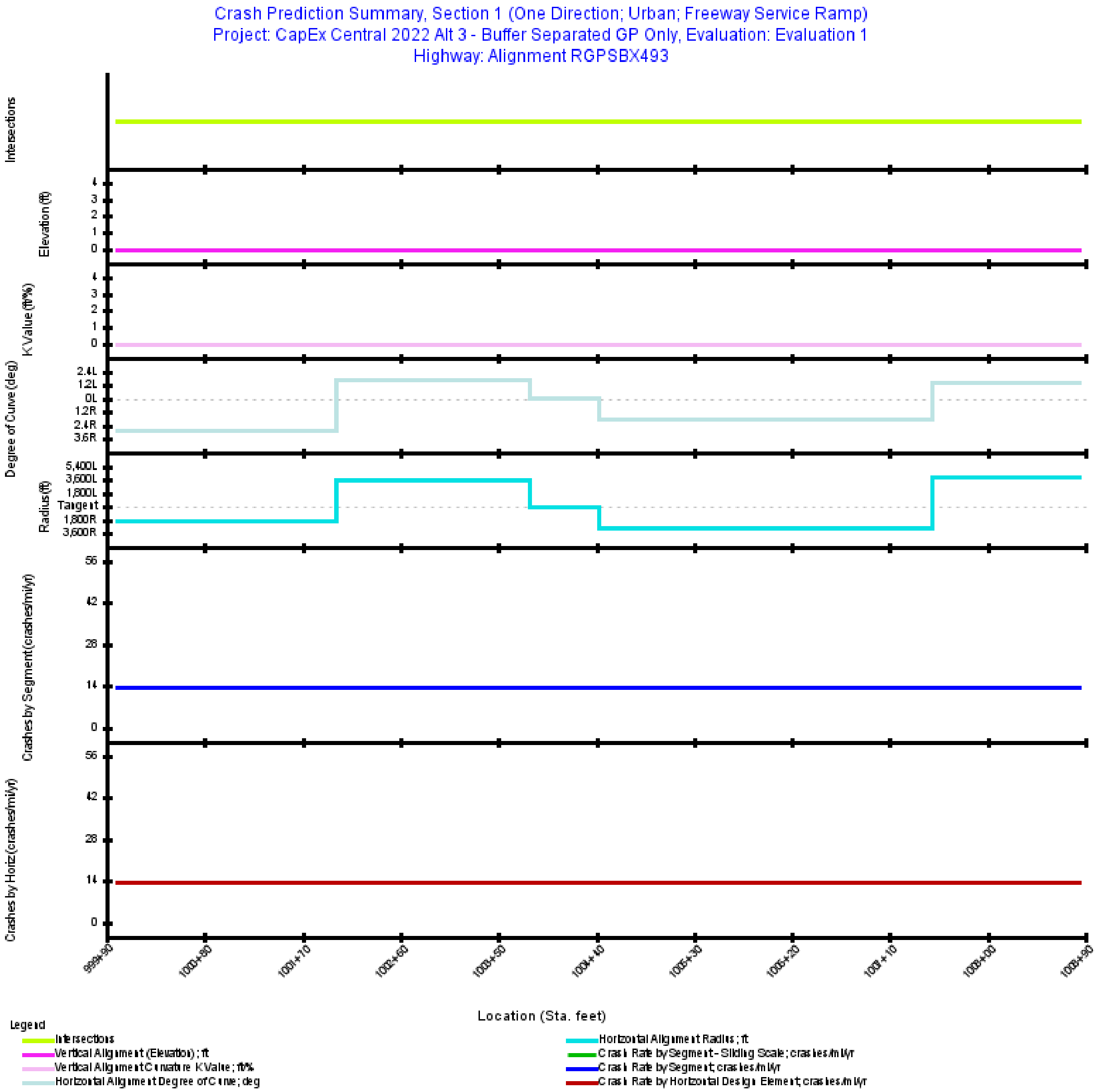

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1008+84.641	884.64	0.1675	2030: 41,750

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1675**
Average Future Road AADT (vpd)	**41,750**
Predicted Crashes	
Total Crashes	**2.25**
Fatal and Injury Crashes	**1.20**
Property-Damage-Only Crashes	**1.05**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**53**
Percent Property-Damage-Only Crashes (%)	**47**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**13.4378**
FI Crash Rate (crashes/mi/yr)	**7.1504**
PDO Crash Rate (crashes/mi/yr)	**6.2874**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.55**
Travel Crash Rate (crashes/million veh-mi)	**0.88**
Travel FI Crash Rate (crashes/million veh-mi)	**0.47**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.41**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1008+84.641	0.1675	2.252	2.2515	1.1980	1.0534	13.4378	0.88
Total			0.1675	2.252	2.2515	1.1980	1.0534	13.4378	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1002+01.311	0.0381	0.512	0.5123	0.2726	0.2397	13.4378	0.88
Simple Curve 2	1002+01.311	1003+78.552	0.0336	0.451	0.4511	0.2400	0.2111	13.4378	0.88
Tangent	1003+78.552	1004+43.059	0.0122	0.164	0.1642	0.0874	0.0768	13.4378	0.88
Simple Curve 3	1004+43.059	1007+48.492	0.0578	0.777	0.7773	0.4136	0.3637	13.4378	0.88
Simple Curve 4	1007+48.492	1008+84.641	0.0258	0.346	0.3465	0.1844	0.1621	13.4378	0.88

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.25	1.20	53.211	1.05	46.789
Total	2.25	1.20	53.211	1.05	46.789
Average	2.25	1.20	53.211	1.05	46.789

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0312	0.0945	0.4067	0.6656	1.0534

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.02	0.8	0.02	1.0
Highway Segment	Collision with Fixed Object	0.66	29.3	0.59	26.2	1.25	55.5
Highway Segment	Collision with Other Object	0.05	2.1	0.12	5.1	0.16	7.2
Highway Segment	Other Single-vehicle Collision	0.19	8.4	0.09	3.9	0.28	12.3
Highway Segment	Collision with Parked Vehicle	0.01	0.6	0.01	0.6	0.03	1.2
Highway Segment	Total Single Vehicle Crashes	0.91	40.5	0.82	36.6	1.74	77.1
Highway Segment	Right-Angle Collision	0.01	0.4	0.00	0.2	0.01	0.6
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.01	0.4	0.01	0.2	0.01	0.6
Highway Segment	Rear-end Collision	0.21	9.5	0.16	7.0	0.37	16.5
Highway Segment	Sideswipe, Same Direction Collision	0.05	2.3	0.06	2.7	0.11	5.0
Highway Segment	Total Multiple Vehicle Crashes	0.28	12.7	0.23	10.2	0.52	22.9
Highway Segment	Total Highway Segment Crashes	1.20	53.2	1.05	46.8	2.25	100.0
	Total Crashes	1.20	53.2	1.05	46.8	2.25	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1008+84.641	Warning: for segment #1 (1000+00.000 to 1008+84.641), The ramp type for Ramp Alignment RGPSBX493 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1008+84.641	Warning: for segment #1 (1000+00.000 to 1008+84.641), traffic volume (41,750 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EX

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:14 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:05:42 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBN413
Highway Comment: Imported from RGPSBN413.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:05:32 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1011+92.933

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1011+92.933
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

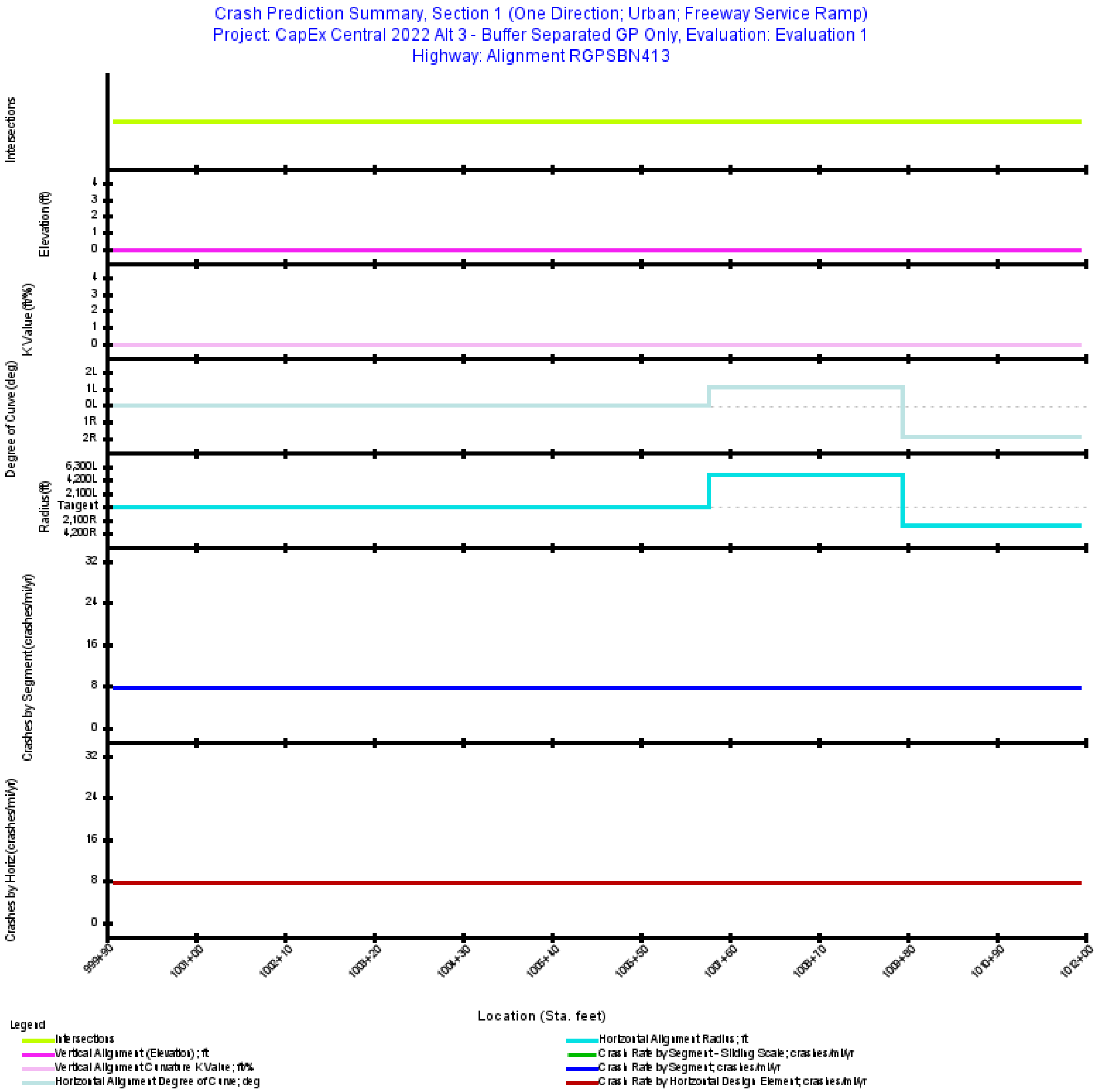

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1011+92.933	1,192.93	0.2259	2030: 21,900

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2259**
Average Future Road AADT (vpd)	**21,900**
Predicted Crashes	
Total Crashes	**1.72**
Fatal and Injury Crashes	**0.79**
Property-Damage-Only Crashes	**0.93**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**46**
Percent Property-Damage-Only Crashes (%)	**54**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**7.6113**
FI Crash Rate (crashes/mi/yr)	**3.4903**
PDO Crash Rate (crashes/mi/yr)	**4.1210**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.81**
Travel Crash Rate (crashes/million veh-mi)	**0.95**
Travel FI Crash Rate (crashes/million veh-mi)	**0.44**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.52**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1011+92.933	0.2259	1.720	1.7197	0.7886	0.9311	7.6113	0.95
Total			0.2259	1.720	1.7197	0.7886	0.9311	7.6113	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1007+34.022	0.1390	1.058	1.0581	0.4852	0.5729	7.6113	0.95
Simple Curve 1	1007+34.022	1009+73.512	0.0454	0.345	0.3452	0.1583	0.1869	7.6113	0.95
Simple Curve 2	1009+73.512	1011+92.933	0.0416	0.316	0.3163	0.1450	0.1713	7.6113	0.95

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.72	0.79	45.856	0.93	54.144
Total	1.72	0.79	45.856	0.93	54.144
Average	1.72	0.79	45.856	0.93	54.144

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0135	0.0410	0.2712	0.4628	0.9311

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.7	0.01	0.8
Highway Segment	Collision with Fixed Object	0.37	21.5	0.39	22.9	0.76	44.4
Highway Segment	Collision with Other Object	0.03	1.5	0.08	4.4	0.10	6.0
Highway Segment	Other Single-vehicle Collision	0.11	6.2	0.06	3.4	0.17	9.6
Highway Segment	Collision with Parked Vehicle	0.01	0.4	0.01	0.5	0.02	1.0
Highway Segment	Total Single Vehicle Crashes	0.51	29.8	0.55	32.0	1.06	61.7
Highway Segment	Right-Angle Collision	0.01	0.5	0.01	0.4	0.01	0.9
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.2
Highway Segment	Other Multi-vehicle Collision	0.01	0.5	0.01	0.5	0.02	1.0
Highway Segment	Rear-end Collision	0.21	12.1	0.26	15.3	0.47	27.4
Highway Segment	Sideswipe, Same Direction Collision	0.05	2.9	0.10	5.9	0.15	8.8
Highway Segment	Total Multiple Vehicle Crashes	0.28	16.1	0.38	22.2	0.66	38.3
Highway Segment	Total Highway Segment Crashes	0.79	45.9	0.93	54.1	1.72	100.0
	Total Crashes	0.79	45.9	0.93	54.1	1.72	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1011+92.933	Warning: for segment #1 (1000+00.000 to 1011+92.933), The ramp type for Ramp Alignment RGPSBN413 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1011+92.933	Warning: for segment #1 (1000+00.000 to 1011+92.933), traffic volume (21,900 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

Disclaimer

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This software product is provided "as-is," without warranty of any kind-either expressed or implied (but not limited to the implied warranties of merchantability and fitness for a particular purpose). The FHWA do not warrant that the functions contained in the software will meet the end-user's requirements or that the operation of the software will be uninterrupted and error-free.

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Report Overview

Report Generated: Aug 25, 2022 2:14 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:08:32 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBXMLK3
Highway Comment: Imported from RGPSBXMLK3.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:08:22 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+97.851

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+97.851
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

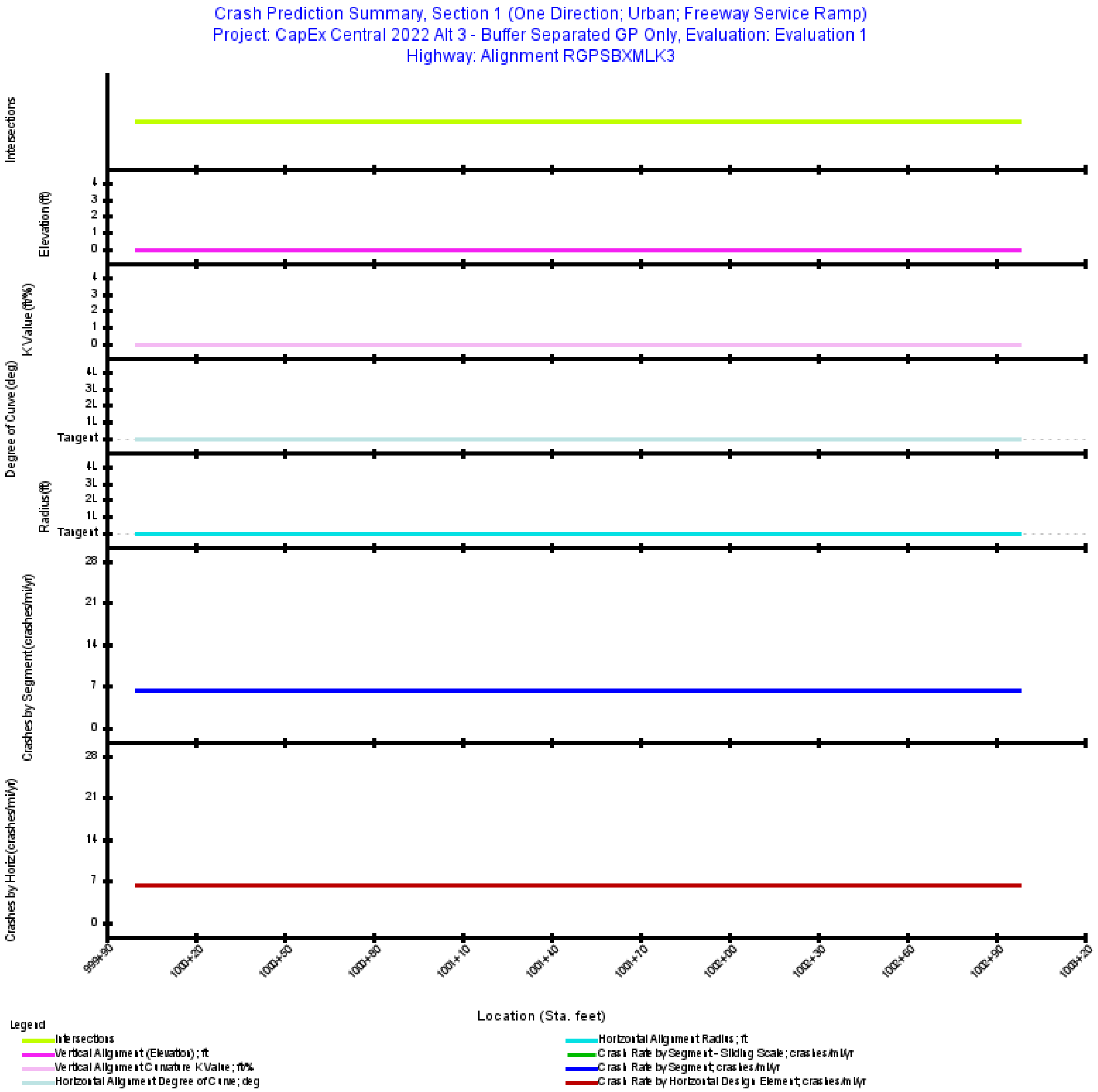

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1000+00.000	1002+97.851	297.85	0.0564	2030: 16,250

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0564**
Average Future Road AADT (vpd)	**16,250**
Predicted Crashes	
Total Crashes	**0.35**
Fatal and Injury Crashes	**0.14**
Property-Damage-Only Crashes	**0.21**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**41**
Percent Property-Damage-Only Crashes (%)	**59**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**6.2479**
FI Crash Rate (crashes/mi/yr)	**2.5341**
PDO Crash Rate (crashes/mi/yr)	**3.7137**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.33**
Travel Crash Rate (crashes/million veh-mi)	**1.05**
Travel FI Crash Rate (crashes/million veh-mi)	**0.43**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.63**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1002+97.851	0.0564	0.352	0.3524	0.1430	0.2095	6.2479	1.05
Total			0.0564	0.352	0.3524	0.1430	0.2095	6.2479	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1002+97.851	0.0564	0.352	0.3524	0.1430	0.2095	6.2479	1.05

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.35	0.14	40.560	0.21	59.440
Total	0.35	0.14	40.560	0.21	59.440
Average	0.35	0.14	40.560	0.21	59.440

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0036	0.0110	0.0380	0.0903	0.2095

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.00	1.0	0.00	1.2
Highway Segment	Collision with Fixed Object	0.09	26.4	0.12	33.0	0.21	59.4
Highway Segment	Collision with Other Object	0.01	1.9	0.02	6.4	0.03	8.3
Highway Segment	Other Single-vehicle Collision	0.03	7.6	0.02	4.9	0.04	12.5
Highway Segment	Collision with Parked Vehicle	0.00	0.5	0.00	0.7	0.01	1.3
Highway Segment	Total Single Vehicle Crashes	0.13	36.6	0.16	46.1	0.29	82.7
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.2	0.00	0.4
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.3	0.00	0.4
Highway Segment	Rear-end Collision	0.01	3.0	0.03	9.2	0.04	12.2
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.7	0.01	3.5	0.01	4.3
Highway Segment	Total Multiple Vehicle Crashes	0.01	4.0	0.05	13.3	0.06	17.3
Highway Segment	Total Highway Segment Crashes	0.14	40.6	0.21	59.4	0.35	100.0
	Total Crashes	0.14	40.6	0.21	59.4	0.35	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1002+97.851	Warning: for segment #1 (1000+00.000 to 1002+97.851), The ramp type for Ramp Alignment RGPSBXMLK3 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:15 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:08:08 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBX83
Highway Comment: Imported from RGPSBX83.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:07:57 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1027+25.960

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1027+25.960
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

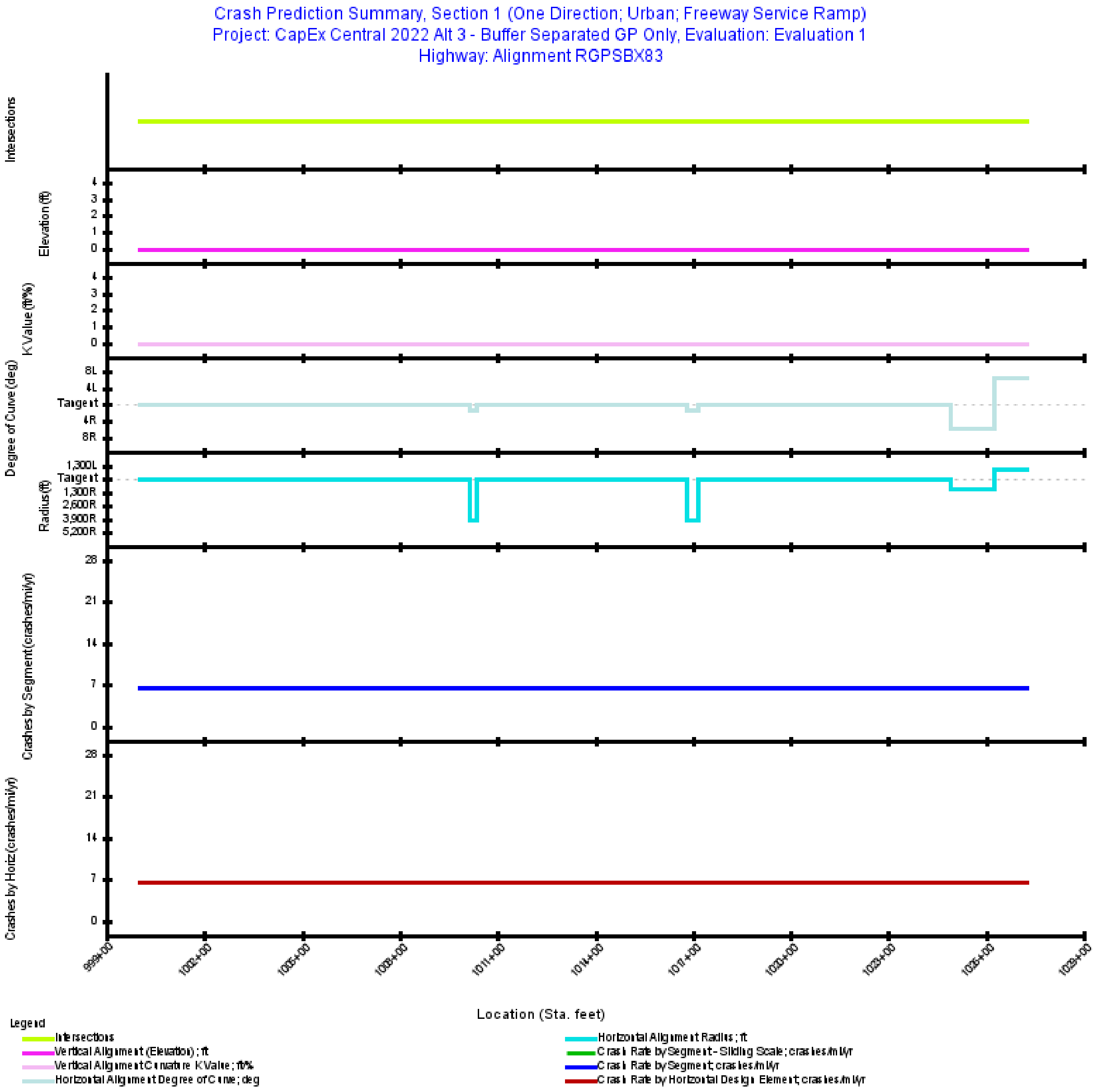

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1027+25.960	2,725.96	0.5163	2030: 17,650

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.5163**
Average Future Road AADT (vpd)	**17,650**
Predicted Crashes	
Total Crashes	**3.35**
Fatal and Injury Crashes	**1.62**
Property-Damage-Only Crashes	**1.72**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**49**
Percent Property-Damage-Only Crashes (%)	**51**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**6.4869**
FI Crash Rate (crashes/mi/yr)	**3.1471**
PDO Crash Rate (crashes/mi/yr)	**3.3398**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**3.33**
Travel Crash Rate (crashes/million veh-mi)	**1.01**
Travel FI Crash Rate (crashes/million veh-mi)	**0.49**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.52**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1027+25.960	0.5163	3.349	3.3490	1.6248	1.7243	6.4869	1.01
Total			0.5163	3.349	3.3490	1.6248	1.7243	6.4869	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1010+15.601	0.1923	1.248	1.2477	0.6053	0.6424	6.4869	1.01
Simple Curve 1	1010+15.601	1010+37.682	0.0042	0.027	0.0271	0.0132	0.0140	6.4869	1.01
Tangent	1010+37.682	1016+82.823	0.1222	0.793	0.7926	0.3845	0.4081	6.4869	1.01
Simple Curve 2	1016+82.823	1017+16.679	0.0064	0.042	0.0416	0.0202	0.0214	6.4869	1.01
Tangent	1017+16.679	1024+89.455	0.1464	0.949	0.9494	0.4606	0.4888	6.4869	1.01
Simple Curve 3	1024+89.455	1026+26.469	0.0259	0.168	0.1683	0.0817	0.0867	6.4869	1.01
Simple Curve 4	1026+26.469	1027+25.960	0.0188	0.122	0.1222	0.0593	0.0629	6.4869	1.01

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	3.35	1.62	48.515	1.72	51.485
Total	3.35	1.62	48.515	1.72	51.485
Average	3.35	1.62	48.515	1.72	51.485

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0395	0.1198	0.5215	0.9439	1.7243

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.2	0.03	1.0	0.04	1.1
Highway Segment	Collision with Fixed Object	1.10	32.8	1.05	31.4	2.15	64.2
Highway Segment	Collision with Other Object	0.08	2.3	0.20	6.1	0.28	8.4
Highway Segment	Other Single-vehicle Collision	0.32	9.4	0.16	4.7	0.47	14.1
Highway Segment	Collision with Parked Vehicle	0.02	0.7	0.02	0.7	0.05	1.4
Highway Segment	Total Single Vehicle Crashes	1.52	45.4	1.47	43.9	2.99	89.3
Highway Segment	Right-Angle Collision	0.00	0.1	0.01	0.1	0.01	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.01	0.2	0.01	0.3
Highway Segment	Rear-end Collision	0.08	2.3	0.17	5.2	0.25	7.6
Highway Segment	Sideswipe, Same Direction Collision	0.02	0.6	0.07	2.0	0.09	2.6
Highway Segment	Total Multiple Vehicle Crashes	0.10	3.1	0.25	7.6	0.36	10.7
Highway Segment	Total Highway Segment Crashes	1.62	48.5	1.72	51.5	3.35	100.0
	Total Crashes	1.62	48.5	1.72	51.5	3.35	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1027+25.960	Warning: for segment #1 (1000+00.000 to 1027+25.960), The ramp type for Ramp Alignment RGPSBX83 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:15 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:04:54 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBN153
Highway Comment: Imported from RGPSBN153.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:04:44 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1011+39.465

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1011+39.465
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

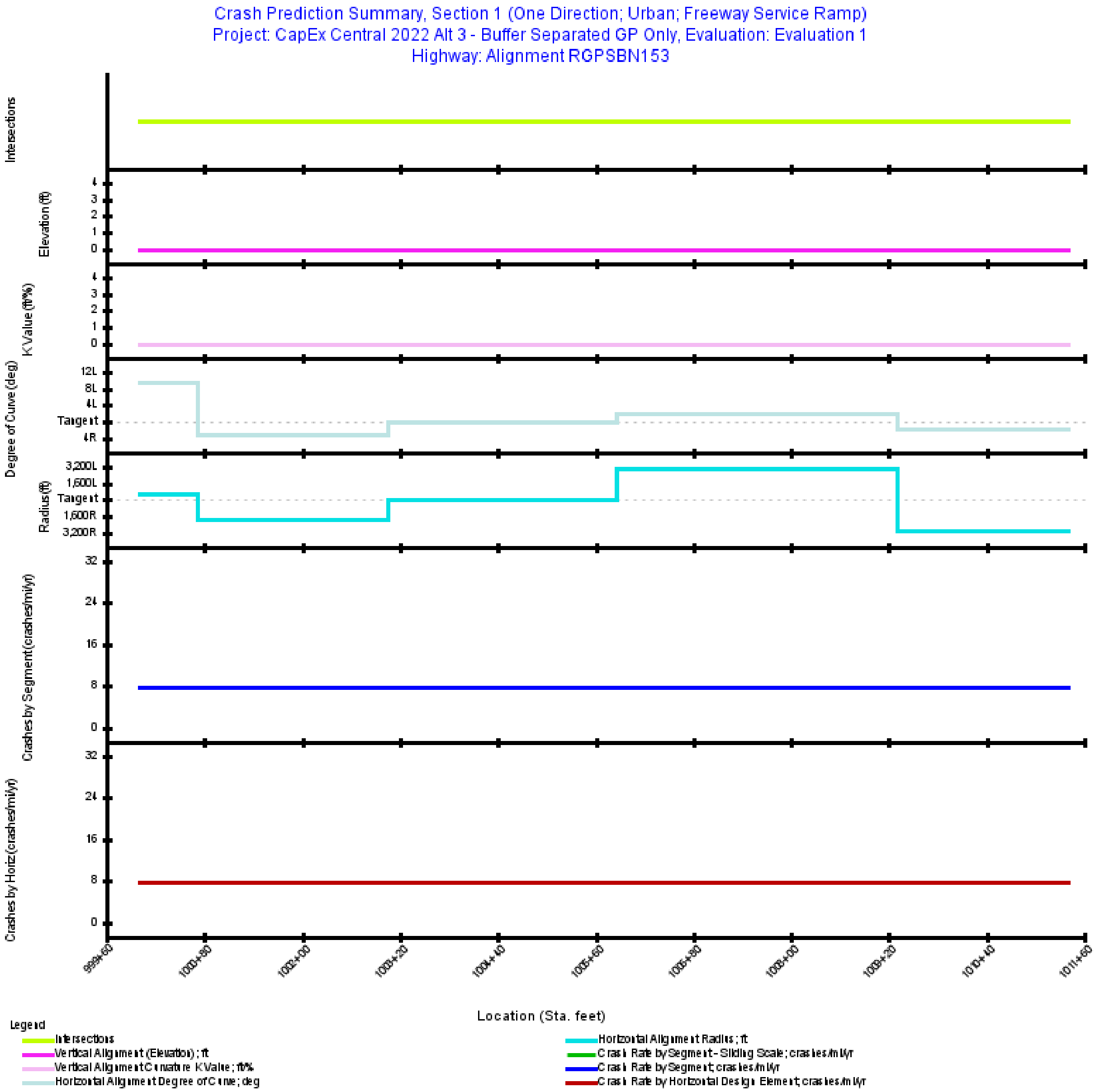

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1011+39.465	1,139.46	0.2158	2030: 19,950

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2158**
Average Future Road AADT (vpd)	**19,950**
Predicted Crashes	
Total Crashes	**1.69**
Fatal and Injury Crashes	**0.76**
Property-Damage-Only Crashes	**0.93**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**45**
Percent Property-Damage-Only Crashes (%)	**55**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**7.8379**
FI Crash Rate (crashes/mi/yr)	**3.5421**
PDO Crash Rate (crashes/mi/yr)	**4.2958**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.57**
Travel Crash Rate (crashes/million veh-mi)	**1.08**
Travel FI Crash Rate (crashes/million veh-mi)	**0.49**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.59**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1011+39.465	0.2158	1.692	1.6915	0.7644	0.9271	7.8379	1.08
Total			0.2158	1.692	1.6915	0.7644	0.9271	7.8379	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1000+71.950	0.0136	0.107	0.1068	0.0483	0.0585	7.8379	1.08
Simple Curve 2	1000+71.950	1003+06.006	0.0443	0.347	0.3474	0.1570	0.1904	7.8379	1.08
Tangent	1003+06.006	1005+86.798	0.0532	0.417	0.4168	0.1884	0.2285	7.8379	1.08
Simple Curve 3	1005+86.798	1009+30.829	0.0652	0.511	0.5107	0.2308	0.2799	7.8379	1.08
Simple Curve 4	1009+30.829	1011+39.465	0.0395	0.310	0.3097	0.1400	0.1697	7.8379	1.08

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.69	0.76	45.191	0.93	54.809
Total	1.69	0.76	45.191	0.93	54.809
Average	1.69	0.76	45.191	0.93	54.809

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0128	0.0387	0.2572	0.4558	0.9271

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.8	0.01	0.9
Highway Segment	Collision with Fixed Object	0.38	22.5	0.42	24.6	0.80	47.1
Highway Segment	Collision with Other Object	0.03	1.6	0.08	4.8	0.11	6.4
Highway Segment	Other Single-vehicle Collision	0.11	6.5	0.06	3.7	0.17	10.2
Highway Segment	Collision with Parked Vehicle	0.01	0.5	0.01	0.6	0.02	1.0
Highway Segment	Total Single Vehicle Crashes	0.53	31.2	0.58	34.4	1.11	65.5
Highway Segment	Right-Angle Collision	0.01	0.4	0.01	0.4	0.01	0.8
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.2
Highway Segment	Other Multi-vehicle Collision	0.01	0.4	0.01	0.5	0.02	0.9
Highway Segment	Rear-end Collision	0.18	10.5	0.24	14.1	0.42	24.6
Highway Segment	Sideswipe, Same Direction Collision	0.04	2.5	0.09	5.4	0.14	8.0
Highway Segment	Total Multiple Vehicle Crashes	0.24	14.0	0.34	20.4	0.58	34.5
Highway Segment	Total Highway Segment Crashes	0.76	45.2	0.93	54.8	1.69	100.0
	Total Crashes	0.76	45.2	0.93	54.8	1.69	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1011+39.465	Warning: for segment #1 (1000+00.000 to 1011+39.465), The ramp type for Ramp Alignment RGPSBN153 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1011+39.465	Warning: for segment #1 (1000+00.000 to 1011+39.465), traffic volume (19,950 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:16 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:08:55 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBXNASH3
Highway Comment: Imported from RGPSBXNASH3.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:08:45 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1004+98.242

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1004+98.242
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

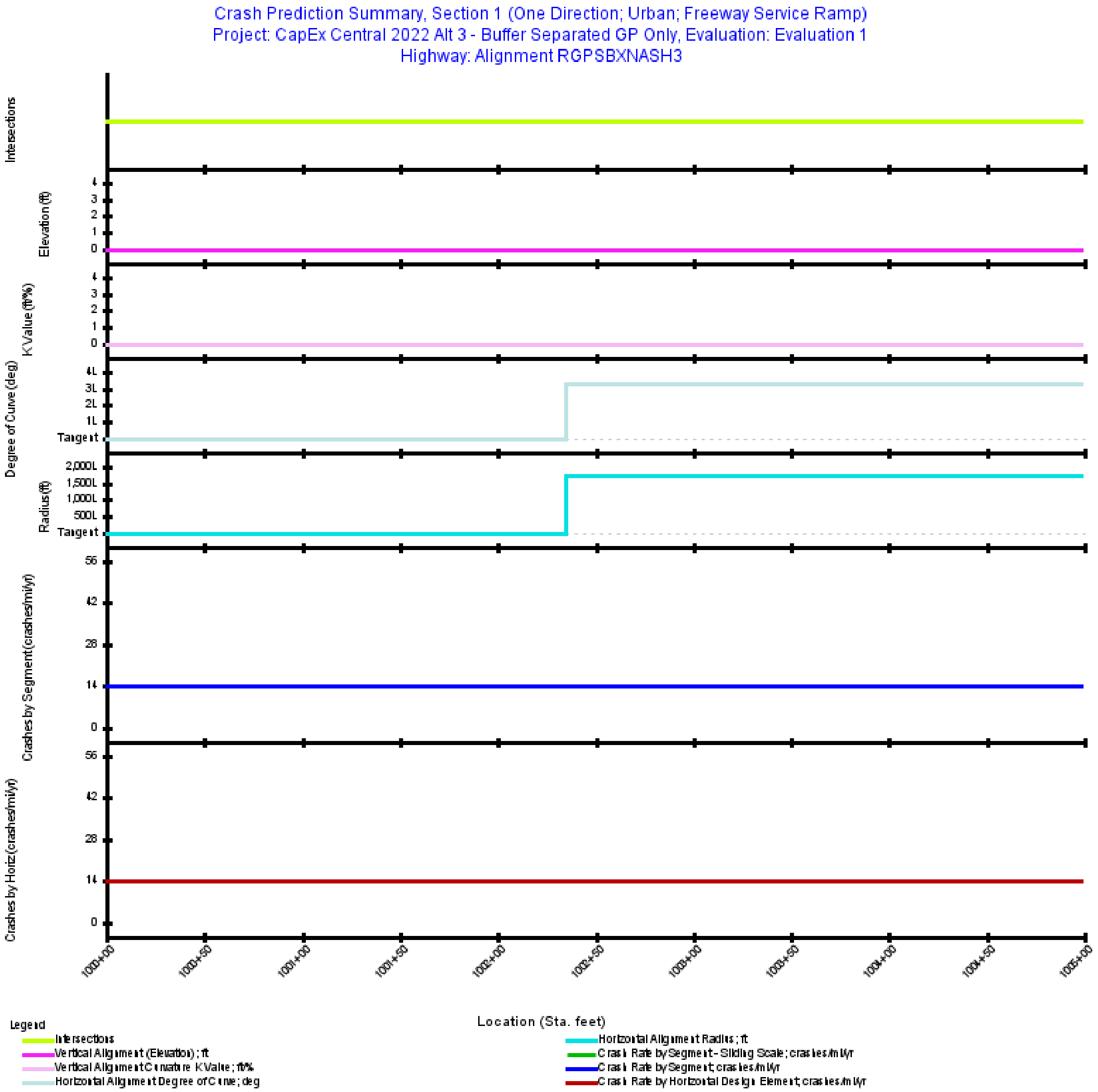

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1000+00.000	1004+98.242	498.24	0.0944	2030: 32,400

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0944**
Average Future Road AADT (vpd)	**32,400**
Predicted Crashes	
Total Crashes	**1.32**
Fatal and Injury Crashes	**0.57**
Property-Damage-Only Crashes	**0.75**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**43**
Percent Property-Damage-Only Crashes (%)	**57**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**13.9902**
FI Crash Rate (crashes/mi/yr)	**6.0840**
PDO Crash Rate (crashes/mi/yr)	**7.9062**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.12**
Travel Crash Rate (crashes/million veh-mi)	**1.18**
Travel FI Crash Rate (crashes/million veh-mi)	**0.51**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.67**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1004+98.242	0.0944	1.320	1.3202	0.5741	0.7461	13.9902	1.18
Total			0.0944	1.320	1.3202	0.5741	0.7461	13.9902	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1002+34.847	0.0445	0.622	0.6223	0.2706	0.3517	13.9902	1.18
Simple Curve 1	1002+34.847	1004+98.242	0.0499	0.698	0.6979	0.3035	0.3944	13.9902	1.18

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.32	0.57	43.487	0.75	56.513
Total	1.32	0.57	43.487	0.75	56.513
Average	1.32	0.57	43.487	0.75	56.513

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0136	0.0412	0.1445	0.3749	0.7461

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.9	0.01	1.0
Highway Segment	Collision with Fixed Object	0.32	24.5	0.38	28.9	0.71	53.4
Highway Segment	Collision with Other Object	0.02	1.7	0.07	5.6	0.10	7.3
Highway Segment	Other Single-vehicle Collision	0.09	7.1	0.06	4.3	0.15	11.4
Highway Segment	Collision with Parked Vehicle	0.01	0.5	0.01	0.6	0.01	1.2
Highway Segment	Total Single Vehicle Crashes	0.45	33.9	0.53	40.4	0.98	74.4
Highway Segment	Right-Angle Collision	0.00	0.3	0.00	0.3	0.01	0.6
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.3	0.01	0.4	0.01	0.7
Highway Segment	Rear-end Collision	0.10	7.2	0.15	11.1	0.24	18.3
Highway Segment	Sideswipe, Same Direction Collision	0.02	1.7	0.06	4.3	0.08	6.0
Highway Segment	Total Multiple Vehicle Crashes	0.13	9.6	0.21	16.1	0.34	25.6
Highway Segment	Total Highway Segment Crashes	0.57	43.5	0.75	56.5	1.32	100.0
	Total Crashes	0.57	43.5	0.75	56.5	1.32	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1004+98.242	Warning: for segment #1 (1000+00.000 to 1004+98.242), The ramp type for Ramp Alignment RGPSBXNASH3 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1004+98.242	Warning: for segment #1 (1000+00.000 to 1004+98.242), traffic volume (32,400 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2EX

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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The United States Government does not endorse products or manufacturers. Trade and manufacturers' names may appear in this software and documentation only because they are considered essential to the objective of the software.

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This software product is provided "as-is," without warranty of any kind-either expressed or implied (but not limited to the implied warranties of merchantability and fitness for a particular purpose). The FHWA do not warrant that the functions contained in the software will meet the end-user's requirements or that the operation of the software will be uninterrupted and error-free.

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Report Overview

Report Generated: Aug 25, 2022 2:17 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:06:06 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBN53
Highway Comment: Imported from RGPSBN53.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:05:56 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1001+82.113

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1001+82.113
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

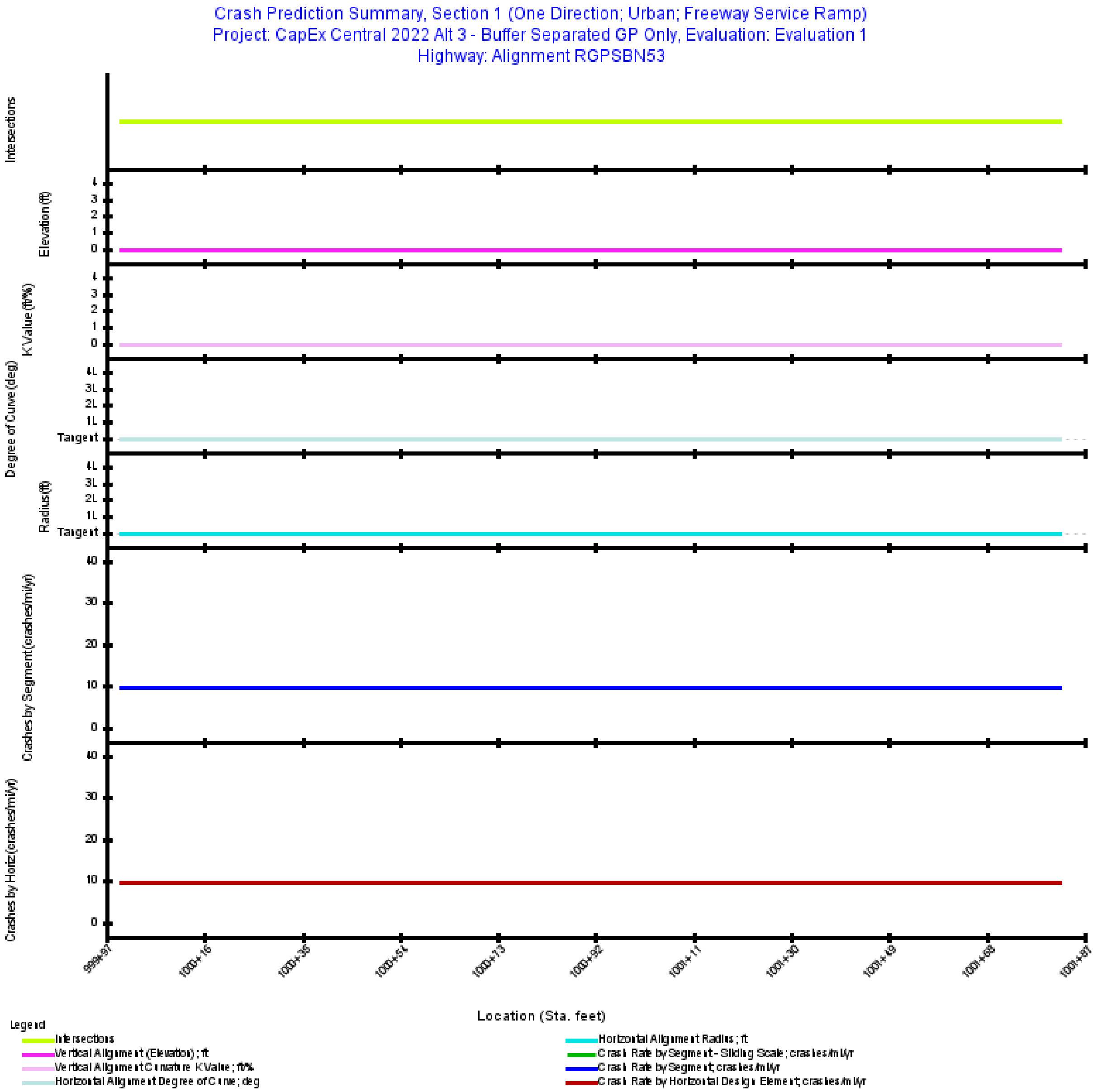

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1001+82.113	182.11	0.0345	2030: 32,700

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.0345**
Average Future Road AADT (vpd)	**32,700**
Predicted Crashes	
Total Crashes	**0.34**
Fatal and Injury Crashes	**0.17**
Property-Damage-Only Crashes	**0.16**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**52**
Percent Property-Damage-Only Crashes (%)	**48**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**9.7076**
FI Crash Rate (crashes/mi/yr)	**5.0253**
PDO Crash Rate (crashes/mi/yr)	**4.6822**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.41**
Travel Crash Rate (crashes/million veh-mi)	**0.81**
Travel FI Crash Rate (crashes/million veh-mi)	**0.42**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.39**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1001+82.113	0.0345	0.335	0.3348	0.1733	0.1615	9.7076	0.81
Total			0.0345	0.335	0.3348	0.1733	0.1615	9.7076	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1001+82.113	0.0345	0.335	0.3348	0.1733	0.1615	9.7076	0.81

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.34	0.17	51.767	0.16	48.233
Total	0.34	0.17	51.767	0.16	48.233
Average	0.34	0.17	51.767	0.16	48.233

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0035	0.0106	0.0681	0.0912	0.1615

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.00	0.6	0.00	0.7
Highway Segment	Collision with Fixed Object	0.06	18.0	0.06	18.4	0.12	36.4
Highway Segment	Collision with Other Object	0.00	1.3	0.01	3.6	0.02	4.8
Highway Segment	Other Single-vehicle Collision	0.02	5.2	0.01	2.7	0.03	7.9
Highway Segment	Collision with Parked Vehicle	0.00	0.4	0.00	0.4	0.00	0.8
Highway Segment	Total Single Vehicle Crashes	0.08	25.0	0.09	25.6	0.17	50.6
Highway Segment	Right-Angle Collision	0.00	0.8	0.00	0.4	0.00	1.2
Highway Segment	Head-on Collision	0.00	0.2	0.00	0.0	0.00	0.3
Highway Segment	Other Multi-vehicle Collision	0.00	0.8	0.00	0.5	0.01	1.4
Highway Segment	Rear-end Collision	0.07	20.1	0.05	15.6	0.12	35.7
Highway Segment	Sideswipe, Same Direction Collision	0.02	4.8	0.02	6.0	0.04	10.8
Highway Segment	Total Multiple Vehicle Crashes	0.09	26.8	0.08	22.6	0.17	49.4
Highway Segment	Total Highway Segment Crashes	0.17	51.8	0.16	48.2	0.34	100.0
	Total Crashes	0.17	51.8	0.16	48.2	0.34	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1001+82.113	Warning: for segment #1 (1000+00.000 to 1001+82.113), The ramp type for Ramp Alignment RGPSBN53 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1001+82.113	Warning: for segment #1 (1000+00.000 to 1001+82.113), traffic volume (32,700 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:17 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:06:55 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBNRVS3
Highway Comment: Imported from RGPSBNRVS3.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:06:44 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1012+04.368

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1012+04.368
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

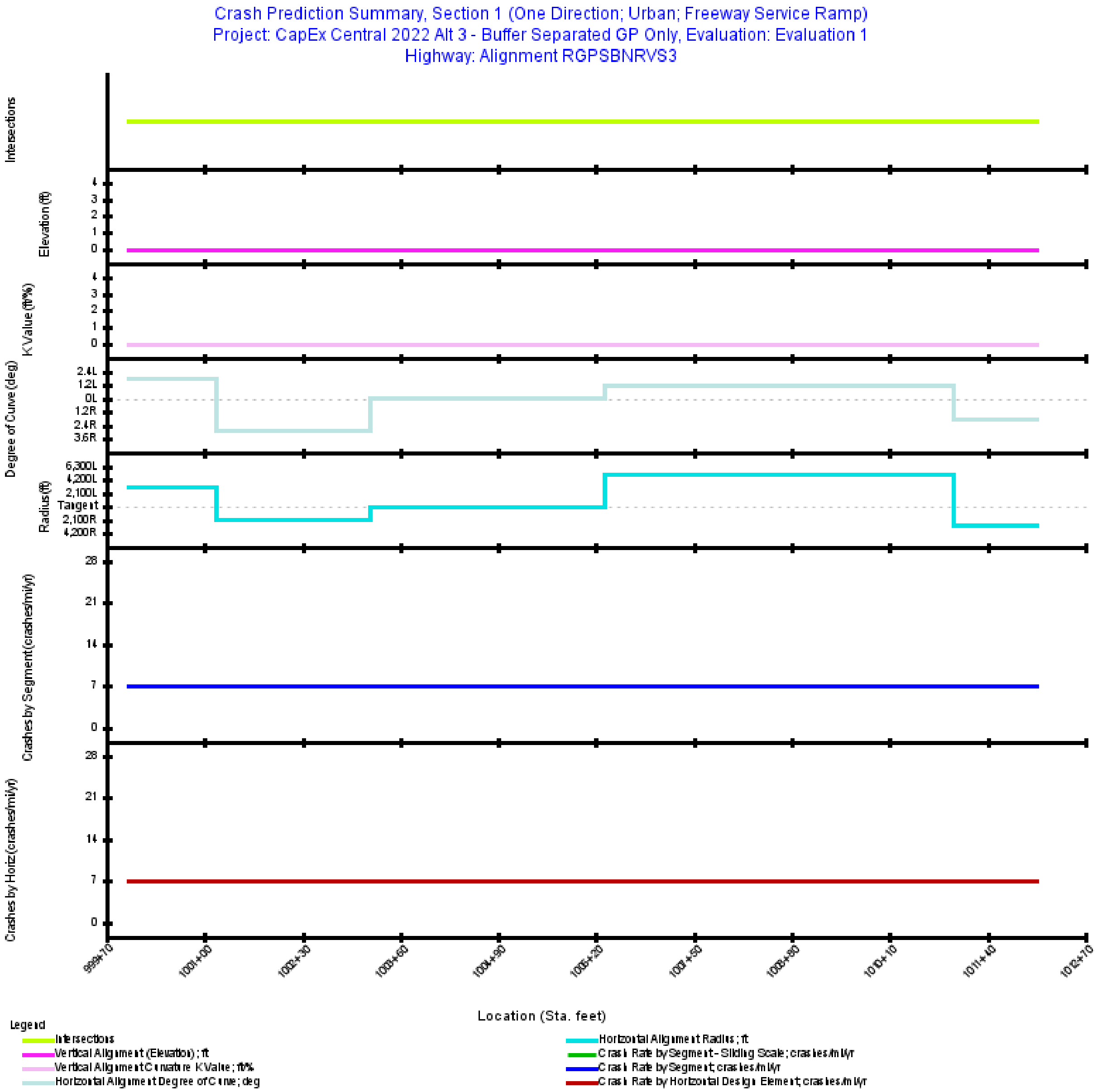

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1012+04.368	1,204.37	0.2281	2030: 19,550

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2281**
Average Future Road AADT (vpd)	**19,550**
Predicted Crashes	
Total Crashes	**1.57**
Fatal and Injury Crashes	**0.71**
Property-Damage-Only Crashes	**0.86**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**45**
Percent Property-Damage-Only Crashes (%)	**55**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**6.8941**
FI Crash Rate (crashes/mi/yr)	**3.1155**
PDO Crash Rate (crashes/mi/yr)	**3.7786**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**1.63**
Travel Crash Rate (crashes/million veh-mi)	**0.97**
Travel FI Crash Rate (crashes/million veh-mi)	**0.44**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.53**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1012+04.368	0.2281	1.573	1.5725	0.7106	0.8619	6.8941	0.97
Total			0.2281	1.573	1.5725	0.7106	0.8619	6.8941	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+15.945	0.0220	0.151	0.1514	0.0684	0.0830	6.8941	0.97
Simple Curve 2	1001+15.945	1003+19.619	0.0386	0.266	0.2659	0.1202	0.1458	6.8941	0.97
Tangent	1003+19.619	1006+31.648	0.0591	0.407	0.4074	0.1841	0.2233	6.8941	0.97
Simple Curve 3	1006+31.648	1010+95.315	0.0878	0.605	0.6054	0.2736	0.3318	6.8941	0.97
Simple Curve 4	1010+95.315	1012+04.368	0.0207	0.142	0.1424	0.0643	0.0780	6.8941	0.97

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.57	0.71	45.191	0.86	54.809
Total	1.57	0.71	45.191	0.86	54.809
Average	1.57	0.71	45.191	0.86	54.809

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0122	0.0369	0.2444	0.4171	0.8619

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.7	0.01	0.9
Highway Segment	Collision with Fixed Object	0.35	22.3	0.38	24.0	0.73	46.3
Highway Segment	Collision with Other Object	0.03	1.6	0.07	4.7	0.10	6.2
Highway Segment	Other Single-vehicle Collision	0.10	6.4	0.06	3.6	0.16	10.0
Highway Segment	Collision with Parked Vehicle	0.01	0.5	0.01	0.5	0.02	1.0
Highway Segment	Total Single Vehicle Crashes	0.49	30.9	0.53	33.5	1.01	64.4
Highway Segment	Right-Angle Collision	0.01	0.4	0.01	0.4	0.01	0.8
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.2
Highway Segment	Other Multi-vehicle Collision	0.01	0.4	0.01	0.5	0.01	1.0
Highway Segment	Rear-end Collision	0.17	10.7	0.23	14.7	0.40	25.4
Highway Segment	Sideswipe, Same Direction Collision	0.04	2.6	0.09	5.7	0.13	8.2
Highway Segment	Total Multiple Vehicle Crashes	0.23	14.3	0.34	21.3	0.56	35.6
Highway Segment	Total Highway Segment Crashes	0.71	45.2	0.86	54.8	1.57	100.0
	Total Crashes	0.71	45.2	0.86	54.8	1.57	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1012+04.368	Warning: for segment #1 (1000+00.000 to 1012+04.368), The ramp type for Ramp Alignment RGPSBNRVS3 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.
1000+00.000	1012+04.368	Warning: for segment #1 (1000+00.000 to 1012+04.368), traffic volume (19,550 vpd) for 2030 is not within the model limit (18,000 vpd) for reliable results for segment type 1EN

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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The use of the IHSDM software is being done strictly on a voluntary basis. In exchange for provision of IHSDM, the user agrees that the Federal Highway Administration (FHWA), U.S. Department of Transportation and any other agency of the Federal Government shall not be responsible for any errors, damage or other liability that may result from any and all use of the software, including installation and testing of the software. The user further agrees to hold the FHWA and the Federal Government harmless from any resulting liability. The user agrees that this hold harmless provision shall flow to any person to whom or any entity to which the user provides the IHSDM software. It is the user's full responsibility to inform any person to whom or any entity to which it provides the IHSDM software of this hold harmless provision.

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Report Overview

Report Generated: Aug 25, 2022 2:18 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:09:19 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBXWODW3
Highway Comment: Imported from RGPSBXWODW3.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:09:09 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1006+79.716

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1006+79.716
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

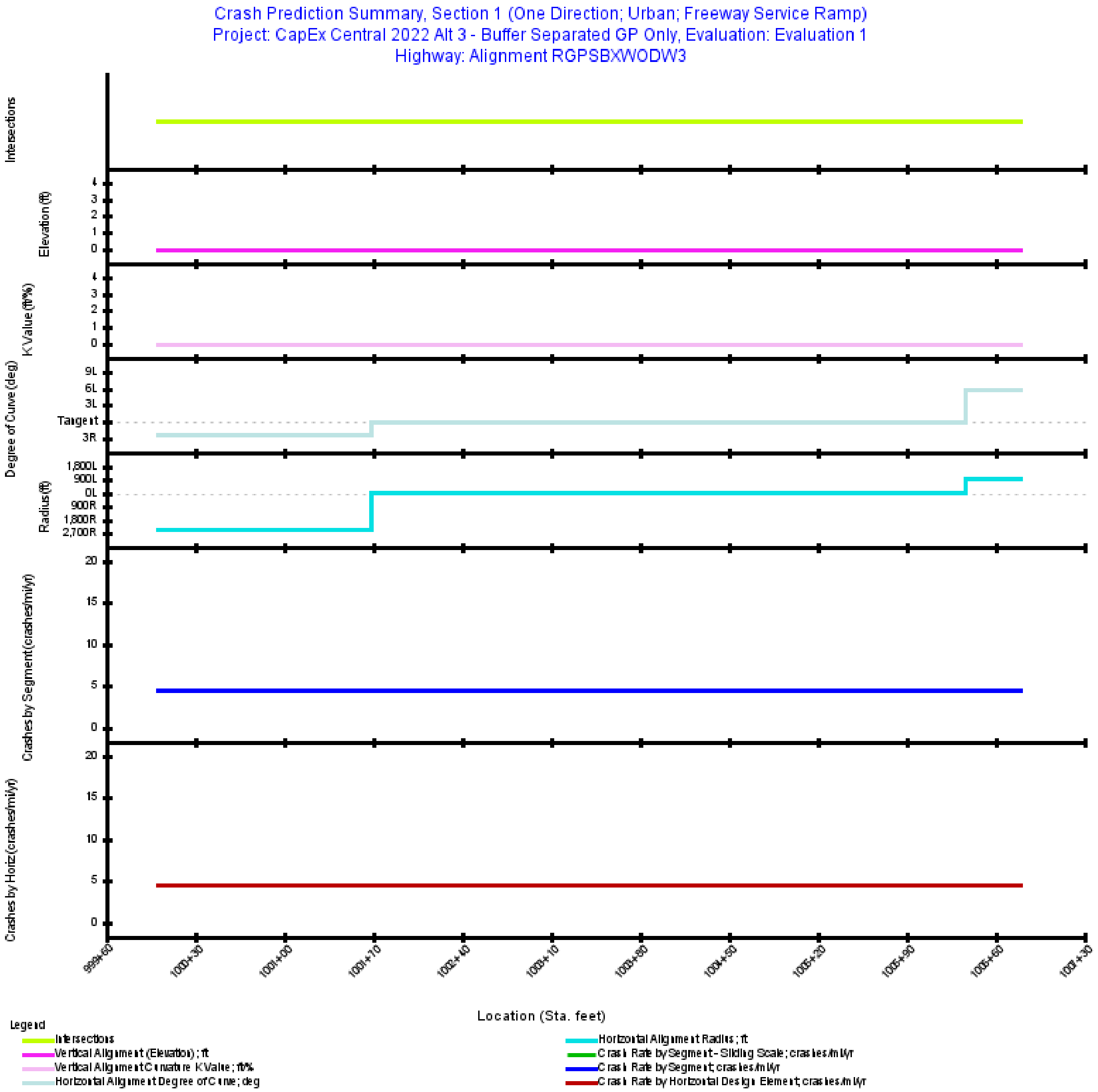

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1006+79.716	679.72	0.1287	2030: 12,400

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1287**
Average Future Road AADT (vpd)	**12,400**
Predicted Crashes	
Total Crashes	**0.58**
Fatal and Injury Crashes	**0.28**
Property-Damage-Only Crashes	**0.30**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**4.4736**
FI Crash Rate (crashes/mi/yr)	**2.1608**
PDO Crash Rate (crashes/mi/yr)	**2.3128**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.58**
Travel Crash Rate (crashes/million veh-mi)	**0.99**
Travel FI Crash Rate (crashes/million veh-mi)	**0.48**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.51**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1006+79.716	0.1287	0.576	0.5759	0.2782	0.2977	4.4736	0.99
Total			0.1287	0.576	0.5759	0.2782	0.2977	4.4736	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+68.833	0.0320	0.143	0.1430	0.0691	0.0740	4.4736	0.99
Tangent	1001+68.833	1006+36.053	0.0885	0.396	0.3959	0.1912	0.2047	4.4736	0.99
Simple Curve 2	1006+36.053	1006+79.716	0.0083	0.037	0.0370	0.0179	0.0191	4.4736	0.99

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.58	0.28	48.301	0.30	51.699
Total	0.58	0.28	48.301	0.30	51.699
Average	0.58	0.28	48.301	0.30	51.699

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0072	0.0218	0.0939	0.1552	0.2977

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.19	33.2	0.19	32.4	0.38	65.6
Highway Segment	Collision with Other Object	0.01	2.3	0.04	6.3	0.05	8.6
Highway Segment	Other Single-vehicle Collision	0.06	9.6	0.03	4.8	0.08	14.4
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.7	0.01	1.4
Highway Segment	Total Single Vehicle Crashes	0.27	46.0	0.26	45.3	0.53	91.3
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.2	0.00	0.2
Highway Segment	Rear-end Collision	0.01	1.8	0.03	4.4	0.04	6.2
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.4	0.01	1.7	0.01	2.1
Highway Segment	Total Multiple Vehicle Crashes	0.01	2.3	0.04	6.4	0.05	8.7
Highway Segment	Total Highway Segment Crashes	0.28	48.3	0.30	51.7	0.58	100.0
	Total Crashes	0.28	48.3	0.30	51.7	0.58	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1006+79.716	Warning: for segment #1 (1000+00.000 to 1006+79.716), The ramp type for Ramp Alignment RGPSBXWODW3 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:06:30 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBNOLF2
Highway Comment: Imported from RGPSBNOLF2.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:06:20 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1020+90.521

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1020+90.521
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

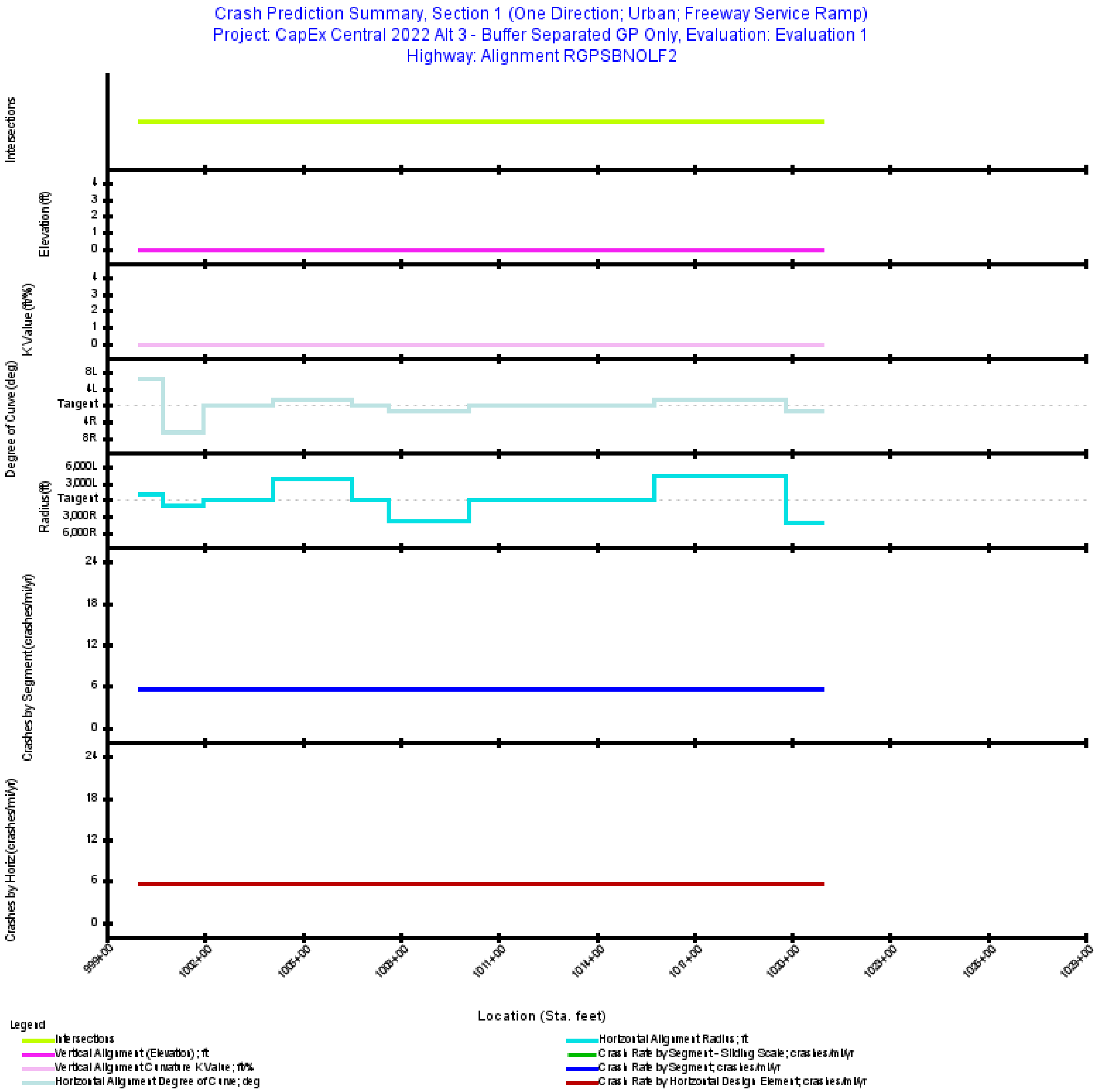

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1020+90.521	2,090.52	0.3959	2030: 14,500

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.3959**
Average Future Road AADT (vpd)	**14,500**
Predicted Crashes	
Total Crashes	**2.18**
Fatal and Injury Crashes	**0.97**
Property-Damage-Only Crashes	**1.21**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**44**
Percent Property-Damage-Only Crashes (%)	**56**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.5156**
FI Crash Rate (crashes/mi/yr)	**2.4515**
PDO Crash Rate (crashes/mi/yr)	**3.0641**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2.10**
Travel Crash Rate (crashes/million veh-mi)	**1.04**
Travel FI Crash Rate (crashes/million veh-mi)	**0.46**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.58**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1020+90.521	0.3959	2.184	2.1838	0.9706	1.2132	5.5156	1.04
Total			0.3959	2.184	2.1838	0.9706	1.2132	5.5156	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1000+70.286	0.0133	0.073	0.0734	0.0326	0.0408	5.5156	1.04
Simple Curve 2	1000+70.286	1001+96.805	0.0240	0.132	0.1322	0.0587	0.0734	5.5156	1.04
Tangent	1001+96.805	1004+08.616	0.0401	0.221	0.2213	0.0983	0.1229	5.5156	1.04
Simple Curve 3	1004+08.616	1005+30.870	0.0232	0.128	0.1277	0.0568	0.0709	5.5156	1.04
Simple Curve 4	1005+30.870	1006+53.123	0.0232	0.128	0.1277	0.0568	0.0709	5.5156	1.04
Tangent	1006+53.123	1007+65.415	0.0213	0.117	0.1173	0.0521	0.0652	5.5156	1.04
Simple Curve 5	1007+65.415	1010+11.078	0.0465	0.257	0.2566	0.1141	0.1426	5.5156	1.04
Tangent	1010+11.078	1015+78.431	0.1075	0.593	0.5927	0.2634	0.3292	5.5156	1.04
Simple Curve 6	1015+78.431	1019+80.707	0.0762	0.420	0.4202	0.1868	0.2334	5.5156	1.04
Simple Curve 7	1019+80.707	1020+90.521	0.0208	0.115	0.1147	0.0510	0.0637	5.5156	1.04

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.18	0.97	44.447	1.21	55.553
Total	2.18	0.97	44.447	1.21	55.553
Average	2.18	0.97	44.447	1.21	55.553

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0163	0.0493	0.3277	0.5773	1.2132

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.02	0.8	0.02	0.9
Highway Segment	Collision with Fixed Object	0.52	24.0	0.57	26.1	1.09	50.1
Highway Segment	Collision with Other Object	0.04	1.7	0.11	5.1	0.15	6.8
Highway Segment	Other Single-vehicle Collision	0.15	6.9	0.09	3.9	0.24	10.8
Highway Segment	Collision with Parked Vehicle	0.01	0.5	0.01	0.6	0.02	1.1
Highway Segment	Total Single Vehicle Crashes	0.72	33.2	0.80	36.5	1.52	69.7
Highway Segment	Right-Angle Collision	0.01	0.3	0.01	0.3	0.01	0.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.01	0.3	0.01	0.5	0.02	0.8
Highway Segment	Rear-end Collision	0.18	8.4	0.29	13.2	0.47	21.6
Highway Segment	Sideswipe, Same Direction Collision	0.04	2.0	0.11	5.1	0.15	7.1
Highway Segment	Total Multiple Vehicle Crashes	0.25	11.2	0.42	19.1	0.66	30.3
Highway Segment	Total Highway Segment Crashes	0.97	44.4	1.21	55.6	2.18	100.0
	Total Crashes	0.97	44.4	1.21	55.6	2.18	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1020+90.521	Warning: for segment #1 (1000+00.000 to 1020+90.521), The ramp type for Ramp Alignment RGPSBNOLF2 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

Disclaimer

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Under no circumstances will the FHWA be liable to the end-user for any damages or claimed lost profits, lost savings, or other incidental or consequential damages rising out of the use or inability to use the software (even if these organizations have been advised of the possibility of such damages), or for any claim by any other party.

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Report Overview

Report Generated: Aug 25, 2022 2:19 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:07:43 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Buffer Separated GP Only
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RGPSBX712
Highway Comment: Imported from RGPSBX712.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:07:33 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1017+36.522

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1017+36.522
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

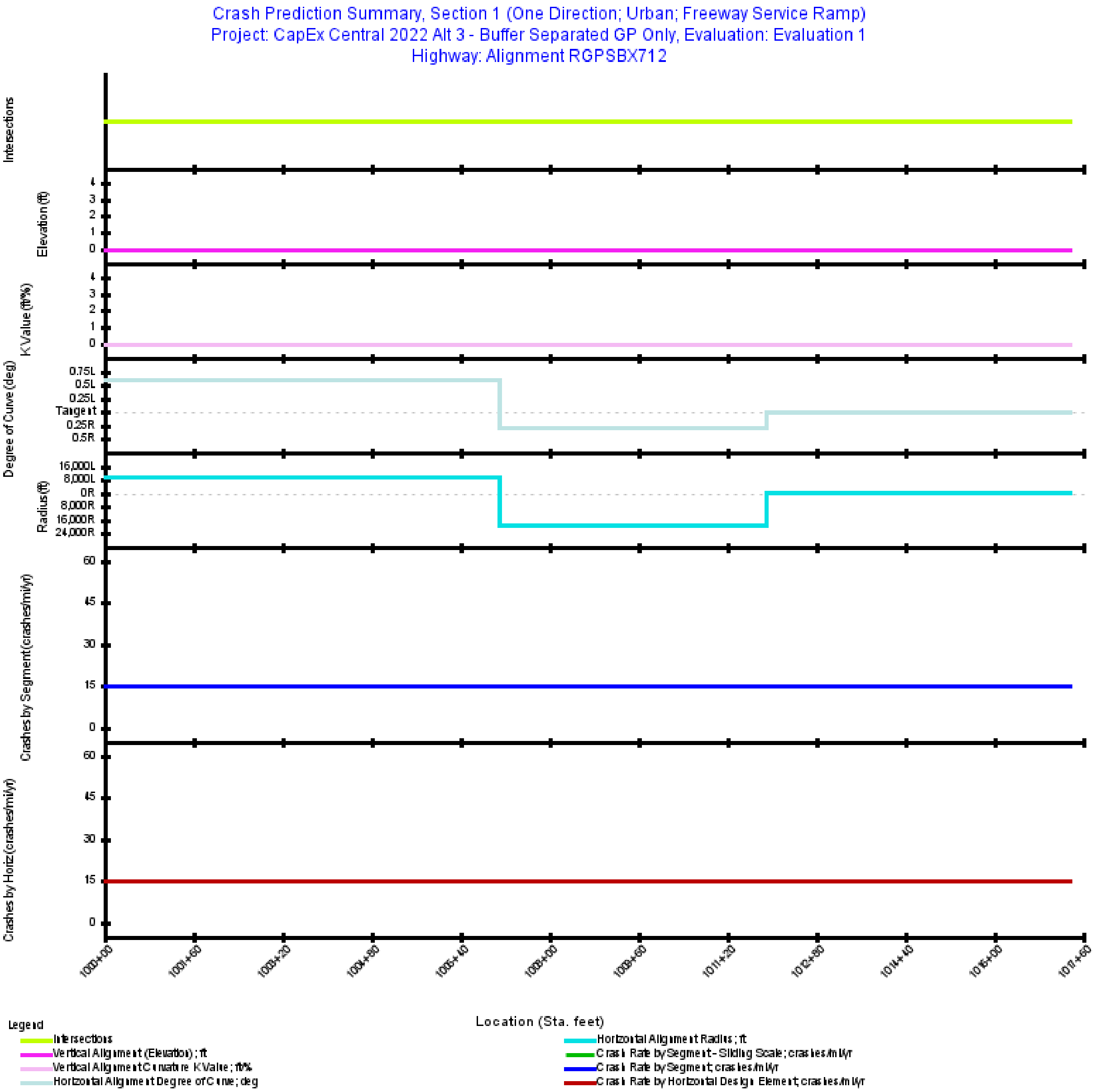

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road Two-lane Ramp Exit	Urban	1000+00.000	1017+36.522	1,736.52	0.3289	2030: 34,450

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.3289**
Average Future Road AADT (vpd)	**34,450**
Predicted Crashes	
Total Crashes	**4.92**
Fatal and Injury Crashes	**2.13**
Property-Damage-Only Crashes	**2.79**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**43**
Percent Property-Damage-Only Crashes (%)	**57**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**14.9626**
FI Crash Rate (crashes/mi/yr)	**6.4790**
PDO Crash Rate (crashes/mi/yr)	**8.4836**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**4.14**
Travel Crash Rate (crashes/million veh-mi)	**1.19**
Travel FI Crash Rate (crashes/million veh-mi)	**0.52**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.68**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1017+36.522	0.3289	4.921	4.9210	2.1308	2.7901	14.9626	1.19
Total			0.3289	4.921	4.9210	2.1308	2.7901	14.9626	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1007+09.610	0.1344	2.011	2.0109	0.8707	1.1402	14.9626	1.19
Simple Curve 2	1007+09.610	1011+90.546	0.0911	1.363	1.3629	0.5901	0.7727	14.9626	1.19
Tangent	1011+90.546	1017+36.522	0.1034	1.547	1.5472	0.6700	0.8772	14.9626	1.19

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.92	2.13	43.301	2.79	56.699
Total	4.92	2.13	43.301	2.79	56.699
Average	4.92	2.13	43.301	2.79	56.699

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0477	0.1447	0.5117	1.4267	2.7901

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.01	0.1	0.04	0.9	0.05	1.0
Highway Segment	Collision with Fixed Object	1.15	23.4	1.39	28.2	2.54	51.6
Highway Segment	Collision with Other Object	0.08	1.7	0.27	5.5	0.35	7.1
Highway Segment	Other Single-vehicle Collision	0.33	6.7	0.21	4.2	0.54	11.0
Highway Segment	Collision with Parked Vehicle	0.02	0.5	0.03	0.6	0.06	1.1
Highway Segment	Total Single Vehicle Crashes	1.59	32.4	1.94	39.3	3.53	71.7
Highway Segment	Right-Angle Collision	0.02	0.3	0.01	0.3	0.03	0.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.01	0.1
Highway Segment	Other Multi-vehicle Collision	0.02	0.3	0.02	0.4	0.04	0.8
Highway Segment	Rear-end Collision	0.40	8.2	0.59	12.0	0.99	20.1
Highway Segment	Sideswipe, Same Direction Collision	0.10	2.0	0.23	4.6	0.32	6.6
Highway Segment	Total Multiple Vehicle Crashes	0.54	10.9	0.85	17.4	1.39	28.3
Highway Segment	Total Highway Segment Crashes	2.13	43.3	2.79	56.7	4.92	100.0
	Total Crashes	2.13	43.3	2.79	56.7	4.92	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1017+36.522	Warning: for segment #1 (1000+00.000 to 1017+36.522), The ramp type for Ramp Alignment RGPSBX712 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.
1000+00.000	1017+36.522	Warning: for segment #1 (1000+00.000 to 1017+36.522), traffic volume (34,450 vpd) for 2030 is not within the model limit (32,000 vpd) for reliable results for segment type 2EX

I-35 Modified Build Alternative 3 Model ML Ramps

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:38 PM
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Evaluation Date: Thu Jun 23 11:49:40 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RMLNBX13
Highway Comment: Imported from RMLNBX13.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:49:26 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1008+38.522

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1008+38.522
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

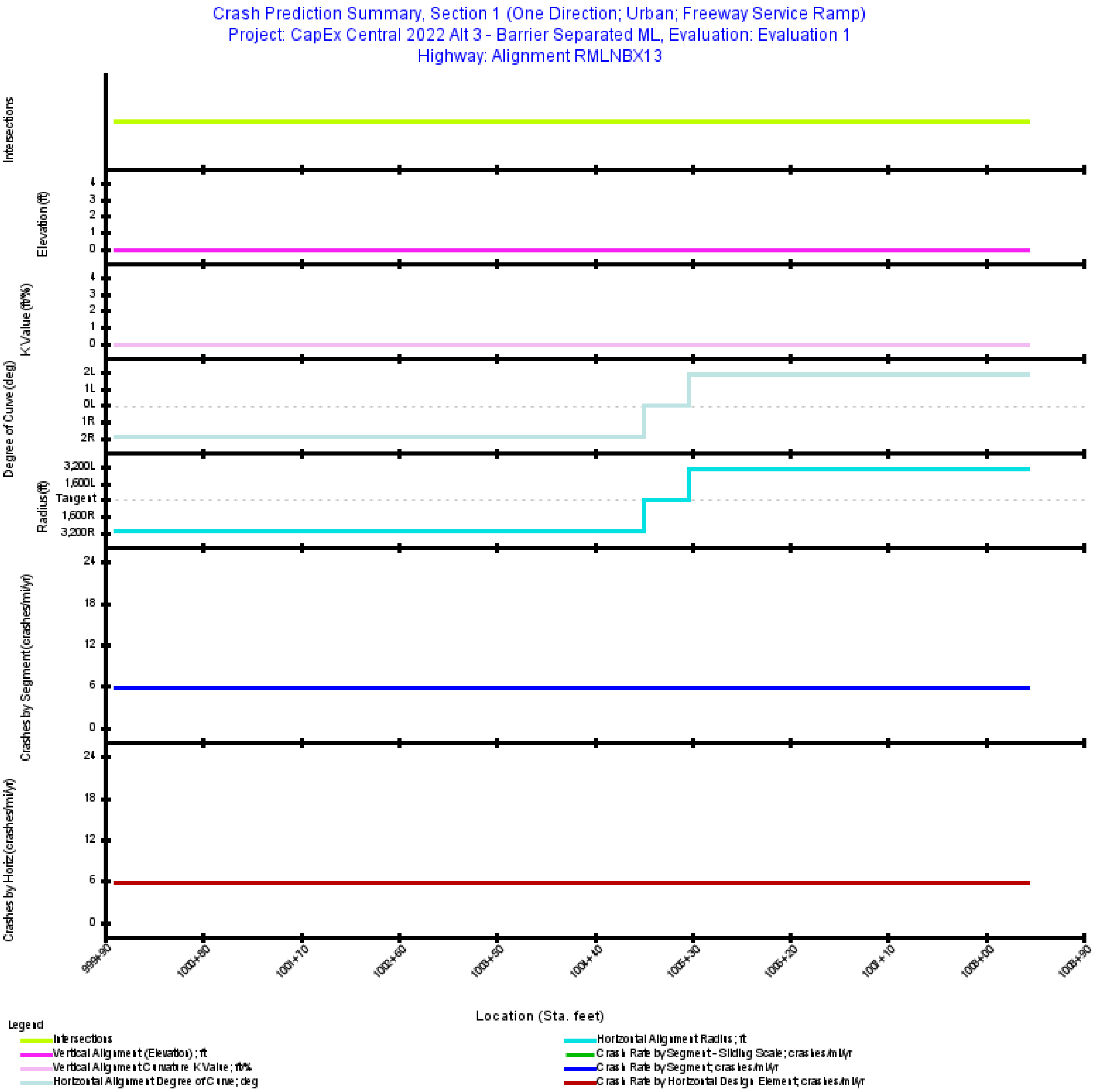
Crash Prediction Summary, Section 1 (One Direction; Urban; Freeway Service Ramp)
Project: CapEx Central 2022 Alt 3 - Barrier Separated ML, Evaluation: Evaluation 1
Highway: Alignment RMLNBX13

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1008+38.522	838.52	0.1588	2030: 16,650

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1588**
Average Future Road AADT (vpd)	**16,650**
Predicted Crashes	
Total Crashes	**0.92**
Fatal and Injury Crashes	**0.44**
Property-Damage-Only Crashes	**0.47**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.7800**
FI Crash Rate (crashes/mi/yr)	**2.7943**
PDO Crash Rate (crashes/mi/yr)	**2.9857**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.97**
Travel Crash Rate (crashes/million veh-mi)	**0.95**
Travel FI Crash Rate (crashes/million veh-mi)	**0.46**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.49**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1008+38.522	0.1588	0.918	0.9179	0.4438	0.4742	5.7800	0.95
Total			0.1588	0.918	0.9179	0.4438	0.4742	5.7800	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1004+85.150	0.0919	0.531	0.5311	0.2567	0.2743	5.7800	0.95
Tangent	1004+85.150	1005+26.692	0.0079	0.045	0.0455	0.0220	0.0235	5.7800	0.95
Simple Curve 2	1005+26.692	1008+38.522	0.0591	0.341	0.3414	0.1650	0.1763	5.7800	0.95

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.92	0.44	48.344	0.47	51.656
Total	0.92	0.44	48.344	0.47	51.656
Average	0.92	0.44	48.344	0.47	51.656

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0113	0.0342	0.1477	0.2506	0.4742

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.30	32.8	0.29	31.7	0.59	64.5
Highway Segment	Collision with Other Object	0.02	2.3	0.06	6.2	0.08	8.5
Highway Segment	Other Single-vehicle Collision	0.09	9.4	0.04	4.7	0.13	14.2
Highway Segment	Collision with Parked Vehicle	0.01	0.7	0.01	0.7	0.01	1.4
Highway Segment	Total Single Vehicle Crashes	0.42	45.4	0.41	44.3	0.82	89.7
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.2	0.00	0.3
Highway Segment	Rear-end Collision	0.02	2.2	0.05	5.1	0.07	7.3
Highway Segment	Sideswipe, Same Direction Collision	0.01	0.5	0.02	2.0	0.02	2.5
Highway Segment	Total Multiple Vehicle Crashes	0.03	2.9	0.07	7.4	0.10	10.3
Highway Segment	Total Highway Segment Crashes	0.44	48.3	0.47	51.7	0.92	100.0
	Total Crashes	0.44	48.3	0.47	51.7	0.92	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1008+38.522	Warning: for segment #1 (1000+00.000 to 1008+38.522), The ramp type for Ramp Alignment RMLNBX13 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Limited Warranty and Limitations of Remedies

This software product is provided "as-is," without warranty of any kind-either expressed or implied (but not limited to the implied warranties of merchantability and fitness for a particular purpose). The FHWA do not warrant that the functions contained in the software will meet the end-user's requirements or that the operation of the software will be uninterrupted and error-free.

Under no circumstances will the FHWA be liable to the end-user for any damages or claimed lost profits, lost savings, or other incidental or consequential damages rising out of the use or inability to use the software (even if these organizations have been advised of the possibility of such damages), or for any claim by any other party.

Notice

The use of the IHSDM software is being done strictly on a voluntary basis. In exchange for provision of IHSDM, the user agrees that the Federal Highway Administration (FHWA), U.S. Department of Transportation and any other agency of the Federal Government shall not be responsible for any errors, damage or other liability that may result from any and all use of the software, including installation and testing of the software. The user further agrees to hold the FHWA and the Federal Government harmless from any resulting liability. The user agrees that this hold harmless provision shall flow to any person to whom or any entity to which the user provides the IHSDM software. It is the user's full responsibility to inform any person to whom or any entity to which it provides the IHSDM software of this hold harmless provision.

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Report Overview

Report Generated: Aug 25, 2022 2:39 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:49:09 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RMLNBN13
Highway Comment: Imported from RMLNBN13.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:48:50 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1008+32.145

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1008+32.145
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

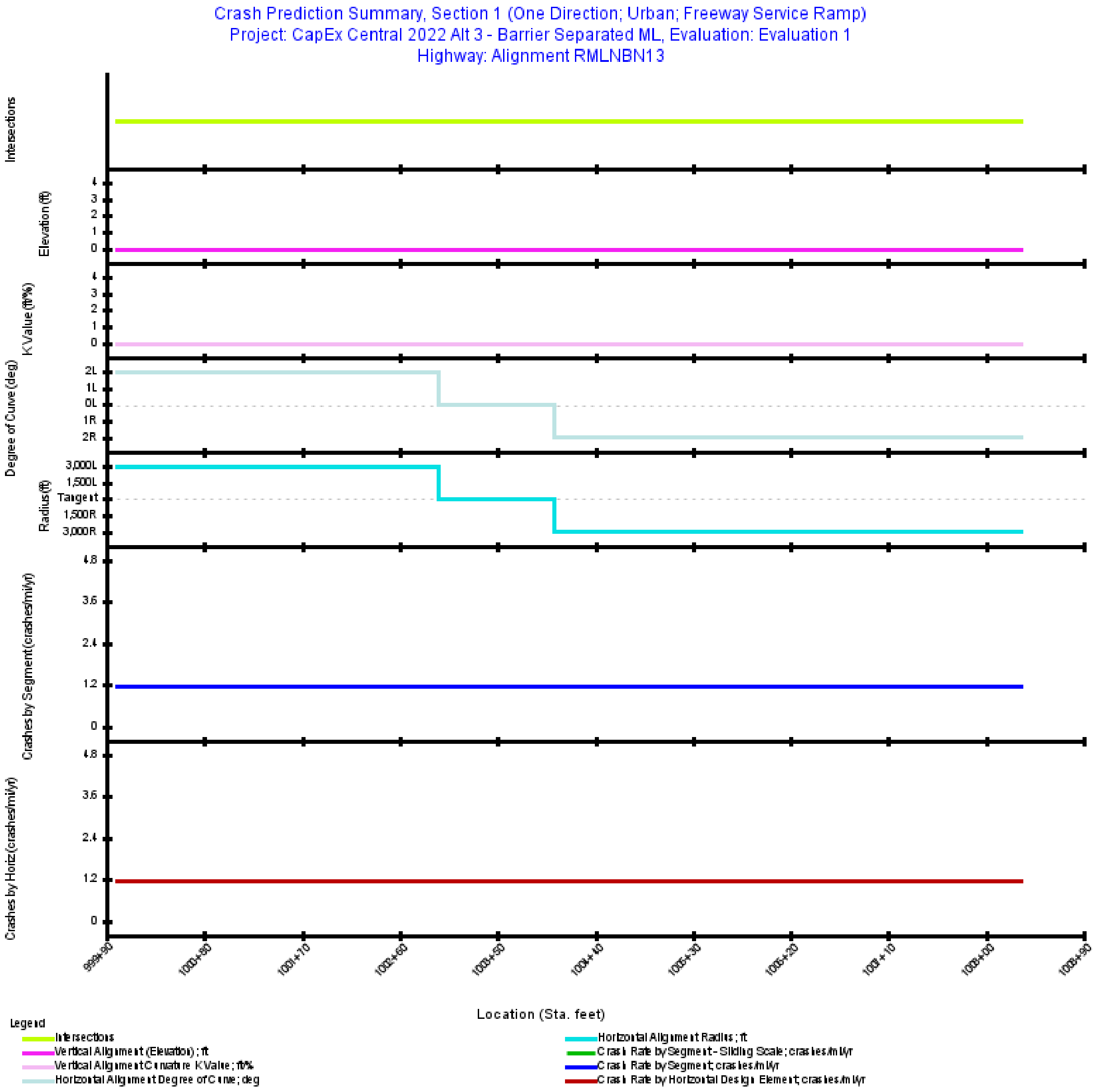

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1008+32.145	832.15	0.1576	2030: 2,250

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1576**
Average Future Road AADT (vpd)	**2,250**
Predicted Crashes	
Total Crashes	**0.18**
Fatal and Injury Crashes	**0.09**
Property-Damage-Only Crashes	**0.10**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**47**
Percent Property-Damage-Only Crashes (%)	**53**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**1.1757**
FI Crash Rate (crashes/mi/yr)	**0.5507**
PDO Crash Rate (crashes/mi/yr)	**0.6250**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.13**
Travel Crash Rate (crashes/million veh-mi)	**1.43**
Travel FI Crash Rate (crashes/million veh-mi)	**0.67**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.76**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1008+32.145	0.1576	0.185	0.1853	0.0868	0.0985	1.1757	1.43
Total			0.1576	0.185	0.1853	0.0868	0.0985	1.1757	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1002+96.142	0.0561	0.066	0.0659	0.0309	0.0351	1.1757	1.43
Tangent	1002+96.142	1004+02.022	0.0201	0.024	0.0236	0.0110	0.0125	1.1757	1.43
Simple Curve 2	1004+02.022	1008+32.145	0.0815	0.096	0.0958	0.0449	0.0509	1.1757	1.43

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.18	0.09	46.844	0.10	53.156
Total	0.18	0.09	46.844	0.10	53.156
Average	0.18	0.09	46.844	0.10	53.156

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0015	0.0045	0.0298	0.0510	0.0985

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.00	1.0	0.00	1.1
Highway Segment	Collision with Fixed Object	0.05	28.0	0.06	32.1	0.11	60.1
Highway Segment	Collision with Other Object	0.00	2.0	0.01	6.2	0.01	8.2
Highway Segment	Other Single-vehicle Collision	0.01	8.1	0.01	4.8	0.02	12.9
Highway Segment	Collision with Parked Vehicle	0.00	0.6	0.00	0.7	0.00	1.3
Highway Segment	Total Single Vehicle Crashes	0.07	38.8	0.08	44.9	0.15	83.6
Highway Segment	Right-Angle Collision	0.00	0.3	0.00	0.1	0.00	0.4
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.3	0.00	0.2	0.00	0.5
Highway Segment	Rear-end Collision	0.01	6.1	0.01	5.7	0.02	11.8
Highway Segment	Sideswipe, Same Direction Collision	0.00	1.5	0.00	2.2	0.01	3.7
Highway Segment	Total Multiple Vehicle Crashes	0.01	8.1	0.01	8.3	0.03	16.4
Highway Segment	Total Highway Segment Crashes	0.09	46.8	0.10	53.2	0.18	100.0
	Total Crashes	0.09	46.8	0.10	53.2	0.18	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1008+32.145	Warning: for segment #1 (1000+00.000 to 1008+32.145), The ramp type for Ramp Alignment RMLNBN13 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:50:11 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RMLNBX23
Highway Comment: Imported from RMLNBX23.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:50:02 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1009+09.066

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

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Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1009+09.066
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

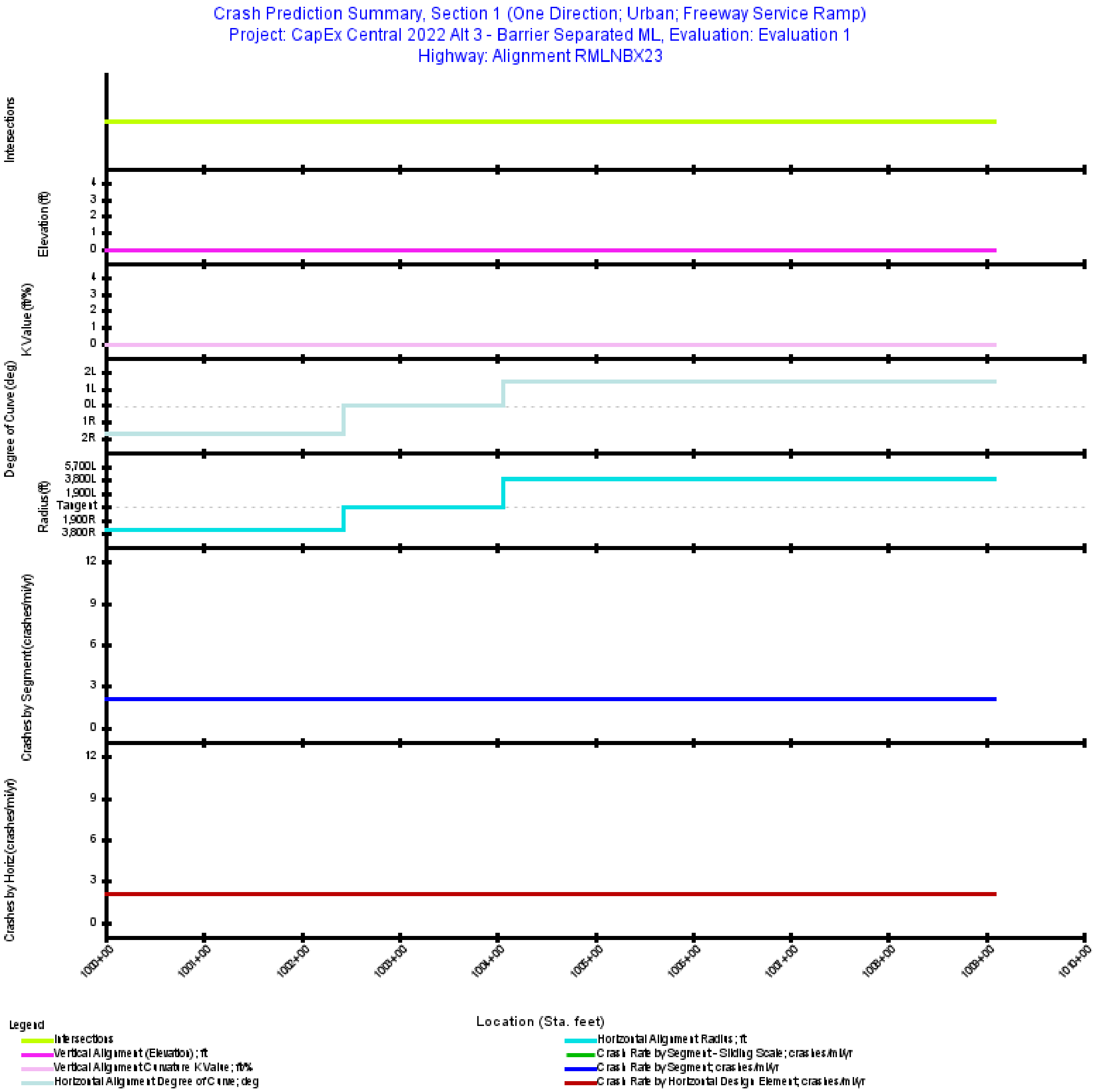

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1009+09.066	909.07	0.1722	2030: 4,250

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1722**
Average Future Road AADT (vpd)	**4,250**
Predicted Crashes	
Total Crashes	**0.36**
Fatal and Injury Crashes	**0.17**
Property-Damage-Only Crashes	**0.18**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**49**
Percent Property-Damage-Only Crashes (%)	**51**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**2.0851**
FI Crash Rate (crashes/mi/yr)	**1.0174**
PDO Crash Rate (crashes/mi/yr)	**1.0677**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.27**
Travel Crash Rate (crashes/million veh-mi)	**1.34**
Travel FI Crash Rate (crashes/million veh-mi)	**0.66**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.69**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1009+09.066	0.1722	0.359	0.3590	0.1752	0.1838	2.0851	1.34
Total			0.1722	0.359	0.3590	0.1752	0.1838	2.0851	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1002+42.790	0.0460	0.096	0.0959	0.0468	0.0491	2.0851	1.34
Tangent	1002+42.790	1004+06.535	0.0310	0.065	0.0647	0.0316	0.0331	2.0851	1.34
Simple Curve 2	1004+06.535	1009+09.066	0.0952	0.199	0.1985	0.0968	0.1016	2.0851	1.34

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.36	0.17	48.794	0.18	51.206
Total	0.36	0.17	48.794	0.18	51.206
Average	0.36	0.17	48.794	0.18	51.206

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0044	0.0134	0.0579	0.0995	0.1838

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.00	1.0	0.00	1.2
Highway Segment	Collision with Fixed Object	0.12	34.0	0.12	34.0	0.24	68.0
Highway Segment	Collision with Other Object	0.01	2.4	0.02	6.6	0.03	9.0
Highway Segment	Other Single-vehicle Collision	0.04	9.8	0.02	5.1	0.05	14.9
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.8	0.01	1.5
Highway Segment	Total Single Vehicle Crashes	0.17	47.1	0.17	47.5	0.34	94.6
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.1
Highway Segment	Rear-end Collision	0.01	1.3	0.01	2.6	0.01	3.8
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.3	0.00	1.0	0.01	1.3
Highway Segment	Total Multiple Vehicle Crashes	0.01	1.7	0.01	3.7	0.02	5.4
Highway Segment	Total Highway Segment Crashes	0.17	48.8	0.18	51.2	0.36	100.0
	Total Crashes	0.17	48.8	0.18	51.2	0.36	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1009+09.066	Warning: for segment #1 (1000+00.000 to 1009+09.066), The ramp type for Ramp Alignment RMLNBX23 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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This software product is provided "as-is," without warranty of any kind-either expressed or implied (but not limited to the implied warranties of merchantability and fitness for a particular purpose). The FHWA do not warrant that the functions contained in the software will meet the end-user's requirements or that the operation of the software will be uninterrupted and error-free.

Under no circumstances will the FHWA be liable to the end-user for any damages or claimed lost profits, lost savings, or other incidental or consequential damages rising out of the use or inability to use the software (even if these organizations have been advised of the possibility of such damages), or for any claim by any other party.

Notice

The use of the IHSDM software is being done strictly on a voluntary basis. In exchange for provision of IHSDM, the user agrees that the Federal Highway Administration (FHWA), U.S. Department of Transportation and any other agency of the Federal Government shall not be responsible for any errors, damage or other liability that may result from any and all use of the software, including installation and testing of the software. The user further agrees to hold the FHWA and the Federal Government harmless from any resulting liability. The user agrees that this hold harmless provision shall flow to any person to whom or any entity to which the user provides the IHSDM software. It is the user's full responsibility to inform any person to whom or any entity to which it provides the IHSDM software of this hold harmless provision.

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Report Overview

Report Generated: Aug 25, 2022 2:47 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:50:37 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RMLSBN13
Highway Comment: Imported from RMLSBN13.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:50:28 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1008+60.096

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1008+60.096
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

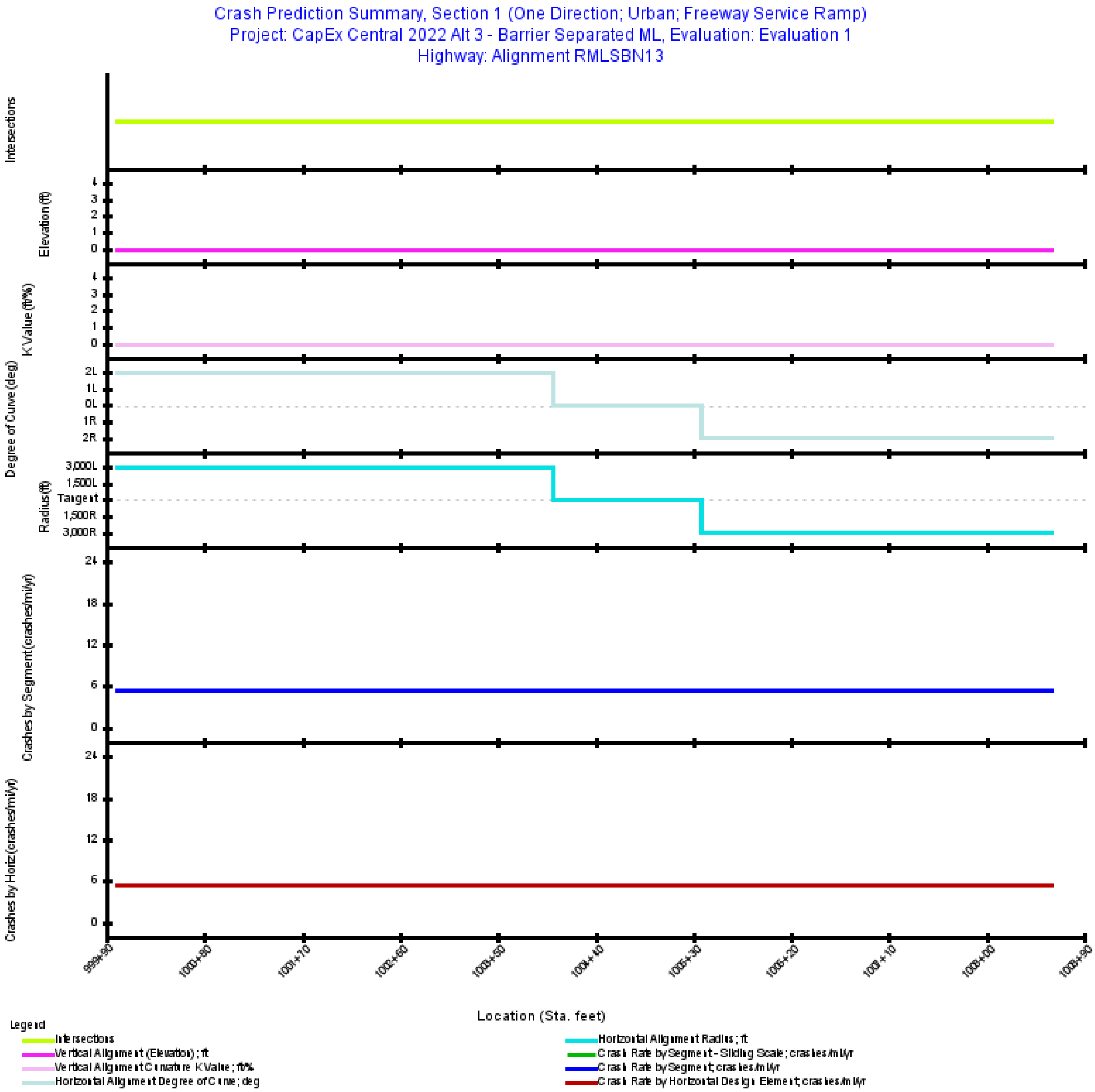

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1008+60.096	860.10	0.1629	2030: 15,200

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1629**
Average Future Road AADT (vpd)	**15,200**
Predicted Crashes	
Total Crashes	**0.87**
Fatal and Injury Crashes	**0.39**
Property-Damage-Only Crashes	**0.48**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**44**
Percent Property-Damage-Only Crashes (%)	**56**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**5.3509**
FI Crash Rate (crashes/mi/yr)	**2.3776**
PDO Crash Rate (crashes/mi/yr)	**2.9734**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.90**
Travel Crash Rate (crashes/million veh-mi)	**0.96**
Travel FI Crash Rate (crashes/million veh-mi)	**0.43**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.54**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1008+60.096	0.1629	0.872	0.8717	0.3873	0.4844	5.3509	0.96
Total			0.1629	0.872	0.8717	0.3873	0.4844	5.3509	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1004+01.181	0.0760	0.407	0.4066	0.1807	0.2259	5.3509	0.96
Tangent	1004+01.181	1005+36.782	0.0257	0.137	0.1374	0.0611	0.0764	5.3509	0.96
Simple Curve 2	1005+36.782	1008+60.096	0.0612	0.328	0.3277	0.1456	0.1821	5.3509	0.96

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.87	0.39	44.433	0.48	55.567
Total	0.87	0.39	44.433	0.48	55.567
Average	0.87	0.39	44.433	0.48	55.567

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0067	0.0204	0.1347	0.2255	0.4844

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.1	0.01	0.8	0.01	0.9
Highway Segment	Collision with Fixed Object	0.21	23.6	0.22	25.7	0.43	49.4
Highway Segment	Collision with Other Object	0.01	1.7	0.04	5.0	0.06	6.7
Highway Segment	Other Single-vehicle Collision	0.06	6.8	0.03	3.8	0.09	10.7
Highway Segment	Collision with Parked Vehicle	0.00	0.5	0.01	0.6	0.01	1.1
Highway Segment	Total Single Vehicle Crashes	0.28	32.8	0.31	35.9	0.60	68.7
Highway Segment	Right-Angle Collision	0.00	0.4	0.00	0.4	0.01	0.7
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.4	0.00	0.5	0.01	0.8
Highway Segment	Rear-end Collision	0.08	8.8	0.12	13.6	0.20	22.3
Highway Segment	Sideswipe, Same Direction Collision	0.02	2.1	0.05	5.2	0.06	7.3
Highway Segment	Total Multiple Vehicle Crashes	0.10	11.7	0.17	19.7	0.27	31.3
Highway Segment	Total Highway Segment Crashes	0.39	44.4	0.48	55.6	0.87	100.0
	Total Crashes	0.39	44.4	0.48	55.6	0.87	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1008+60.096	Warning: for segment #1 (1000+00.000 to 1008+60.096), The ramp type for Ramp Alignment RMLSBN13 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:48 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:51:36 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RMLSBX13
Highway Comment: Imported from RMLSBX13.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:51:26 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1005+75.833

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1005+75.833
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;

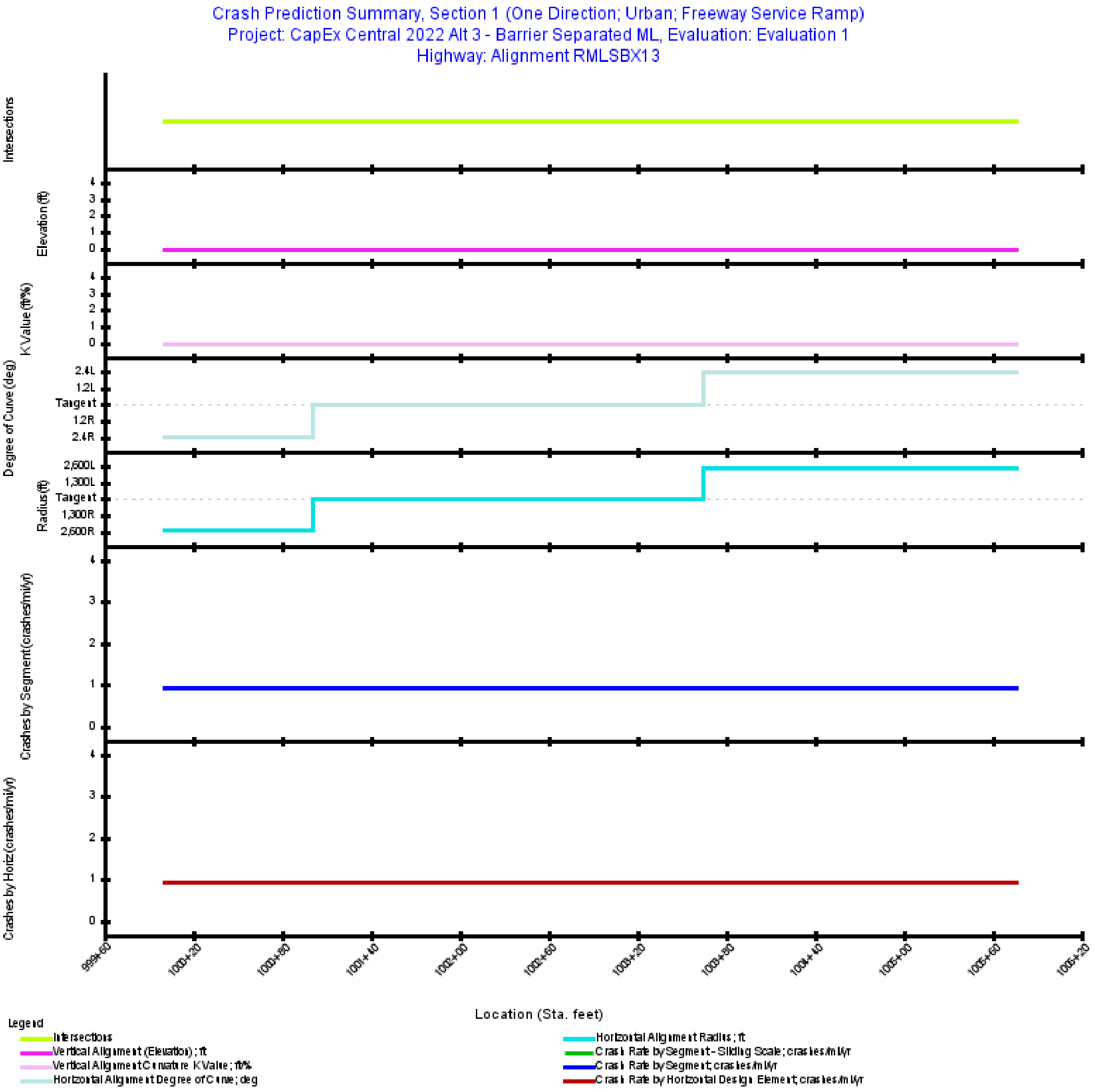

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1005+75.833	575.83	0.1091	2030: 1,450

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.1091**
Average Future Road AADT (vpd)	**1,450**
Predicted Crashes	
Total Crashes	**0.10**
Fatal and Injury Crashes	**0.05**
Property-Damage-Only Crashes	**0.05**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**49**
Percent Property-Damage-Only Crashes (%)	**51**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**0.9265**
FI Crash Rate (crashes/mi/yr)	**0.4510**
PDO Crash Rate (crashes/mi/yr)	**0.4756**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.06**
Travel Crash Rate (crashes/million veh-mi)	**1.75**
Travel FI Crash Rate (crashes/million veh-mi)	**0.85**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.90**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1005+75.833	0.1091	0.101	0.1010	0.0492	0.0519	0.9265	1.75
Total			0.1091	0.101	0.1010	0.0492	0.0519	0.9265	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+00.834	0.0191	0.018	0.0177	0.0086	0.0091	0.9265	1.75
Tangent	1001+00.834	1003+64.673	0.0500	0.046	0.0463	0.0225	0.0238	0.9265	1.75
Simple Curve 2	1003+64.673	1005+75.833	0.0400	0.037	0.0371	0.0180	0.0190	0.9265	1.75

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.10	0.05	48.671	0.05	51.329
Total	0.10	0.05	48.671	0.05	51.329
Average	0.10	0.05	48.671	0.05	51.329

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0013	0.0039	0.0167	0.0274	0.0519

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.00	1.1	0.00	1.3
Highway Segment	Collision with Fixed Object	0.03	33.9	0.04	35.3	0.07	69.2
Highway Segment	Collision with Other Object	0.00	2.4	0.01	6.8	0.01	9.2
Highway Segment	Other Single-vehicle Collision	0.01	9.8	0.01	5.3	0.01	15.0
Highway Segment	Collision with Parked Vehicle	0.00	0.7	0.00	0.8	0.00	1.5
Highway Segment	Total Single Vehicle Crashes	0.05	47.0	0.05	49.3	0.10	96.2
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.1
Highway Segment	Rear-end Collision	0.00	1.3	0.00	1.4	0.00	2.7
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.3	0.00	0.5	0.00	0.9
Highway Segment	Total Multiple Vehicle Crashes	0.00	1.7	0.00	2.1	0.00	3.8
Highway Segment	Total Highway Segment Crashes	0.05	48.7	0.05	51.3	0.10	100.0
	Total Crashes	0.05	48.7	0.05	51.3	0.10	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1005+75.833	Warning: for segment #1 (1000+00.000 to 1005+75.833), The ramp type for Ramp Alignment RMLSBX13 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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This software product is provided "as-is," without warranty of any kind-either expressed or implied (but not limited to the implied warranties of merchantability and fitness for a particular purpose). The FHWA do not warrant that the functions contained in the software will meet the end-user's requirements or that the operation of the software will be uninterrupted and error-free.

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Report Overview

Report Generated: Aug 25, 2022 2:48 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:52:14 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RMLSBX23
Highway Comment: Imported from RMLSBX23.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:52:05 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1010+83.566

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

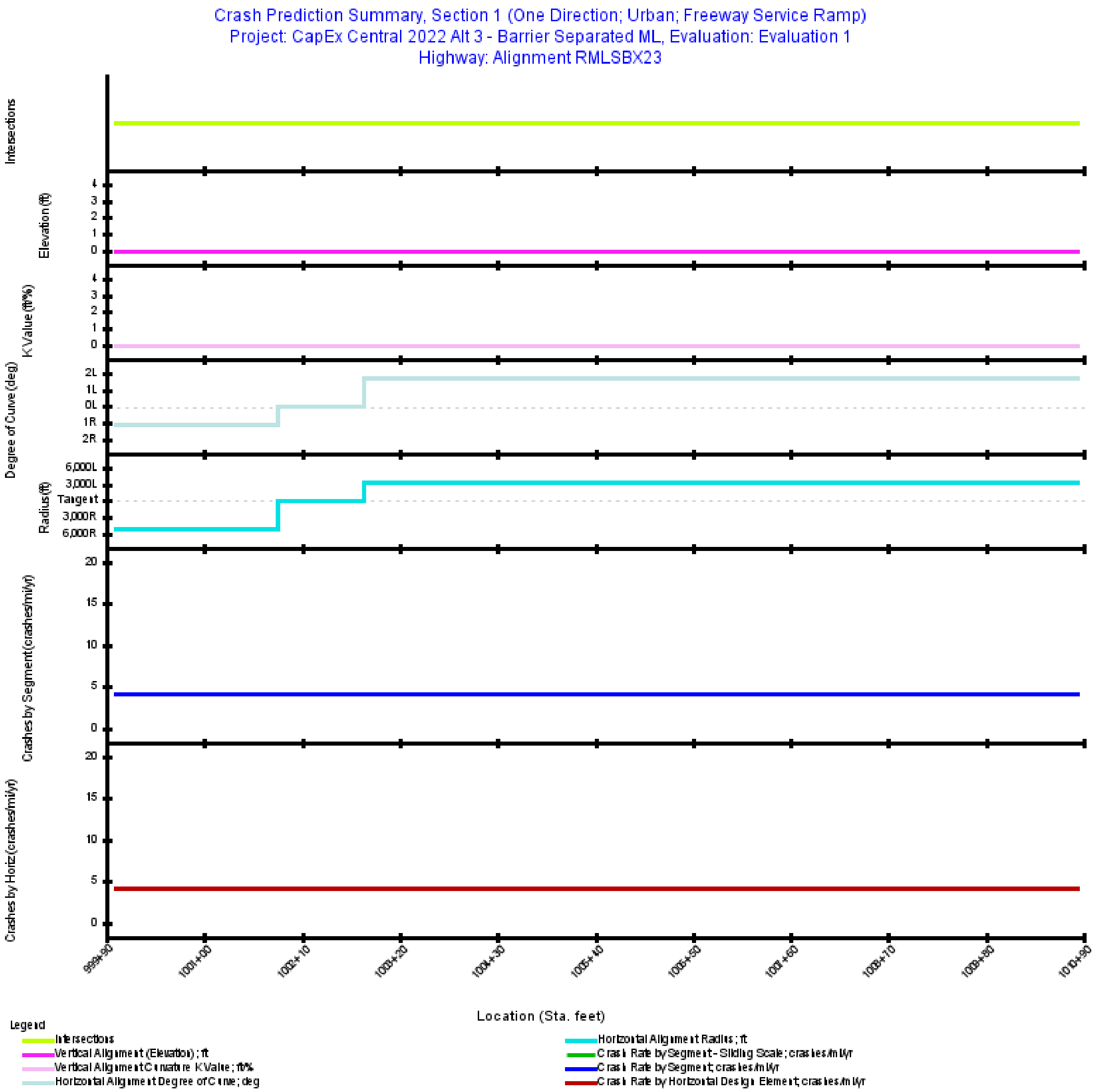
The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1010+83.566
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: EX_RAMP_MV_FI=1.0; EX_RAMP_MV_PDO=1.0; EX_RAMP_SV_FI=1.0; EX_RAMP_SV_PDO=1.0;



Crash Prediction Summary, Section 1 (One Direction; Urban; Freeway Service Ramp)
Project: CapEx Central 2022 Alt 3 - Barrier Separated ML, Evaluation: Evaluation 1
Highway: Alignment RMLSBX23

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Exit	Urban	1000+00.000	1010+83.566	1,083.57	0.2052	2030: 10,650

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.2052**
Average Future Road AADT (vpd)	**10,650**
Predicted Crashes	
Total Crashes	**0.84**
Fatal and Injury Crashes	**0.41**
Property-Damage-Only Crashes	**0.43**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**48**
Percent Property-Damage-Only Crashes (%)	**52**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**4.0768**
FI Crash Rate (crashes/mi/yr)	**1.9757**
PDO Crash Rate (crashes/mi/yr)	**2.1011**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.80**
Travel Crash Rate (crashes/million veh-mi)	**1.05**
Travel FI Crash Rate (crashes/million veh-mi)	**0.51**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.54**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1010+83.566	0.2052	0.837	0.8366	0.4055	0.4312	4.0768	1.05
Total			0.2052	0.837	0.8366	0.4055	0.4312	4.0768	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 1	1000+00.000	1001+82.945	0.0346	0.141	0.1413	0.0685	0.0728	4.0768	1.05
Tangent	1001+82.945	1002+79.793	0.0183	0.075	0.0748	0.0362	0.0385	4.0768	1.05
Simple Curve 2	1002+79.793	1010+83.566	0.1522	0.621	0.6206	0.3008	0.3199	4.0768	1.05

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.84	0.41	48.461	0.43	51.539
Total	0.84	0.41	48.461	0.43	51.539
Average	0.84	0.41	48.461	0.43	51.539

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0103	0.0312	0.1348	0.2292	0.4312

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.01	1.0	0.01	1.2
Highway Segment	Collision with Fixed Object	0.28	33.4	0.27	32.6	0.55	66.1
Highway Segment	Collision with Other Object	0.02	2.4	0.05	6.3	0.07	8.7
Highway Segment	Other Single-vehicle Collision	0.08	9.6	0.04	4.9	0.12	14.5
Highway Segment	Collision with Parked Vehicle	0.01	0.7	0.01	0.7	0.01	1.4
Highway Segment	Total Single Vehicle Crashes	0.39	46.3	0.38	45.6	0.77	91.9
Highway Segment	Right-Angle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Other Multi-vehicle Collision	0.00	0.1	0.00	0.1	0.00	0.2
Highway Segment	Rear-end Collision	0.01	1.6	0.03	4.1	0.05	5.7
Highway Segment	Sideswipe, Same Direction Collision	0.00	0.4	0.01	1.6	0.02	2.0
Highway Segment	Total Multiple Vehicle Crashes	0.02	2.2	0.05	6.0	0.07	8.1
Highway Segment	Total Highway Segment Crashes	0.41	48.5	0.43	51.5	0.84	100.0
	Total Crashes	0.41	48.5	0.43	51.5	0.84	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1010+83.566	Warning: for segment #1 (1000+00.000 to 1010+83.566), The ramp type for Ramp Alignment RMLSBX23 is set at the Ramp Connection (Exit) and in the Ramp (Exit). The Ramp value takes precedence.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 11:51:05 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Barrier Separated ML
Project Comment: Created Fri Jun 10 15:41:42 CDT 2022
Project Unit System: U.S. Customary

Highway Title: Alignment RMLSBN23
Highway Comment: Imported from RMLSBN23.xml
Highway Version: 1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 11:50:49 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1016+07.218

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Freeway Ramp Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1016+07.218
Functional Class: Freeway Service Ramp
Type of Alignment: One Direction
Model Category: Freeway Service Ramp
Calibration Factor: ENT_RAMP_MV_FI=1.0; ENT_RAMP_MV_PDO=1.0; ENT_RAMP_SV_FI=1.0; ENT_RAMP_SV_PDO=1.0;

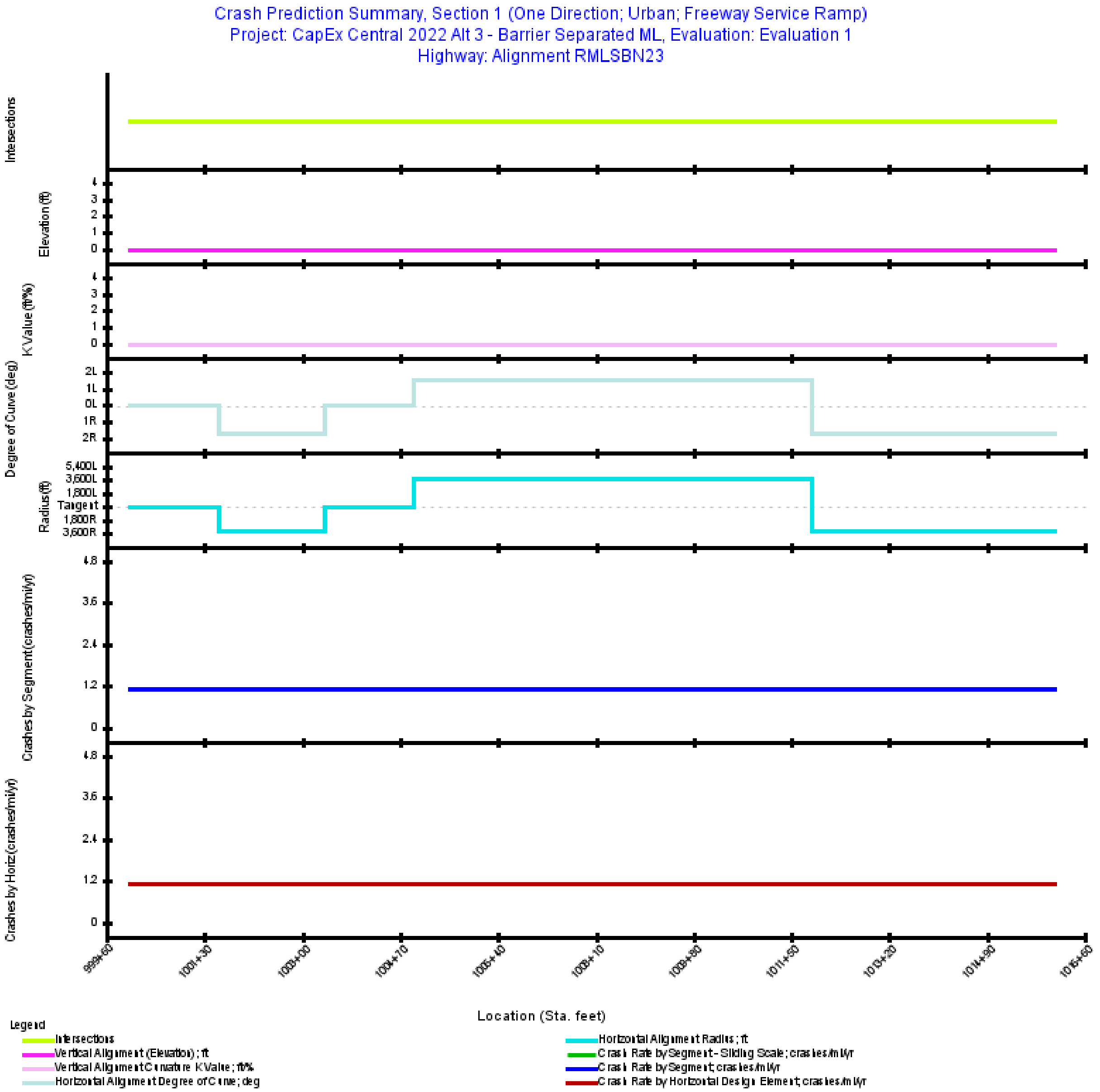

Figure 1. Crash Prediction Summary (Freeway Ramp Sections)

Table 1. Evaluation Freeway - Homogeneous Segments (Freeway Ramp Sections)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length (mi)	AADT
1	Freeway Ramp and C-D Road One-lane Ramp Entrance	Urban	1000+00.000	1016+07.218	1,607.22	0.3044	2030: 2,050

Table 2. Predicted Ramp Crash Rates and Frequencies Summary (Freeway Ramp Sections)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Evaluated Length (mi)	**0.3044**
Average Future Road AADT (vpd)	**2,050**
Predicted Crashes	
Total Crashes	**0.34**
Fatal and Injury Crashes	**0.16**
Property-Damage-Only Crashes	**0.18**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**47**
Percent Property-Damage-Only Crashes (%)	**53**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**1.1199**
FI Crash Rate (crashes/mi/yr)	**0.5281**
PDO Crash Rate (crashes/mi/yr)	**0.5917**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**0.23**
Travel Crash Rate (crashes/million veh-mi)	**1.50**
Travel FI Crash Rate (crashes/million veh-mi)	**0.71**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.79**

Table 3. Predicted Crash Frequencies and Rates by Ramp Segment/Intersection (Freeway Ramp Sections)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1016+07.218	0.3044	0.341	0.3409	0.1608	0.1801	1.1199	1.50
Total			0.3044	0.341	0.3409	0.1608	0.1801	1.1199	

Table 4. Predicted Crash Frequencies and Rates by Horizontal Design Element (Freeway Ramp Sections)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi /yr)	Predicted Travel Crash Rate (crashes/mi llion veh-mi)
Tangent	1000+00.000	1001+55.306	0.0294	0.033	0.0329	0.0155	0.0174	1.1199	1.50
Simple Curve 1	1001+55.306	1003+38.156	0.0346	0.039	0.0388	0.0183	0.0205	1.1199	1.50
Tangent	1003+38.156	1004+93.939	0.0295	0.033	0.0330	0.0156	0.0175	1.1199	1.50
Simple Curve 2	1004+93.939	1011+84.996	0.1309	0.147	0.1466	0.0691	0.0774	1.1199	1.50
Simple Curve 3	1011+84.996	1016+07.218	0.0800	0.090	0.0896	0.0422	0.0473	1.1199	1.50

Table 5. Predicted Crash Frequencies by Year (Freeway Ramp Sections)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	0.34	0.16	47.160	0.18	52.840
Total	0.34	0.16	47.160	0.18	52.840
Average	0.34	0.16	47.160	0.18	52.840

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Crash Severity by Ramp Segment (Freeway Ramp Sections)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0027	0.0082	0.0543	0.0956	0.1801

Table 7. Predicted Freeway Ramp Crash Type Distribution (Freeway Ramp Sections)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.2	0.00	1.0	0.00	1.1
Highway Segment	Collision with Fixed Object	0.10	28.1	0.11	32.1	0.20	60.2
Highway Segment	Collision with Other Object	0.01	2.0	0.02	6.2	0.03	8.2
Highway Segment	Other Single-vehicle Collision	0.03	8.1	0.02	4.8	0.04	12.9
Highway Segment	Collision with Parked Vehicle	0.00	0.6	0.00	0.7	0.00	1.3
Highway Segment	Total Single Vehicle Crashes	0.13	38.9	0.15	44.8	0.29	83.8
Highway Segment	Right-Angle Collision	0.00	0.3	0.00	0.1	0.00	0.4
Highway Segment	Head-on Collision	0.00	0.1	0.00	0.0	0.00	0.1
Highway Segment	Other Multi-vehicle Collision	0.00	0.3	0.00	0.2	0.00	0.4
Highway Segment	Rear-end Collision	0.02	6.2	0.02	5.5	0.04	11.7
Highway Segment	Sideswipe, Same Direction Collision	0.01	1.5	0.01	2.1	0.01	3.6
Highway Segment	Total Multiple Vehicle Crashes	0.03	8.2	0.03	8.0	0.06	16.2
Highway Segment	Total Highway Segment Crashes	0.16	47.2	0.18	52.8	0.34	100.0
	Total Crashes	0.16	47.2	0.18	52.8	0.34	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 8. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+00.000	1016+07.218	Warning: for segment #1 (1000+00.000 to 1016+07.218), The ramp type for Ramp Alignment RMLSBN23 is set at the Ramp Connection (Entrance) and in the Ramp (Entrance). The Ramp value takes precedence.

I-35 Modified Build Alternative 3 Model Frontage Road Intersections

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Fri Jul 23 12:14:51 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - Build Alt 3
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: 51st Street @ Cameron Road
Intersection Comment: Created Mon Mar 01 15:42:16 CST 2021
Intersection Version: v1

Evaluation Title: Evaluation 6
Evaluation Comment: Created Fri Jul 23 12:14:18 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1010+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

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- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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Section Types

51st Street @ Cameron Road Evaluation

Intersection: 51st Street @ Cameron Road
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1010+00.000
Calibration Factor: 3SG=1.0;

Table 1. Evaluation Intersection (51st Street @ Cameron Road)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	51st Street @ Cameron Road (v1)	Urban/Suburban Arterial Intersection Three-Legged Signalized	1009+00.000	2030: 38,100	2030: 26,450	3	Signalized	2	2	0	0	true	false	false	3	0	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (51st Street @ Cameron Road)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**6.68**
Fatal and Injury Crashes	**1.96**
Property-Damage-Only Crashes	**4.72**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**29**
Percent Property-Damage-Only Crashes (%)	**71**

Table 3. Predicted Crash Frequencies by Year (51st Street @ Cameron Road)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	6.68	1.96	29.327	4.72	70.673
Total	6.68	1.96	29.327	4.72	70.673
Average	6.68	1.96	29.327	4.72	70.673

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (51st Street @ Cameron Road)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Collision with Animal	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Bicycle	0.07	1.1	0.00	0.0	0.07	1.1
Intersection	Collision with Fixed Object	0.09	1.3	0.24	3.6	0.33	4.9
Intersection	Non-Collision	0.03	0.4	0.00	0.1	0.03	0.5
Intersection	Collision with Other Object	0.01	0.2	0.02	0.3	0.03	0.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.01	0.1	0.01	0.2
Intersection	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Total Intersection Single Vehicle Crashes	0.20	3.0	0.27	4.0	0.47	7.1
Intersection	Angle Collision	0.49	7.4	0.91	13.6	1.40	21.0
Intersection	Head-on Collision	0.07	1.0	0.09	1.3	0.16	2.3
Intersection	Other Multi-vehicle Collision	0.10	1.5	0.88	13.2	0.98	14.7
Intersection	Rear-end Collision	0.96	14.4	2.43	36.4	3.40	50.8
Intersection	Sideswipe	0.13	2.0	0.14	2.1	0.28	4.1
Intersection	Total Intersection Multiple Vehicle Crashes	1.76	26.3	4.45	66.6	6.21	92.9
Intersection	Total Intersection Crashes	1.96	29.3	4.72	70.7	6.68	100.0
	Total Crashes	1.96	29.3	4.72	70.7	6.68	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1009+00.000	1009+00.000	for intersection #1 (1009+00.000 to 1009+00.000), minor road traffic volume (26,450 vpd) for 2030 is not within the model limit (16,400 vpd) for reliable results for intersection type 3SG

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 08:26:08 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Airport Blvd EAST
Intersection Comment: Created Tue Jun 29 09:20:12 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 08:26:00 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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Section Types

I-35 & Airport Blvd EAST Evaluation

Intersection: I-35 & Airport Blvd EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Airport Blvd EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Airport Blvd EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 19,900	2030: 47,050	4	Signalized	2	0	2	0	true	false	true	3	0	10

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Airport Blvd EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**20.13**
Fatal and Injury Crashes	**4.11**
Property-Damage-Only Crashes	**16.03**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Airport Blvd EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	20.13	4.11	20.389	16.03	79.612
Total	20.13	4.11	20.389	16.03	79.612
Average	20.13	4.11	20.389	16.03	79.612

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Airport Blvd EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	3.24	16.1	11.75	58.3	14.98	74.4
Intersection	Collision with Bicycle	0.24	1.2	0.00	0.0	0.24	1.2
Intersection	Head-on Collision	0.15	0.7	0.48	2.4	0.63	3.1
Intersection	Other Multi-vehicle Collision	0.12	0.6	0.19	1.0	0.31	1.5
Intersection	Other Single-vehicle Collision	0.02	0.1	0.34	1.7	0.36	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.12	0.6	0.95	4.7	1.06	5.3
Intersection	Sideswipe	0.23	1.1	2.32	11.5	2.55	12.7
Intersection	Total Intersection Total Vehicle Crashes	4.11	20.4	16.03	79.6	20.14	100.0
Intersection	Total Intersection Crashes	4.11	20.4	16.03	79.6	20.14	100.0
	Total Crashes	4.11	20.4	16.03	79.6	20.14	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	Information: for intersection #1 (1001+00.000 to 1001+00.000), For I-35 & Airport Blvd EAST, minor leg E Airport Blvd at 1006+00.000 has higher average traffic volume (44225.0) than major leg N I-35 NBFR @ Airport Blvd at 1001+00.000 average traffic volume (19900.0). For I-35 & Airport Blvd EAST, minor leg W Airport Blvd at 1006+00.000 has higher average traffic volume (44225.0) than major leg N I-35 NBFR @ Airport Blvd at 1001+00.000 average traffic volume (19900.0). For I-35 & Airport Blvd EAST, minor leg E Airport Blvd at 1006+00.000 has higher average traffic volume (44225.0) than major leg S I-35 NBFR @ Airport Blvd at 1001+00.000 average traffic volume (19900.0). For I-35 & Airport Blvd EAST, minor leg W Airport Blvd at 1006+00.000 has higher average traffic volume (44225.0) than major leg S I-35 NBFR @ Airport Blvd at 1001+00.000 average traffic volume (19900.0).

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 08:26:32 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 38 1/2 St EAST
Intersection Comment: Created Tue Jun 29 09:47:45 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 08:26:24 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & 38 1/2 St EAST Evaluation

Intersection: I-35 & 38 1/2 St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 38 1/2 St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 38 1/2 St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 22,300	2030: 12,600	4	Signalized	2	0	2	0	true	false	false	3	1	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 38 1/2 St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**4.82**
Fatal and Injury Crashes	**0.96**
Property-Damage-Only Crashes	**3.87**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & 38 1/2 St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.82	0.96	19.838	3.87	80.162
Total	4.82	0.96	19.838	3.87	80.162
Average	4.82	0.96	19.838	3.87	80.162

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 38 1/2 St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.75	15.6	2.83	58.7	3.59	74.4
Intersection	Collision with Bicycle	0.06	1.2	0.00	0.0	0.06	1.2
Intersection	Head-on Collision	0.04	0.7	0.12	2.4	0.15	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.6	0.05	1.0	0.07	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.08	1.7	0.09	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.6	0.23	4.7	0.26	5.3
Intersection	Sideswipe	0.05	1.1	0.56	11.6	0.61	12.7
Intersection	Total Intersection Total Vehicle Crashes	0.96	19.9	3.87	80.1	4.83	100.0
Intersection	Total Intersection Crashes	0.96	19.9	3.87	80.1	4.83	100.0
	Total Crashes	0.96	19.9	3.87	80.1	4.83	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Generated: Aug 25, 2022 2:51 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 21 14:46:34 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 32nd St EAST
Intersection Comment: Created Tue Jun 29 09:59:14 CDT 2021
Intersection Version: v1

Evaluation Title: 20220721
Evaluation Comment: Created Thu Jul 21 14:46:25 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & 32nd St EAST Evaluation

Intersection: I-35 & 32nd St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 3SG=1.0;

Table 1. Evaluation Intersection (I-35 & 32nd St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 32nd St EAST (v1)	Urban/Suburban Arterial Intersection Three-Legged Signalized	1001+00.000	2030: 15,700	2030: 6,750	3	Signalized	2	0	3	0	true	false	false	0	0	3

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 32nd St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**2.18**
Fatal and Injury Crashes	**0.49**
Property-Damage-Only Crashes	**1.70**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**22**
Percent Property-Damage-Only Crashes (%)	**78**

Table 3. Predicted Crash Frequencies by Year (I-35 & 32nd St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	2.18	0.49	22.288	1.70	77.712
Total	2.18	0.49	22.288	1.70	77.712
Average	2.18	0.49	22.288	1.70	77.712

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 32nd St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.40	18.4	0.97	44.4	1.37	62.8
Intersection	Collision with Bicycle	0.03	1.6	0.00	0.0	0.03	1.6
Intersection	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Other Multi-vehicle Collision	0.00	0.0	0.12	5.5	0.12	5.5
Intersection	Other Single-vehicle Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.05	2.3	0.24	11.1	0.29	13.4
Intersection	Sideswipe	0.00	0.0	0.36	16.6	0.36	16.6
Intersection	Total Intersection Total Vehicle Crashes	0.49	22.3	1.70	77.7	2.18	100.0
Intersection	Total Intersection Crashes	0.49	22.3	1.70	77.7	2.18	100.0
	Total Crashes	0.49	22.3	1.70	77.7	2.18	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Fri Jul 01 14:31:01 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Manor Rd
Intersection Comment: Created Tue Jun 29 10:10:06 CDT 2021
Intersection Version: v1

Evaluation Title: 20220701 Updated Configuration
Evaluation Comment: Created Fri Jul 01 14:30:42 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & Manor Rd Evaluation

Intersection: I-35 & Manor Rd
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Manor Rd)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Manor Rd (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 40,000	2030: 9,300	4	Signalized	4	0	0	0	true	false	true	5	0	6

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Manor Rd)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**5.80**
Fatal and Injury Crashes	**2.06**
Property-Damage-Only Crashes	**3.73**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**36**
Percent Property-Damage-Only Crashes (%)	**64**

Table 3. Predicted Crash Frequencies by Year (I-35 & Manor Rd)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.80	2.06	35.607	3.73	64.393
Total	5.80	2.06	35.607	3.73	64.393
Average	5.80	2.06	35.607	3.73	64.393

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Manor Rd)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Collision with Animal	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Bicycle	0.09	1.5	0.00	0.0	0.09	1.5
Intersection	Collision with Fixed Object	0.04	0.8	0.19	3.2	0.23	4.0
Intersection	Non-Collision	0.01	0.1	0.01	0.1	0.02	0.3
Intersection	Collision with Other Object	0.00	0.1	0.01	0.3	0.02	0.3
Intersection	Other Single-vehicle Collision	0.00	0.0	0.01	0.1	0.01	0.1
Intersection	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Total Intersection Single Vehicle Crashes	0.15	2.5	0.21	3.7	0.36	6.2
Intersection	Angle Collision	0.67	11.5	0.86	14.8	1.52	26.3
Intersection	Head-on Collision	0.09	1.6	0.11	1.8	0.20	3.4
Intersection	Other Multi-vehicle Collision	0.10	1.8	0.74	12.8	0.85	14.6
Intersection	Rear-end Collision	0.86	14.9	1.70	29.3	2.56	44.2
Intersection	Sideswipe	0.19	3.3	0.11	1.9	0.30	5.2
Intersection	Total Intersection Multiple Vehicle Crashes	1.92	33.1	3.52	60.7	5.44	93.8
Intersection	Total Intersection Crashes	2.06	35.6	3.73	64.4	5.80	100.0
	Total Crashes	2.06	35.6	3.73	64.4	5.80	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 21 14:45:56 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & MLK Jr Blvd EAST
Intersection Comment: Created Tue Jun 29 10:24:34 CDT 2021
Intersection Version: v1

Evaluation Title: 20220721
Evaluation Comment: Created Thu Jul 21 14:45:45 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & MLK Jr Blvd EAST Evaluation

Intersection: I-35 & MLK Jr Blvd EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & MLK Jr Blvd EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & MLK Jr Blvd EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 67,200	2030: 28,400	4	Signalized	4	3	0	0	true	false	true	4	0	8

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & MLK Jr Blvd EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**9.20**
Fatal and Injury Crashes	**5.00**
Property-Damage-Only Crashes	**4.20**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**54**
Percent Property-Damage-Only Crashes (%)	**46**

Table 3. Predicted Crash Frequencies by Year (I-35 & MLK Jr Blvd EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	9.20	5.00	54.371	4.20	45.629
Total	9.20	5.00	54.371	4.20	45.629
Average	9.20	5.00	54.371	4.20	45.629

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & MLK Jr Blvd EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	3.60	39.1	2.32	25.2	5.92	64.3
Intersection	Collision with Bicycle	0.17	1.9	0.00	0.0	0.17	1.9
Intersection	Head-on Collision	0.45	4.9	0.19	2.1	0.64	7.0
Intersection	Other Multi-vehicle Collision	0.14	1.5	0.09	1.0	0.23	2.5
Intersection	Other Single-vehicle Collision	0.06	0.6	0.26	2.8	0.31	3.4
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.40	4.4	0.62	6.8	1.02	11.1
Intersection	Sideswipe	0.18	2.0	0.72	7.8	0.90	9.8
Intersection	Total Intersection Total Vehicle Crashes	5.01	54.4	4.20	45.6	9.21	100.0
Intersection	Total Intersection Crashes	5.01	54.4	4.20	45.6	9.21	100.0
	Total Crashes	5.01	54.4	4.20	45.6	9.21	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Generated: Aug 25, 2022 2:53 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 21 14:45:04 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 15th St
Intersection Comment: Created Tue Jun 29 10:33:31 CDT 2021
Intersection Version: v1

Evaluation Title: 20220721
Evaluation Comment: Created Thu Jul 21 14:44:48 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & 15th St Evaluation

Intersection: I-35 & 15th St
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 15th St)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 15th St (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 85,650	2030: 42,300	4	Signalized	3	2	1	0	true	false	true	1	0	7

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 15th St)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**8.95**
Fatal and Injury Crashes	**4.92**
Property-Damage-Only Crashes	**4.04**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**55**
Percent Property-Damage-Only Crashes (%)	**45**

Table 3. Predicted Crash Frequencies by Year (I-35 & 15th St)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	8.95	4.92	54.904	4.04	45.096
Total	8.95	4.92	54.904	4.04	45.096
Average	8.95	4.92	54.904	4.04	45.096

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 15th St)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	3.54	39.5	2.23	24.9	5.77	64.4
Intersection	Collision with Bicycle	0.17	1.9	0.00	0.0	0.17	1.9
Intersection	Head-on Collision	0.44	4.9	0.19	2.1	0.63	7.0
Intersection	Other Multi-vehicle Collision	0.14	1.5	0.09	1.0	0.23	2.5
Intersection	Other Single-vehicle Collision	0.06	0.6	0.25	2.7	0.30	3.4
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.39	4.4	0.60	6.7	0.99	11.1
Intersection	Sideswipe	0.18	2.0	0.69	7.7	0.87	9.7
Intersection	Total Intersection Total Vehicle Crashes	4.92	54.9	4.04	45.1	8.96	100.0
Intersection	Total Intersection Crashes	4.92	54.9	4.04	45.1	8.96	100.0
	Total Crashes	4.92	54.9	4.04	45.1	8.96	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Evaluation Date: Fri Jul 01 14:22:07 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 12th St
Intersection Comment: Created Tue Jun 29 10:39:20 CDT 2021
Intersection Version: v1

Evaluation Title: Low Speed
Evaluation Comment: Created Fri Jul 01 14:21:56 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & 12th St Evaluation

Intersection: I-35 & 12th St
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 12th St)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 12th St (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 32,300	2030: 11,450	4	Signalized	4	0	0	0	true	false	false	5	0	6

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 12th St)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**4.86**
Fatal and Injury Crashes	**1.69**
Property-Damage-Only Crashes	**3.17**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**35**
Percent Property-Damage-Only Crashes (%)	**65**

Table 3. Predicted Crash Frequencies by Year (I-35 & 12th St)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.86	1.69	34.813	3.17	65.187
Total	4.86	1.69	34.813	3.17	65.187
Average	4.86	1.69	34.813	3.17	65.187

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 12th St)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Collision with Animal	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Bicycle	0.07	1.5	0.00	0.0	0.07	1.5
Intersection	Collision with Fixed Object	0.04	0.9	0.17	3.4	0.21	4.3
Intersection	Non-Collision	0.01	0.2	0.01	0.1	0.01	0.3
Intersection	Collision with Other Object	0.00	0.1	0.01	0.3	0.02	0.4
Intersection	Other Single-vehicle Collision	0.00	0.0	0.00	0.1	0.01	0.1
Intersection	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Total Intersection Single Vehicle Crashes	0.13	2.7	0.19	3.9	0.32	6.6
Intersection	Angle Collision	0.54	11.1	0.73	14.9	1.27	26.1
Intersection	Head-on Collision	0.08	1.6	0.09	1.8	0.17	3.4
Intersection	Other Multi-vehicle Collision	0.09	1.8	0.63	12.9	0.71	14.7
Intersection	Rear-end Collision	0.70	14.5	1.44	29.6	2.14	44.0
Intersection	Sideswipe	0.15	3.2	0.10	2.0	0.25	5.1
Intersection	Total Intersection Multiple Vehicle Crashes	1.56	32.1	2.98	61.2	4.54	93.4
Intersection	Total Intersection Crashes	1.69	34.8	3.17	65.2	4.86	100.0
	Total Crashes	1.69	34.8	3.17	65.2	4.86	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Evaluation Date: Fri Jul 01 13:04:47 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 11th St
Intersection Comment: Created Tue Jun 29 10:46:27 CDT 2021
Intersection Version: v1

Evaluation Title: 20220701 Updated Configuration
Evaluation Comment: Created Fri Jul 01 13:04:38 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & 11th St Evaluation

Intersection: I-35 & 11th St
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 11th St)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 11th St (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 32,300	2030: 15,600	4	Signalized	4	0	0	0	true	false	false	5	1	7

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 11th St)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**5.82**
Fatal and Injury Crashes	**3.07**
Property-Damage-Only Crashes	**2.75**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**53**
Percent Property-Damage-Only Crashes (%)	**47**

Table 3. Predicted Crash Frequencies by Year (I-35 & 11th St)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.82	3.07	52.758	2.75	47.242
Total	5.82	3.07	52.758	2.75	47.242
Average	5.82	3.07	52.758	2.75	47.242

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 11th St)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	2.21	37.9	1.52	26.1	3.73	64.0
Intersection	Collision with Bicycle	0.11	1.9	0.00	0.0	0.11	1.9
Intersection	Head-on Collision	0.28	4.7	0.13	2.2	0.40	6.9
Intersection	Other Multi-vehicle Collision	0.09	1.5	0.06	1.0	0.15	2.5
Intersection	Other Single-vehicle Collision	0.04	0.6	0.17	2.9	0.20	3.5
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.25	4.2	0.41	7.0	0.65	11.2
Intersection	Sideswipe	0.11	1.9	0.47	8.1	0.58	10.0
Intersection	Total Intersection Total Vehicle Crashes	3.07	52.8	2.75	47.2	5.82	100.0
Intersection	Total Intersection Crashes	3.07	52.8	2.75	47.2	5.82	100.0
	Total Crashes	3.07	52.8	2.75	47.2	5.82	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Generated: Aug 25, 2022 2:55 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Fri Jul 01 13:06:10 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 8th St
Intersection Comment: Created Tue Jun 21 15:00:05 CDT 2022
Intersection Version: v1

Evaluation Title: 20220701 Updated Configuration
Evaluation Comment: Created Fri Jul 01 13:06:02 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1001+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

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- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & 8th St Evaluation

Intersection: I-35 & 8th St
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1001+00.000
Calibration Factor: 3SG=1.0;

Table 1. Evaluation Intersection (I-35 & 8th St)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 8th St (v1)	Urban/Suburban Arterial Intersection Three-Legged Signalized	1000+99.997	2030: 6,900	2030: 85,200	3	Signalized	1	0	1	15	false	false	false	0	0	7

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 8th St)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**15.43**
Fatal and Injury Crashes	**4.72**
Property-Damage-Only Crashes	**10.70**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**31**
Percent Property-Damage-Only Crashes (%)	**69**

Table 3. Predicted Crash Frequencies by Year (I-35 & 8th St)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	15.43	4.72	30.628	10.70	69.372
Total	15.43	4.72	30.628	10.70	69.372
Average	15.43	4.72	30.628	10.70	69.372

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 8th St)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	3.98	25.8	6.11	39.6	10.09	65.4
Intersection	Collision with Bicycle	0.24	1.6	0.00	0.0	0.24	1.6
Intersection	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Other Multi-vehicle Collision	0.00	0.0	0.76	4.9	0.76	4.9
Intersection	Other Single-vehicle Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.01	0.0	0.00	0.0	0.01	0.0
Intersection	Rear-end Collision	0.50	3.2	1.53	9.9	2.03	13.1
Intersection	Sideswipe	0.00	0.0	2.29	14.9	2.29	14.9
Intersection	Total Intersection Total Vehicle Crashes	4.72	30.6	10.69	69.3	15.42	100.0
Intersection	Total Intersection Crashes	4.72	30.6	10.69	69.3	15.42	100.0
	Total Crashes	4.72	30.6	10.69	69.3	15.42	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1000+99.997	1000+99.997	Information: for intersection #1 (1000+99.997 to 1000+99.997), For I-35 & 8th St, minor leg N I-35 FR @ 8th St at 1001+00.000 has higher average traffic volume (80300.0) than major leg W 8th St at 1000+99.997 average traffic volume (6900.0). For I-35 & 8th St, minor leg S I-35 FR @ 8th St at 1001+00.000 has higher average traffic volume (80300.0) than major leg W 8th St at 1000+99.997 average traffic volume (6900.0).
1000+99.997	1000+99.997	Warning: for intersection #1 (1000+99.997 to 1000+99.997), minor road traffic volume (85,200 vpd) for 2030 is not within the model limit (58,800 vpd) for reliable results for intersection type 3SG

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

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User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 7th St
Intersection Comment: Created Tue Jun 29 11:18:30 CDT 2021
Intersection Version: v1

Evaluation Title: 20220701 Updated Configuration
Evaluation Comment: Created Fri Jul 01 13:04:51 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & 7th St Evaluation

Intersection: I-35 & 7th St
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 7th St)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 7th St (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 80,300	2030: 24,400	4	Signalized	4	0	0	20	true	false	true	3	14	9

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 7th St)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**10.28**
Fatal and Injury Crashes	**5.75**
Property-Damage-Only Crashes	**4.53**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**56**
Percent Property-Damage-Only Crashes (%)	**44**

Table 3. Predicted Crash Frequencies by Year (I-35 & 7th St)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	10.28	5.75	55.914	4.53	44.086
Total	10.28	5.75	55.914	4.53	44.086
Average	10.28	5.75	55.914	4.53	44.086

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 7th St)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	3.95	38.4	2.50	24.3	6.45	62.8
Intersection	Collision with Bicycle	0.19	1.8	0.00	0.0	0.19	1.8
Intersection	Head-on Collision	0.49	4.8	0.21	2.0	0.70	6.8
Intersection	Other Multi-vehicle Collision	0.15	1.5	0.10	1.0	0.25	2.5
Intersection	Other Single-vehicle Collision	0.06	0.6	0.28	2.7	0.34	3.3
Intersection	Collision with Pedestrian	0.26	2.5	0.00	0.0	0.26	2.5
Intersection	Rear-end Collision	0.44	4.3	0.67	6.5	1.11	10.8
Intersection	Sideswipe	0.20	2.0	0.78	7.5	0.98	9.5
Intersection	Total Intersection Total Vehicle Crashes	5.75	55.9	4.53	44.1	10.28	100.0
Intersection	Total Intersection Crashes	5.75	55.9	4.53	44.1	10.28	100.0
	Total Crashes	5.75	55.9	4.53	44.1	10.28	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

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IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 6th St
Intersection Comment: Created Tue Jun 29 11:26:20 CDT 2021
Intersection Version: v1

Evaluation Title: 20220701 Updated Configuration
Evaluation Comment: Created Fri Jul 01 13:05:08 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & 6th St Evaluation

Intersection: I-35 & 6th St
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 6th St)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 6th St (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 67,350	2030: 13,200	4	Signalized	3	1	2	20	true	false	true	3	11	8

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 6th St)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**6.73**
Fatal and Injury Crashes	**3.75**
Property-Damage-Only Crashes	**2.98**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**56**
Percent Property-Damage-Only Crashes (%)	**44**

Table 3. Predicted Crash Frequencies by Year (I-35 & 6th St)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	6.73	3.75	55.747	2.98	44.253
Total	6.73	3.75	55.747	2.98	44.253
Average	6.73	3.75	55.747	2.98	44.253

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 6th St)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	2.56	38.0	1.64	24.4	4.20	62.4
Intersection	Collision with Bicycle	0.12	1.8	0.00	0.0	0.12	1.8
Intersection	Head-on Collision	0.32	4.7	0.14	2.0	0.46	6.8
Intersection	Other Multi-vehicle Collision	0.10	1.5	0.07	1.0	0.17	2.4
Intersection	Other Single-vehicle Collision	0.04	0.6	0.18	2.7	0.22	3.3
Intersection	Collision with Pedestrian	0.20	3.0	0.00	0.0	0.20	3.0
Intersection	Rear-end Collision	0.28	4.2	0.44	6.5	0.72	10.8
Intersection	Sideswipe	0.13	1.9	0.51	7.6	0.64	9.5
Intersection	Total Intersection Total Vehicle Crashes	3.75	55.8	2.98	44.2	6.73	100.0
Intersection	Total Intersection Crashes	3.75	55.8	2.98	44.2	6.73	100.0
	Total Crashes	3.75	55.8	2.98	44.2	6.73	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:56 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 21 14:44:32 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Cesar Chavez St
Intersection Comment: Created Tue Jun 29 12:00:34 CDT 2021
Intersection Version: v1

Evaluation Title: 20220721
Evaluation Comment: Created Thu Jul 21 14:44:21 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1005+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & Cesar Chavez St Evaluation

Intersection: I-35 & Cesar Chavez St
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1005+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Cesar Chavez St)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Cesar Chavez St (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 35,100	2030: 32,850	4	Signalized	4	0	0	0	true	false	false	4	8	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Cesar Chavez St)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**6.77**
Fatal and Injury Crashes	**2.35**
Property-Damage-Only Crashes	**4.43**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**35**
Percent Property-Damage-Only Crashes (%)	**65**

Table 3. Predicted Crash Frequencies by Year (I-35 & Cesar Chavez St)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	6.77	2.35	34.657	4.43	65.343
Total	6.77	2.35	34.657	4.43	65.343
Average	6.77	2.35	34.657	4.43	65.343

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Cesar Chavez St)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Collision with Animal	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Bicycle	0.10	1.5	0.00	0.0	0.10	1.5
Intersection	Collision with Fixed Object	0.06	0.9	0.23	3.4	0.30	4.4
Intersection	Non-Collision	0.01	0.2	0.01	0.1	0.02	0.3
Intersection	Collision with Other Object	0.01	0.1	0.02	0.3	0.03	0.4
Intersection	Other Single-vehicle Collision	0.00	0.1	0.01	0.1	0.01	0.1
Intersection	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Total Intersection Single Vehicle Crashes	0.18	2.7	0.27	4.0	0.45	6.7
Intersection	Angle Collision	0.75	11.1	1.01	15.0	1.76	26.1
Intersection	Head-on Collision	0.11	1.6	0.12	1.8	0.23	3.4
Intersection	Other Multi-vehicle Collision	0.12	1.8	0.88	13.0	1.00	14.7
Intersection	Rear-end Collision	0.97	14.4	2.01	29.6	2.98	44.0
Intersection	Sideswipe	0.21	3.2	0.13	2.0	0.35	5.1
Intersection	Total Intersection Multiple Vehicle Crashes	2.16	31.9	4.16	61.4	6.32	93.3
Intersection	Total Intersection Crashes	2.35	34.7	4.43	65.3	6.77	100.0
	Total Crashes	2.35	34.7	4.43	65.3	6.77	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	Information: for intersection #1 (1001+00.000 to 1001+00.000), For I-35 & Cesar Chavez St, minor leg N I-35 FR @ Cesar Chavez St at 1001+00.000 has higher average traffic volume (32850.0) than major leg E Cesar Chavez St at 1001+00.000 average traffic volume (19350.0). For I-35 & Cesar Chavez St, minor leg S I-35 FR @ Cesar Chavez St at 1001+00.000 has higher average traffic volume (32850.0) than major leg E Cesar Chavez St at 1001+00.000 average traffic volume (19350.0). For I-35 & Cesar Chavez St, minor leg N I-35 FR @ Cesar Chavez St at 1001+00.000 has higher average traffic volume (32850.0) than major leg W Cesar Chavez St at 1001+00.000 average traffic volume (19350.0). For I-35 & Cesar Chavez St, minor leg S I-35 FR @ Cesar Chavez St at 1001+00.000 has higher average traffic volume (32850.0) than major leg W Cesar Chavez St at 1001+00.000 average traffic volume (19350.0).

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 08:41:40 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Holly St EAST
Intersection Comment: Created Tue Jun 29 12:15:36 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 5
Evaluation Comment: Created Thu Jun 23 08:41:30 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & Holly St EAST Evaluation

Intersection: I-35 & Holly St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Holly St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Holly St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 4,700	2030: 8,000	4	Signalized	0	0	2	0	true	false	true	3	11	2

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Holly St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**1.82**
Fatal and Injury Crashes	**0.45**
Property-Damage-Only Crashes	**1.37**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**25**
Percent Property-Damage-Only Crashes (%)	**75**

Table 3. Predicted Crash Frequencies by Year (I-35 & Holly St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	1.82	0.45	24.928	1.37	75.072
Total	1.82	0.45	24.928	1.37	75.072
Average	1.82	0.45	24.928	1.37	75.072

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Holly St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.36	19.9	1.00	55.0	1.36	74.9
Intersection	Collision with Bicycle	0.02	1.2	0.00	0.0	0.02	1.2
Intersection	Head-on Collision	0.02	0.9	0.04	2.3	0.06	3.2
Intersection	Other Multi-vehicle Collision	0.01	0.7	0.02	0.9	0.03	1.6
Intersection	Other Single-vehicle Collision	0.00	0.1	0.03	1.6	0.03	1.7
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.01	0.7	0.08	4.4	0.09	5.1
Intersection	Sideswipe	0.03	1.4	0.20	10.9	0.22	12.3
Intersection	Total Intersection Total Vehicle Crashes	0.45	24.9	1.37	75.1	1.82	100.0
Intersection	Total Intersection Crashes	0.45	24.9	1.37	75.1	1.82	100.0
	Total Crashes	0.45	24.9	1.37	75.1	1.82	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	Information: for intersection #1 (1001+00.000 to 1001+00.000), For I-35 & Holly St EAST, minor leg E Holly St at 1005+00.000 has higher average traffic volume (8000.0) than major leg N I-35 NBFR @ Holly St at 1001+00.000 average traffic volume (4700.0). For I-35 & Holly St EAST, minor leg W Holly St at 1005+00.000 has higher average traffic volume (8000.0) than major leg N I-35 NBFR @ Holly St at 1001+00.000 average traffic volume (4700.0). For I-35 & Holly St EAST, minor leg E Holly St at 1005+00.000 has higher average traffic volume (8000.0) than major leg S I-35 NBFR @ Holly St at 1001+00.000 average traffic volume (4700.0). For I-35 & Holly St EAST, minor leg W Holly St at 1005+00.000 has higher average traffic volume (8000.0) than major leg S I-35 NBFR @ Holly St at 1001+00.000 average traffic volume (4700.0).

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 09:20:19 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Riverside Dr EAST
Intersection Comment: Created Tue Jun 29 12:38:59 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 09:20:13 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & Riverside Dr EAST Evaluation

Intersection: I-35 & Riverside Dr EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Riverside Dr EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Riverside Dr EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 27,300	2030: 61,350	4	Signalized	2	2	2	0	true	false	false	2	0	8

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Riverside Dr EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**15.94**
Fatal and Injury Crashes	**3.10**
Property-Damage-Only Crashes	**12.84**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**19**
Percent Property-Damage-Only Crashes (%)	**81**

Table 3. Predicted Crash Frequencies by Year (I-35 & Riverside Dr EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	15.94	3.10	19.469	12.84	80.531
Total	15.94	3.10	19.469	12.84	80.531
Average	15.94	3.10	19.469	12.84	80.531

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Riverside Dr EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	2.44	15.3	9.41	59.0	11.85	74.3
Intersection	Collision with Bicycle	0.19	1.2	0.00	0.0	0.19	1.2
Intersection	Head-on Collision	0.11	0.7	0.39	2.4	0.50	3.1
Intersection	Other Multi-vehicle Collision	0.09	0.5	0.15	1.0	0.24	1.5
Intersection	Other Single-vehicle Collision	0.02	0.1	0.27	1.7	0.29	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.09	0.5	0.76	4.8	0.84	5.3
Intersection	Sideswipe	0.17	1.1	1.86	11.7	2.03	12.8
Intersection	Total Intersection Total Vehicle Crashes	3.11	19.5	12.84	80.5	15.95	100.0
Intersection	Total Intersection Crashes	3.11	19.5	12.84	80.5	15.95	100.0
	Total Crashes	3.11	19.5	12.84	80.5	15.95	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	Information: for intersection #1 (1001+00.000 to 1001+00.000), For I-35 & Riverside Dr EAST, minor leg E Riverside Dr at 1004+00.000 has higher average traffic volume (68475.0) than major leg NW I-35 NBFR @ Riverside Dr at 1001+00.000 average traffic volume (27300.0). For I-35 & Riverside Dr EAST, minor leg W Riverside Dr at 1004+00.000 has higher average traffic volume (68475.0) than major leg NW I-35 NBFR @ Riverside Dr at 1001+00.000 average traffic volume (27300.0). For I-35 & Riverside Dr EAST, minor leg E Riverside Dr at 1004+00.000 has higher average traffic volume (68475.0) than major leg SE I-35 NBFR @ Riverside Dr at 1001+00.000 average traffic volume (27300.0). For I-35 & Riverside Dr EAST, minor leg W Riverside Dr at 1004+00.000 has higher average traffic volume (68475.0) than major leg SE I-35 NBFR @ Riverside Dr at 1001+00.000 average traffic volume (27300.0).

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Generated: Aug 25, 2022 2:57 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 09:22:49 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Woodland Ave EAST
Intersection Comment: Created Wed Jun 22 13:47:14 CDT 2022
Intersection Version: v1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 09:22:39 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & Woodland Ave EAST Evaluation

Intersection: I-35 & Woodland Ave EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 3SG=1.0;

Table 1. Evaluation Intersection (I-35 & Woodland Ave EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Woodland Ave EAST (v1)	Urban/Suburban Arterial Intersection Three-Legged Signalized	1001+00.000	2030: 38,000	2030: 8,900	3	Signalized	0	1	1	0	true	false	false	0	0	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Woodland Ave EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**5.49**
Fatal and Injury Crashes	**1.36**
Property-Damage-Only Crashes	**4.13**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**25**
Percent Property-Damage-Only Crashes (%)	**75**

Table 3. Predicted Crash Frequencies by Year (I-35 & Woodland Ave EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.49	1.36	24.785	4.13	75.215
Total	5.49	1.36	24.785	4.13	75.215
Average	5.49	1.36	24.785	4.13	75.215

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Woodland Ave EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.13	20.6	2.36	43.0	3.49	63.6
Intersection	Collision with Bicycle	0.09	1.6	0.00	0.0	0.09	1.6
Intersection	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Other Multi-vehicle Collision	0.00	0.0	0.29	5.3	0.29	5.3
Intersection	Other Single-vehicle Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.14	2.6	0.59	10.8	0.73	13.3
Intersection	Sideswipe	0.00	0.0	0.88	16.1	0.88	16.1
Intersection	Total Intersection Total Vehicle Crashes	1.36	24.8	4.12	75.2	5.48	100.0
Intersection	Total Intersection Crashes	1.36	24.8	4.12	75.2	5.48	100.0
	Total Crashes	1.36	24.8	4.12	75.2	5.48	100.0

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Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

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Report Generated: Aug 25, 2022 2:58 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 09:20:47 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Oltorf St EAST
Intersection Comment: Created Tue Jun 29 12:52:34 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 09:20:35 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & Oltorf St EAST Evaluation

Intersection: I-35 & Oltorf St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Oltorf St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Oltorf St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 23,950	2030: 31,450	4	Signalized	1	1	2	0	true	false	true	5	0	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Oltorf St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**7.61**
Fatal and Injury Crashes	**1.50**
Property-Damage-Only Crashes	**6.10**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Oltorf St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	7.61	1.50	19.761	6.10	80.239
Total	7.61	1.50	19.761	6.10	80.239
Average	7.61	1.50	19.761	6.10	80.239

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Oltorf St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.18	15.5	4.47	58.8	5.66	74.3
Intersection	Collision with Bicycle	0.09	1.2	0.00	0.0	0.09	1.2
Intersection	Head-on Collision	0.06	0.7	0.18	2.4	0.24	3.1
Intersection	Other Multi-vehicle Collision	0.04	0.6	0.07	1.0	0.12	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.13	1.7	0.14	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.04	0.6	0.36	4.7	0.40	5.3
Intersection	Sideswipe	0.08	1.1	0.89	11.6	0.97	12.7
Intersection	Total Intersection Total Vehicle Crashes	1.50	19.8	6.10	80.2	7.61	100.0
Intersection	Total Intersection Crashes	1.50	19.8	6.10	80.2	7.61	100.0
	Total Crashes	1.50	19.8	6.10	80.2	7.61	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	Information: for intersection #1 (1001+00.000 to 1001+00.000), For I-35 & Oltorf St EAST, minor leg E Oltorf St at 1004+80.000 has higher average traffic volume (35425.0) than major leg N I-35 NBFR @ Oltorf St at 1001+00.000 average traffic volume (19675.0). For I-35 & Oltorf St EAST, minor leg W Oltorf St at 1004+80.000 has higher average traffic volume (35425.0) than major leg N I-35 NBFR @ Oltorf St at 1001+00.000 average traffic volume (19675.0). For I-35 & Oltorf St EAST, minor leg E Oltorf St at 1004+80.000 has higher average traffic volume (35425.0) than major leg S I-35 NBFR @ Oltorf St at 1001+00.000 average traffic volume (19675.0). For I-35 & Oltorf St EAST, minor leg W Oltorf St at 1004+80.000 has higher average traffic volume (35425.0) than major leg S I-35 NBFR @ Oltorf St at 1001+00.000 average traffic volume (19675.0).

Interactive Highway Safety Design Model

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Report Overview

Report Generated: Aug 25, 2022 2:58 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Fri Jul 22 16:30:46 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Woodward St EAST
Intersection Comment: Created Tue Jun 29 13:01:03 CDT 2021
Intersection Version: v1

Evaluation Title: 20220722
Evaluation Comment: Created Fri Jul 22 16:30:31 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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Section Types

I-35 & Woodward St EAST Evaluation

Intersection: I-35 & Woodward St EAST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Woodward St EAST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Woodward St EAST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 17,550	2030: 15,700	4	Signalized	2	0	2	0	true	false	false	0	0	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Woodward St EAST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**5.82**
Fatal and Injury Crashes	**1.20**
Property-Damage-Only Crashes	**4.62**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**21**
Percent Property-Damage-Only Crashes (%)	**79**

Table 3. Predicted Crash Frequencies by Year (I-35 & Woodward St EAST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.82	1.20	20.608	4.62	79.391
Total	5.82	1.20	20.608	4.62	79.391
Average	5.82	1.20	20.608	4.62	79.391

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Woodward St EAST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.95	16.3	3.39	58.2	4.33	74.4
Intersection	Collision with Bicycle	0.07	1.2	0.00	0.0	0.07	1.2
Intersection	Head-on Collision	0.04	0.8	0.14	2.4	0.18	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.6	0.06	1.0	0.09	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.10	1.7	0.10	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.6	0.27	4.7	0.31	5.3
Intersection	Sideswipe	0.07	1.1	0.67	11.5	0.74	12.7
Intersection	Total Intersection Total Vehicle Crashes	1.20	20.6	4.62	79.4	5.82	100.0
Intersection	Total Intersection Crashes	1.20	20.6	4.62	79.4	5.82	100.0
	Total Crashes	1.20	20.6	4.62	79.4	5.82	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:59 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Fri Jul 23 13:22:43 CDT 2021
IHSDM Version: v16.0.0 (Sep 30, 2020)
Crash Prediction Module: v11.0.0 (Sep 30, 2020)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: I-35 Central Interchange Analysis - Build Alt 3
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 51st Street
Intersection Comment: Created Wed Mar 03 10:40:11 CST 2021
Intersection Version: v1

Evaluation Title: Evaluation 6
Evaluation Comment: Created Fri Jul 23 13:22:31 CDT 2021

Minimum Location: 1000+00.000
Maximum Location: 1010+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & 51st Street Evaluation

Intersection: I-35 & 51st Street
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1010+00.000
Calibration Factor: USA 42R=1.0;

Table 1. Evaluation Roundabout - Site (I-35 & 51st Street)

Inter. No.	Title	Type	Area Type	Legs	Location (Sta. ft)	Entering AADT
1	I-35 & 51st Street (v1)	Roundabout 42R - Roundabout with 4 legs and two circulating lanes	Urban	4	1005+00.000	Leg 1: 2030: 20,100; Leg 2: 2030: 19,812; Leg 3: 2030: 0; Leg 4: 2030: 7,618

Table 2. Predicted Roundabout Crash Rates and Frequencies Summary (I-35 & 51st Street)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**16.36**
Fatal and Injury Crashes	**1.27**
Property-Damage-Only Crashes	**15.09**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**8**
Percent Property-Damage-Only Crashes (%)	**92**

Table 3. Predicted Crash Frequencies and Rates by Roundabout (I-35 & 51st Street)

Segment Number/Intersection Name/Cross Road	Location (Sta. ft)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Travel Crash Rate (crashes/million veh)
I-35 & 51st Street (v1)	1005+00.000	16.364	16.3637	1.2712	15.0925	0.95

Table 4. Predicted Crash Severity by Roundabout (I-35 & 51st Street)

Seg. No.	Type	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	Roundabout	0.0082	0.0816	0.3242	0.8571	15.0925

Table 5. Predicted Crash Frequencies by Year (I-35 & 51st Street)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	16.36	1.27	7.768	15.09	92.232
Total	16.36	1.27	7.768	15.09	92.232
Average	16.36	1.27	7.768	15.09	92.232

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 6. Predicted Roundabout Crash Type Distribution (I-35 & 51st Street)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Collision with Animal	0.00	0.0	0.04	0.3	0.04	0.3
Intersection	Collision with Fixed Object	0.16	1.0	2.08	12.7	2.24	13.7
Intersection	Collision with Other Object	0.00	0.0	0.03	0.2	0.03	0.2
Intersection	Other Single-vehicle Collision	0.16	1.0	0.56	3.4	0.72	4.4
Intersection	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Total Single Vehicle Crashes	0.32	2.0	2.72	16.6	3.04	18.6
Intersection	Angle Collision	0.18	1.1	2.63	16.0	2.81	17.1
Intersection	Head-on Collision	0.01	0.1	0.07	0.5	0.09	0.5
Intersection	Other Multiple-vehicle Collision	0.19	1.2	3.00	18.3	3.20	19.5
Intersection	Rear-end Collision	0.34	2.1	2.69	16.4	3.03	18.5
Intersection	Sideswipe	0.23	1.4	4.00	24.4	4.22	25.8
Intersection	Total Multiple Vehicle Crashes	0.95	5.8	12.39	75.7	13.34	81.5
Intersection	Total Intersection Crashes	1.27	7.8	15.11	92.2	16.38	100.0
	Total Crashes	1.27	7.8	15.11	92.2	16.38	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 7. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1005+00.000	1005+00.000	for intersection #1 (1005+00.000 to 1005+00.000), minor road traffic volume (38,100 vpd) for 2030 is not within the model limit (19,371 vpd) for reliable results for intersection type 42R

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 08:25:51 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Airport Blvd WEST
Intersection Comment: Created Mon Jun 28 14:07:32 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 08:25:42 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & Airport Blvd WEST Evaluation

Intersection: I-35 & Airport Blvd WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Airport Blvd WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Airport Blvd WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 23,350	2030: 51,250	4	Signalized	2	0	2	0	true	false	false	3	0	10

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Airport Blvd WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**21.59**
Fatal and Injury Crashes	**4.30**
Property-Damage-Only Crashes	**17.29**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Airport Blvd WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	21.59	4.30	19.912	17.29	80.088
Total	21.59	4.30	19.912	17.29	80.088
Average	21.59	4.30	19.912	17.29	80.088

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Airport Blvd WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	3.38	15.7	12.67	58.7	16.06	74.4
Intersection	Collision with Bicycle	0.26	1.2	0.00	0.0	0.26	1.2
Intersection	Head-on Collision	0.16	0.7	0.52	2.4	0.68	3.1
Intersection	Other Multi-vehicle Collision	0.12	0.6	0.21	1.0	0.33	1.5
Intersection	Other Single-vehicle Collision	0.02	0.1	0.36	1.7	0.39	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.12	0.6	1.02	4.7	1.14	5.3
Intersection	Sideswipe	0.24	1.1	2.51	11.6	2.75	12.7
Intersection	Total Intersection Total Vehicle Crashes	4.30	19.9	17.29	80.1	21.59	100.0
Intersection	Total Intersection Crashes	4.30	19.9	17.29	80.1	21.59	100.0
	Total Crashes	4.30	19.9	17.29	80.1	21.59	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	Information: for intersection #1 (1001+00.000 to 1001+00.000), For I-35 & Airport Blvd WEST, minor leg E Airport Blvd at 1001+00.000 has higher average traffic volume (52575.0) than major leg N I-35 SBFR @ Airport Blvd at 1001+00.000 average traffic volume (19400.0). For I-35 & Airport Blvd WEST, minor leg W Airport Blvd at 1001+00.000 has higher average traffic volume (52575.0) than major leg N I-35 SBFR @ Airport Blvd at 1001+00.000 average traffic volume (19400.0). For I-35 & Airport Blvd WEST, minor leg E Airport Blvd at 1001+00.000 has higher average traffic volume (52575.0) than major leg S I-35 SBFR @ Airport Blvd at 1001+00.000 average traffic volume (19400.0). For I-35 & Airport Blvd WEST, minor leg W Airport Blvd at 1001+00.000 has higher average traffic volume (52575.0) than major leg S I-35 SBFR @ Airport Blvd at 1001+00.000 average traffic volume (19400.0).

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 2:59 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 08:26:20 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 38 1/2 St WEST
Intersection Comment: Created Tue Jun 29 09:42:04 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 08:26:12 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

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- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & 38 1/2 St WEST Evaluation

Intersection: I-35 & 38 1/2 St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 38 1/2 St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 38 1/2 St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 25,000	2030: 11,100	4	Signalized	2	0	2	0	true	false	false	3	1	4

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 38 1/2 St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**4.66**
Fatal and Injury Crashes	**0.91**
Property-Damage-Only Crashes	**3.75**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**19**
Percent Property-Damage-Only Crashes (%)	**81**

Table 3. Predicted Crash Frequencies by Year (I-35 & 38 1/2 St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.66	0.91	19.476	3.75	80.524
Total	4.66	0.91	19.476	3.75	80.524
Average	4.66	0.91	19.476	3.75	80.524

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 38 1/2 St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.71	15.3	2.75	59.0	3.46	74.3
Intersection	Collision with Bicycle	0.06	1.2	0.00	0.0	0.06	1.2
Intersection	Head-on Collision	0.03	0.7	0.11	2.4	0.15	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.5	0.04	1.0	0.07	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.08	1.7	0.08	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.5	0.22	4.8	0.25	5.3
Intersection	Sideswipe	0.05	1.1	0.54	11.7	0.59	12.8
Intersection	Total Intersection Total Vehicle Crashes	0.91	19.5	3.75	80.5	4.66	100.0
Intersection	Total Intersection Crashes	0.91	19.5	3.75	80.5	4.66	100.0
	Total Crashes	0.91	19.5	3.75	80.5	4.66	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 3:00 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 21 14:46:21 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & 32nd St WEST
Intersection Comment: Created Tue Jun 29 09:50:34 CDT 2021
Intersection Version: v1

Evaluation Title: 20220721
Evaluation Comment: Created Thu Jul 21 14:46:10 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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Section Types

I-35 & 32nd St WEST Evaluation

Intersection: I-35 & 32nd St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & 32nd St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & 32nd St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 26,150	2030: 10,350	4	Signalized	2	0	2	0	true	false	false	0	0	3

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & 32nd St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**4.63**
Fatal and Injury Crashes	**0.90**
Property-Damage-Only Crashes	**3.74**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**19**
Percent Property-Damage-Only Crashes (%)	**81**

Table 3. Predicted Crash Frequencies by Year (I-35 & 32nd St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.63	0.90	19.332	3.74	80.668
Total	4.63	0.90	19.332	3.74	80.668
Average	4.63	0.90	19.332	3.74	80.668

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & 32nd St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.70	15.2	2.74	59.1	3.44	74.3
Intersection	Collision with Bicycle	0.06	1.2	0.00	0.0	0.06	1.2
Intersection	Head-on Collision	0.03	0.7	0.11	2.4	0.14	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.5	0.04	1.0	0.07	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.08	1.7	0.08	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.5	0.22	4.8	0.25	5.3
Intersection	Sideswipe	0.05	1.1	0.54	11.7	0.59	12.8
Intersection	Total Intersection Total Vehicle Crashes	0.90	19.3	3.74	80.7	4.63	100.0
Intersection	Total Intersection Crashes	0.90	19.3	3.74	80.7	4.63	100.0
	Total Crashes	0.90	19.3	3.74	80.7	4.63	100.0

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Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Generated: Aug 25, 2022 3:00 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jul 21 14:45:37 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & MLK Jr Blvd WEST
Intersection Comment: Created Wed Jun 22 10:00:47 CDT 2022
Intersection Version: v1

Evaluation Title: 20220721
Evaluation Comment: Created Thu Jul 21 14:45:25 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & MLK Jr Blvd WEST Evaluation

Intersection: I-35 & MLK Jr Blvd WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 3SG=1.0;

Table 1. Evaluation Intersection (I-35 & MLK Jr Blvd WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & MLK Jr Blvd WEST (v1)	Urban/Suburban Arterial Intersection Three-Legged Signalized	1001+99.997	2030: 8,450	2030: 35,650	3	Signalized	1	0	2	0	true	false	true	4	0	6

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & MLK Jr Blvd WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**7.50**
Fatal and Injury Crashes	**2.05**
Property-Damage-Only Crashes	**5.44**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**27**
Percent Property-Damage-Only Crashes (%)	**73**

Table 3. Predicted Crash Frequencies by Year (I-35 & MLK Jr Blvd WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	7.50	2.05	27.380	5.44	72.621
Total	7.50	2.05	27.380	5.44	72.621
Average	7.50	2.05	27.380	5.44	72.621

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & MLK Jr Blvd WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.72	23.0	3.11	41.5	4.83	64.5
Intersection	Collision with Bicycle	0.12	1.6	0.00	0.0	0.12	1.6
Intersection	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Other Multi-vehicle Collision	0.00	0.0	0.39	5.2	0.39	5.2
Intersection	Other Single-vehicle Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.21	2.9	0.78	10.4	0.99	13.3
Intersection	Sideswipe	0.00	0.0	1.17	15.6	1.17	15.6
Intersection	Total Intersection Total Vehicle Crashes	2.05	27.4	5.44	72.6	7.49	100.0
Intersection	Total Intersection Crashes	2.05	27.4	5.44	72.6	7.49	100.0
	Total Crashes	2.05	27.4	5.44	72.6	7.49	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+99.997	1001+99.997	Information: for intersection #1 (1001+99.997 to 1001+99.997), For I-35 & MLK Jr Blvd WEST, minor leg E MLK Jr Blvd at 1001+00.000 has higher average traffic volume (28400.0) than major leg N I-35 SBFR @ MLK Jr Blvd at 1001+99.997 average traffic volume (8450.0). For I-35 & MLK Jr Blvd WEST, minor leg W MLK Jr Blvd at 1001+00.000 has higher average traffic volume (28400.0) than major leg N I-35 SBFR @ MLK Jr Blvd at 1001+99.997 average traffic volume (8450.0).

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 09:20:09 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Riverside Dr WEST
Intersection Comment: Created Tue Jun 29 12:18:32 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 09:20:01 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

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However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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Section Types

I-35 & Riverside Dr WEST Evaluation

Intersection: I-35 & Riverside Dr WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Riverside Dr WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Riverside Dr WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 21,800	2030: 52,100	4	Signalized	2	1	2	0	true	false	false	2	0	8

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Riverside Dr WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**14.05**
Fatal and Injury Crashes	**2.83**
Property-Damage-Only Crashes	**11.22**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Riverside Dr WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	14.05	2.83	20.123	11.22	79.876
Total	14.05	2.83	20.123	11.22	79.876
Average	14.05	2.83	20.123	11.22	79.876

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Riverside Dr WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	2.23	15.8	8.23	58.5	10.45	74.4
Intersection	Collision with Bicycle	0.17	1.2	0.00	0.0	0.17	1.2
Intersection	Head-on Collision	0.10	0.7	0.34	2.4	0.44	3.1
Intersection	Other Multi-vehicle Collision	0.08	0.6	0.14	1.0	0.21	1.5
Intersection	Other Single-vehicle Collision	0.02	0.1	0.24	1.7	0.25	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.08	0.6	0.66	4.7	0.74	5.3
Intersection	Sideswipe	0.16	1.1	1.63	11.6	1.78	12.7
Intersection	Total Intersection Total Vehicle Crashes	2.83	20.1	11.22	79.9	14.05	100.0
Intersection	Total Intersection Crashes	2.83	20.1	11.22	79.9	14.05	100.0
	Total Crashes	2.83	20.1	11.22	79.9	14.05	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	Information: for intersection #1 (1001+00.000 to 1001+00.000), For I-35 & Riverside Dr WEST, minor leg E Riverside Dr at 1001+00.000 has higher average traffic volume (59325.0) than major leg N I-35 SBFR @ Riverside Dr at 1001+00.000 average traffic volume (18900.0). For I-35 & Riverside Dr WEST, minor leg W Riverside Dr at 1001+00.000 has higher average traffic volume (59325.0) than major leg N I-35 SBFR @ Riverside Dr at 1001+00.000 average traffic volume (18900.0). For I-35 & Riverside Dr WEST, minor leg E Riverside Dr at 1001+00.000 has higher average traffic volume (59325.0) than major leg S I-35 SBFR @ Riverside Dr at 1001+00.000 average traffic volume (18900.0). For I-35 & Riverside Dr WEST, minor leg W Riverside Dr at 1001+00.000 has higher average traffic volume (59325.0) than major leg S I-35 SBFR @ Riverside Dr at 1001+00.000 average traffic volume (18900.0).

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 09:22:36 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Woodland Ave WEST
Intersection Comment: Created Wed Jun 22 13:45:47 CDT 2022
Intersection Version: v1

Evaluation Title: Evaluation 1
Evaluation Comment: Created Thu Jun 23 09:22:29 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

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Section Types

I-35 & Woodland Ave WEST Evaluation

Intersection: I-35 & Woodland Ave WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 3SG=1.0;

Table 1. Evaluation Intersection (I-35 & Woodland Ave WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Woodland Ave WEST (v1)	Urban/Suburban Arterial Intersection Three-Legged Signalized	1001+00.000	2030: 40,450	2030: 8,650	3	Signalized	0	0	1	0	true	false	false	0	0	3

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Woodland Ave WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**5.34**
Fatal and Injury Crashes	**1.32**
Property-Damage-Only Crashes	**4.02**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**25**
Percent Property-Damage-Only Crashes (%)	**75**

Table 3. Predicted Crash Frequencies by Year (I-35 & Woodland Ave WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	5.34	1.32	24.790	4.02	75.210
Total	5.34	1.32	24.790	4.02	75.210
Average	5.34	1.32	24.790	4.02	75.210

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Woodland Ave WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.10	20.7	2.29	43.0	3.40	63.6
Intersection	Collision with Bicycle	0.08	1.6	0.00	0.0	0.08	1.6
Intersection	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Other Multi-vehicle Collision	0.00	0.0	0.28	5.3	0.28	5.3
Intersection	Other Single-vehicle Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.14	2.6	0.57	10.8	0.71	13.3
Intersection	Sideswipe	0.00	0.0	0.86	16.1	0.86	16.1
Intersection	Total Intersection Total Vehicle Crashes	1.32	24.8	4.01	75.2	5.34	100.0
Intersection	Total Intersection Crashes	1.32	24.8	4.01	75.2	5.34	100.0
	Total Crashes	1.32	24.8	4.01	75.2	5.34	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Generated: Aug 25, 2022 3:02 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 09:20:31 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Oltorf St WEST
Intersection Comment: Created Tue Jun 29 12:47:15 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 09:20:25 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

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Section Types

I-35 & Oltorf St WEST Evaluation

Intersection: I-35 & Oltorf St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Oltorf St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Oltorf St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 19,350	2030: 26,400	4	Signalized	2	1	2	0	true	false	true	4	0	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Oltorf St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**7.44**
Fatal and Injury Crashes	**1.52**
Property-Damage-Only Crashes	**5.92**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Oltorf St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	7.44	1.52	20.386	5.92	79.614
Total	7.44	1.52	20.386	5.92	79.614
Average	7.44	1.52	20.386	5.92	79.614

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Oltorf St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	1.20	16.1	4.34	58.3	5.54	74.4
Intersection	Collision with Bicycle	0.09	1.2	0.00	0.0	0.09	1.2
Intersection	Head-on Collision	0.06	0.7	0.18	2.4	0.23	3.1
Intersection	Other Multi-vehicle Collision	0.04	0.6	0.07	1.0	0.11	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.12	1.7	0.13	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.04	0.6	0.35	4.7	0.39	5.3
Intersection	Sideswipe	0.08	1.1	0.86	11.5	0.94	12.7
Intersection	Total Intersection Total Vehicle Crashes	1.52	20.4	5.92	79.6	7.44	100.0
Intersection	Total Intersection Crashes	1.52	20.4	5.92	79.6	7.44	100.0
	Total Crashes	1.52	20.4	5.92	79.6	7.44	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 5. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1001+00.000	1001+00.000	Information: for intersection #1 (1001+00.000 to 1001+00.000), For I-35 & Oltorf St WEST, minor leg E Oltorf St at 1001+00.000 has higher average traffic volume (29350.0) than major leg N I-35 SBFR @ Oltorf St at 1001+00.000 average traffic volume (19350.0). For I-35 & Oltorf St WEST, minor leg W Oltorf St at 1001+00.000 has higher average traffic volume (29350.0) than major leg N I-35 SBFR @ Oltorf St at 1001+00.000 average traffic volume (19350.0). For I-35 & Oltorf St WEST, minor leg E Oltorf St at 1001+00.000 has higher average traffic volume (29350.0) than major leg S I-35 SBFR @ Oltorf St at 1001+00.000 average traffic volume (19350.0). For I-35 & Oltorf St WEST, minor leg W Oltorf St at 1001+00.000 has higher average traffic volume (29350.0) than major leg S I-35 SBFR @ Oltorf St at 1001+00.000 average traffic volume (19350.0).

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

August 25, 2022

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Report Overview

Report Generated: Aug 25, 2022 3:02 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Nov 12, 2021 12:22 PM)

Evaluation Date: Thu Jun 23 09:20:59 CDT 2022
IHSDM Version: v17.0.0 (Sep 22, 2021)
Crash Prediction Module: v12.0.0 (Sep 22, 2021)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: CapEx Central 2022 Alt 3 - Interchange Analysis
Project Comment: Created Mon Mar 01 13:19:19 CST 2021
Project Unit System: U.S. Customary

Intersection Title: I-35 & Woodward St WEST
Intersection Comment: Created Tue Jun 29 12:55:39 CDT 2021
Intersection Version: v1

Evaluation Title: Evaluation 4
Evaluation Comment: Created Thu Jun 23 09:20:52 CDT 2022

Minimum Location: 1000+00.000
Maximum Location: 1002+00.000

Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration

First Year of Analysis: 2030
Last Year of Analysis: 2030
Empirical-Bayes Analysis: None
First Year of Observed Crashes:
Last Year of Observed Crashes:

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70, 17-58, AND 17-68

Since the publication of the Highway Safety Manual - First Edition (HSM-1), in 2010 by the American Association of State Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

The IHSDM Crash Prediction Module (CPM) is intended as a faithful implementation of HSM Part C predictive methods. As NCHRP projects to develop new predictive methods for the HSM are completed, FHWA works to incorporate the new methods into IHSDM, sometimes in advance of publication in the HSM. The following new crash predictive methods have been accepted by NCHRP project panels and incorporated into IHSDM, while pending AASHTO's approval for incorporation into a future edition of the HSM:

- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.
- Intersection crash prediction methods for some intersection configurations and traffic control types not currently addressed in the HSM (e.g., all-way stop; rural 3-leg signalized; 3-leg stop-controlled where the major leg turns; urban 5-leg signalized; urban high-speed intersections): completed in 2021 under NCHRP Project 17-68.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58, 17-68, and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

I-35 & Woodward St WEST Evaluation

Intersection: I-35 & Woodward St WEST
Evaluation Start Location: 1000+00.000
Evaluation End Location: 1002+00.000
Calibration Factor: 4SG=1.0;

Table 1. Evaluation Intersection (I-35 & Woodward St WEST)

Inter. No.	Title	Type	Location (Sta. ft)	Major AADT	Minor AADT	Legs	Traffic Control	Approaches w/Left Turn Lanes	Approaches w/Right Turn Lanes	Approaches w/o Right Turn on Red	Pedestrian Volume (crossings/day)	Lighted at Night	Red Light Camera	School Nearby	Number of Bus Stops	Number of Alcohol Sales Establishments	Max Lanes Crossed
1	I-35 & Woodward St WEST (v1)	Urban/Suburban Arterial Intersection Four-Legged Signalized	1001+00.000	2030: 19,900	2030: 15,700	4	Signalized	2	1	2	0	true	false	false	0	0	5

Table 2. Predicted Intersection Crash Rates and Frequencies Summary (I-35 & Woodward St WEST)

First Year of Analysis	**2030**
Last Year of Analysis	**2030**
Predicted Crashes	
Total Crashes	**4.60**
Fatal and Injury Crashes	**0.93**
Property-Damage-Only Crashes	**3.67**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**20**
Percent Property-Damage-Only Crashes (%)	**80**

Table 3. Predicted Crash Frequencies by Year (I-35 & Woodward St WEST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2030	4.60	0.93	20.219	3.67	79.781
Total	4.60	0.93	20.219	3.67	79.781
Average	4.60	0.93	20.219	3.67	79.781

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Intersection Crash Type Distribution (I-35 & Woodward St WEST)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Angle Collision	0.73	15.9	2.69	58.5	3.42	74.4
Intersection	Collision with Bicycle	0.06	1.2	0.00	0.0	0.06	1.2
Intersection	Head-on Collision	0.03	0.7	0.11	2.4	0.14	3.1
Intersection	Other Multi-vehicle Collision	0.03	0.6	0.04	1.0	0.07	1.5
Intersection	Other Single-vehicle Collision	0.01	0.1	0.08	1.7	0.08	1.8
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Rear-end Collision	0.03	0.6	0.22	4.7	0.24	5.3
Intersection	Sideswipe	0.05	1.1	0.53	11.6	0.58	12.7
Intersection	Total Intersection Total Vehicle Crashes	0.93	20.2	3.67	79.8	4.60	100.0
Intersection	Total Intersection Crashes	0.93	20.2	3.67	79.8	4.60	100.0
	Total Crashes	0.93	20.2	3.67	79.8	4.60	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

MEMO

January 13, 2021

To: Susan Fraser, P.E., CFM

From: Matthew G. Best, P.E., PTOE
HDR

Subject: I-35 Capital Express Central Project: No-Build Projected 2025 and 2045 Travel Times between US 290E to US290W/SH 71

Introduction

As part of the I-35 Capital Express Central Project's Purpose and Need, corridor mainlane travel time projections for future years 2025 and 2045 were developed. The purpose of this memo is to outline the methodology used to forecast the 2025 and 2045 corridor travel times.

Methodology

The calibrated 2017 I-35 AM and PM peak hour *Vissim* microsimulation models were incorporated in the analysis. The models include the general purpose mainlanes, ramps, interchanges, and frontage roads. Using the calibrated existing 2017 conditions models as bases, the No-Build scenario AM and PM peak hour *Vissim* models were constructed for the future years of 2030 and 2050. In the future year models, traffic volumes were increased, assuming a two (2) percent annual growth rate between 2017 and 2030 and a 1.5 percent annual growth rate between 2030 and 2050. The 2030 and 2050 AM and PM peak model geometries were also revised to reflect projects previously planned by TxDOT for construction that would be completed by 2030, including the following projects within the I-35 Capital Express Central limits:

- I-35 at Oltorf Street
- I-35 at 51st Street

The 2030 and 2050 No-Build *Vissim* models' traffic volumes were adjusted to 2025 and 2045 to align with the Purpose and Need and the 2045 Regional Transportation Plan. In these adjusted models, the traffic volumes were decreased, assuming a two (2) percent annual growth reduction between 2030 and 2025 and a 1.5 percent annual growth reduction between 2050 and 2045. The models were run multiple times with different random seeds, and the travel times were summarized to determine the projected travel times to traverse the limits of the I-35 Capital Express Central project.

Results

Table 1 shows the 2019 field travel times (based on INRIX data) and the projected Central corridor No-Build mainlane travel times for 2025 and 2045 between US 290E and US 290W/SH 71. The future year No-Build model results show significant increases in travel times in the study area due to excessive congestion, most noticeably in the PM peak period results.

Table 1: 2019 Existing and Future Years No-Build Projected Corridor Mainlane Travel Times between US 290E and US 290W/SH 71

	2019 (INRIX)		2025		2045	
Direction	AM Peak Hour (min)	PM Peak Hour (min)	AM Peak Hour (min)	PM Peak Hour (min)	AM Peak Hour (min)	PM Peak Hour (min)
NB	19.2	32.2	19.8	131.6	33.6	223.2
SB	16.6	36.6	16.4	78.3	19.5	208.6

CC: Stephanie Messerli, P.E., AICP

VMT/VHT Memo

Texas Department of Transportation

MEMO

August 31, 2022

To: Tommy Abrego, P.E.
Mobility35 Program Manager, TxDOT Austin District

Through: Michael Lee, P.E.
I-35/Mobility35 Interim Program Manager

From: Behruz Paschai, Ph.D., P.E.
Traffic Operations Director, C&M Associates, Inc.

Subject: CapEx Central Travel Demand Model Update and Measures of Effectiveness Summary

---

As the Build Alternatives of Interstate 35 Capital Express Central project in Austin, Texas are being reviewed for the project Environmental Impact Analysis process, the project environmental team has identified a list of evaluation criteria comparing No Build and Build Alternatives (Alternative 2 and Modified Alternative 3). Within the Purpose and Need section of the evaluation criteria matrix, one of the subsections "Addressing demand by prioritizing the movement of people, goods, and services through and across the corridor; improving operational efficiency" contain four criteria of "Mainlane Travel Times", "Managed Lane Travel Time", "Travel demand along adjacent transportation roadway network", and "Annual cost of travel."

To address the latter two mentioned criteria, the GEC was tasked with updating the 2045 CAMPO Travel Demand Model (TDM) for the Central segment based on the provided schematics for each alternative. The outcomes of these TDM model runs were utilized in generating the requested Measures of Effectiveness (MOE) of daily vehicle-miles-of-travel (VMT) and vehicle-hours-of-travel (VHT) by roadway type. The area of analysis includes a 1-mile buffer around I-35, MoPac, and US 183, as shown in

Figure *1*.

The GEC provided the MOEs for the following alternatives:

- No-Build (Model files received from Alliance Transportation Group [ATG] and no further updates were incorporated)
- Alternative 2 (Updated based on pencil-down schematics received on 05/24/2022)
- Modified Alternative 3 (Updated based on pencil-down schematics received on 05/24/2022)

The updates entailed modifications to roadway link geometries, link direction, number of lanes, functional class, and area type to match the corresponding schematics. The MOE summary for these three alternatives is presented in Table *1*. VMT is the total distance traveled by all the vehicles in the network within the buffers and VHT is the total travel time of all vehicles on the roadway links within the buffers. The sum of daily VMT of I-35 (excluding mainlanes, HOV lanes, ramps, frontage roads, and collector-distributor roads), MoPac (full buffer), and US 183 (full buffer) was utilized for the criterion “Travel demand along adjacent transportation roadway network”.

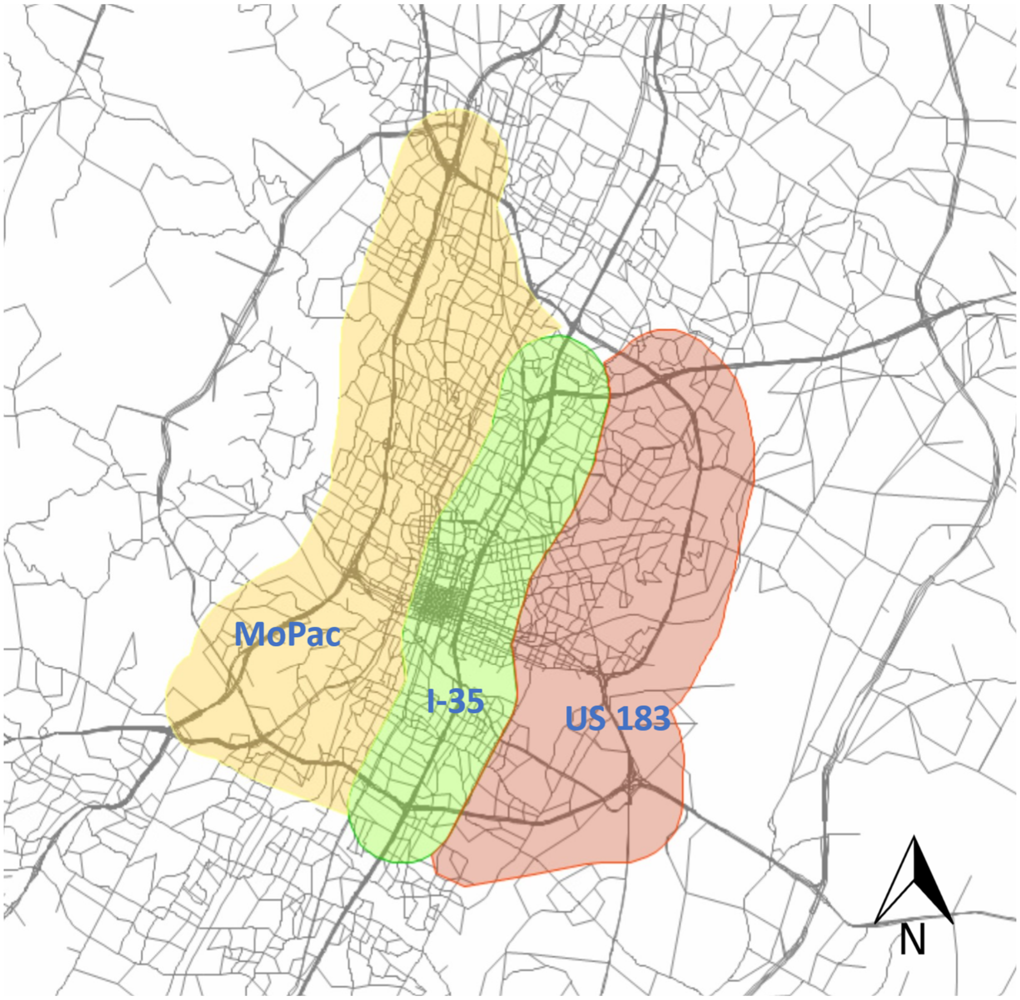


Figure 1. MOE Buffer Map

Table 1. MOE Summary (Year 2045)

Buffer	I-35		MoPac	US 183	Total
Roadway Types	Main & HOV	Others (Excluding frontage road, ramps, CDs and DCs)	All		Others/All
MOE	Daily VHT	Daily VMT	Daily VMT		Daily VMT
Alt 2	65,028	2,580,673	7,466,499	4,341,464	14,388,636
Modified Alt 3	68,065	2,576,748	7,451,638	4,313,764	14,342,150
No-Build	73,882	2,583,970	7,542,305	4,474,545	14,600,820

For the “annual cost of travel” criterion, the daily I-35 (mainlanes and HOV lanes) VHT values were converted to monetary values to estimate travel costs. These VHTs were assumed to be realized on 250 days per year (approximate number of annual workdays) at an hourly cost of $32.83, which is based on passenger car value of delay time, as determined by The University of Texas at Austin Center for Transportation Research (“Value of Delay Time and Road User Costs”, Memorandum from Duane S. Milligan, P.E. and Marisabel Z. Ramthun P.E., March 10, 2022). The resulting values are shown in Table 2.

Table 2. I-35 Mainlane & HOV Lane Annual Cost of Travel

Buffer	I-35	
MOE	Daily VHT	Annual Cost of Travel (2045)
Alt 2	65,028	$534M
Modified Alt 3	68,065	$559M
No-Build	73,882	$606M

Historical Crash Memo

MEMO

September 8, 2022

To: Tommy Abrego, P.E.
Mobility35 Program Manager, TxDOT Austin District

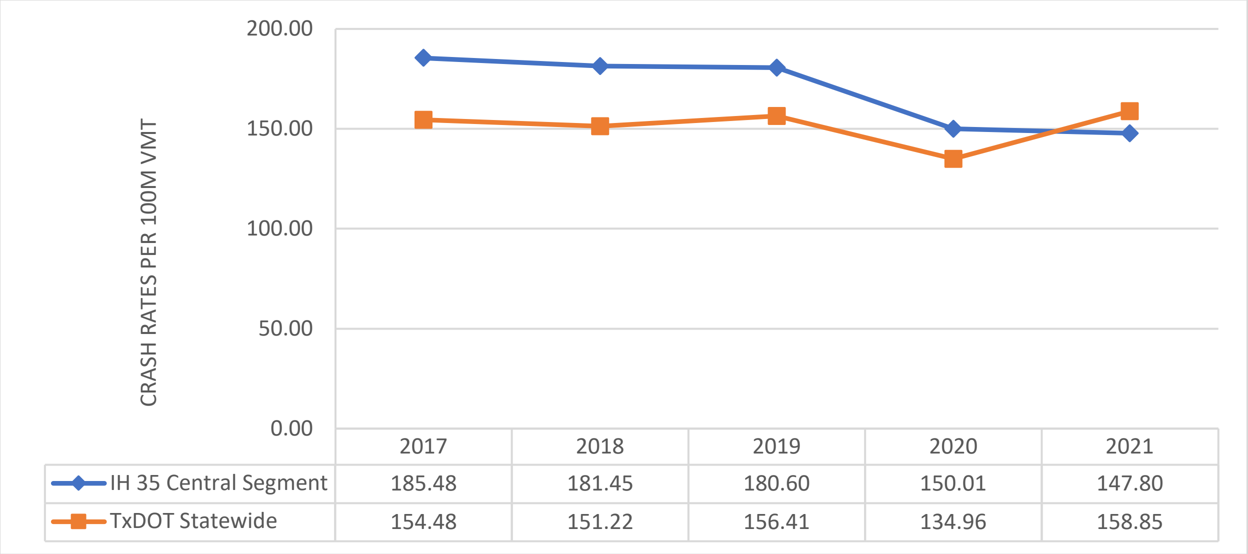
From: Matthew G. Best, P.E., PTOE
Traffic Project Manager, HDR

Subject: Mobility35 Capital Express Central: Historical Crash Analysis

---

As part of the Interstate 35 Capital Express Central project in Austin, Texas, an Environmental Impact Statement (EIS) is being prepared. As part of the Purpose and Need section of the EIS, safety deficiencies have been identified as part of the need for improvements along the corridor. This memorandum documents the recent historical crash history of the project area.

To analyze safety within the project limits, crash data from years 2017 through 2021 were obtained from TxDOT Design Division. A total of 5,190 crashes were reported during the five-year period, with 57 percent of the crashes occurring on the mainlanes, 38 percent on the frontage roads, and the remaining 5 percent on the ramps and connectors of the system. **Figure 1** shows the crash rates within the project limits compared to the statewide average for urban interstate facilities in Texas. Over this five-year period, the project limits had an average crash rate of 169.07 crashes per 100 million VMT, and, for every year, crash rates were higher than the statewide average except in 2021.



Sources TxDOT Statewide Traffic Crash Rates 2017, 2018, 2019, 2020, and 2021

Figure 1. Capital Express Central Crash Rates per 100M VMT

Table 1 shows the total number of crashes along with crash severity data within the project limits using the KABCO injury scale, which categorizes injuries by level of severity. Years 2020 and 2021 had significantly fewer crashes compared to the previous three (3) years as the project limits, like the rest of the state, had significantly less traffic volume due to the COVID-19 pandemic. Of the 5,190 total crashes, there were 37 (0.7 percent) fatal crashes (K), 142 (2.7 percent) incapacitating injury crashes (A), 1,058 (20.4 percent) non-incapacitating injury crashes (B), 1,162 (22.4 percent) possible injury crashes (C), and 2,703 (52.1 percent) property damage only (PDO) crashes (O). An additional 88 (1.7 percent) of the crashes were reported with no severity.

Table 1. Capital Express Central Crash Severity Summary

Year	Fatal Crashes (K*)	Severe Incapacitating Crashes (A*)	Moderate Non-Incapacitating Crashes (B*)	Minor Possible Injury Crashes (C*)	Property Damage Only Crashes (O*)	Unknown Severity Crashes	Total Crashes
2017	3	29	217	245	657	18	1,169
2018	9	36	208	266	618	11	1,148
2019	10	23	250	276	561	14	1,134
2020	2	24	195	156	415	17	809
2021	13	30	188	219	452	28	930
Avg/Yr	7	28	212	232	541	18	1,038
Totals	37	142	1,058	1,162	2,703	88	5,190
%	0.7%	2.7%	20.4%	22.4%	52.1%	1.7%	

Source: TxDOT, FHWA

*KABCO Injury Scale = “K” – Fatal injuries including deaths that occur within 30 days following an injury in a motor vehicle crash. “A” – Severe injuries including skull fractures, internal injuries, broken or distorted limbs, unconsciousness, severe lacerations, severe burns, and unable to leave the scene without assistance. “B” – Moderate injuries including viable injuries such as a “lump” on the head, abrasions, and minor lacerations. “C” – Minor injuries including hysteria, nausea, momentary unconsciousness, and complaint of pain without visible signs of injury. “O” – Property damage only.

Table 2 shows crash type, including bicycle and pedestrian accidents. The data indicate that of the 5,190 total recorded crashes within the project limits, there were:

- 1,674 (32.2 percent) rear-end crashes
- 1,291 (24.9 percent) same direction crashes other (not sideswipes or rear ends)
- 785 (15.1 percent) angle/other crashes
- 653 (12.6 percent) single vehicle fixed object/overturn/turning
- 599 (11.5 percent) sideswipe crashes
- 97 (1.9 percent) single vehicle pedestrian/bicycle crashes
- 91 (1.8 percent) opposite direction crashes

Of the 97 crashes involving a pedestrian or cyclist, 38 (39 percent) of them occurred between 8th Street and Cesar Chavez Street. Twenty-five of these 38 crashes within this section of the project limits occurred at intersections.

Table 2. Capital Express Central Crash Type Summary

Year	Single Vehicle (Fixed Object/ Overturn/Turning)	Single Vehicle (Pedestrian/ Bicycle)	2+ Same Direction (Sideswipe)	2+ Same Direction (Rear End)	2+ Same Direction (Other)	2+ Opposite Direction	2+ Angle/ Other	Total
2017	124	12	133	374	341	17	168	1,169
2018	142	19	116	387	315	25	144	1,148
2019	113	36	127	413	269	23	153	1,134
2020	120	11	109	235	166	13	155	809
2021	154	19	114	265	200	13	165	930
Avg/Yr	131	19	120	335	258	18	157	1,038
Totals	653	97	599	1,674	1,291	91	785	5,190
%	12.6%	1.9%	11.5%	32.2%	24.9%	1.8%	15.1%	

Source: TxDOT

Additionally, two (2) fatal crashes in which the contributing factor was “pedestrian failed to yield right-of-way to vehicle” occurred on the 4th Street Lance Armstrong Bikeway—both between 4:00 a.m. and 6:00 a.m. Five (5) injury crashes with the same contributing factor (three (3) Injury B and two (2) Injury C), occurred within 350 feet of the 7th Street interchange. All of these five (5) crashes occurred during the morning and afternoon peak hours. Even though there are crosswalks at the intersections of the I-35 frontage roads and 6th, 7th, and 8th Streets, these crashes resulted because pedestrians crossed the frontage roads/side streets midblock.

Traffic Memo

Texas
Department
of Transportation

MEMO

September 8, 2022

To: Tommy Abrego, P.E.
TxDOT Austin District

From: Matthew G. Best, P.E., PTOE
Engineer Traffic, HDR

Subject: Mobility35 Capital Express Central: Build Alternative Options

Background

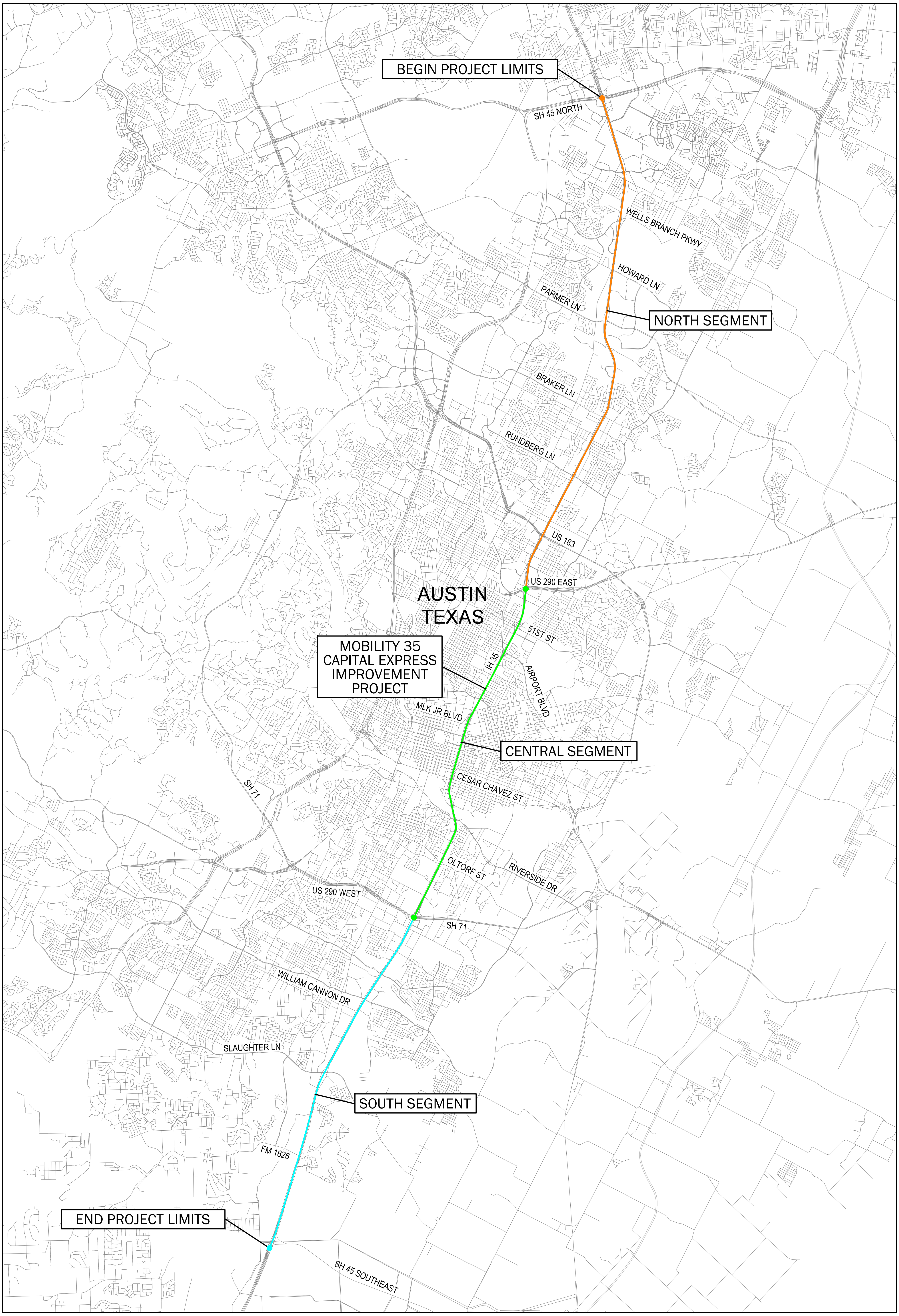
Interstate 35 (I-35) is being reconfigured to accommodate the future managed lanes and other improvements in Travis County. The Texas Department of Transportation (TxDOT) has identified approximately 27 miles of I-35, extending from SH 45 North (SH 45 N) to SH 45 Southeast (SH 45 SE) in Travis County, that will be reconstructed and/or have additional capacity added to meet the significant growth that has occurred in the Austin area.

Study Area

The Mobility35 Capital Express project study area consists of the I-35 segment between SH 45 N and SH 45 SE, divided into three segments, as shown in Figure 1:

- South: From SH 45 SE to US 290 W/SH 71
- Central From US 290 W/SH 71 to US 290 E
- North: From US 290 E to SH 45 N

The South and North segments were each analyzed as part of previous projects, while the Central project is the subject of the current analysis and this memorandum.



PROJECT VICINITY MAP	N	Texas Department of Transportation	FIGURE 1

Traffic Volume Forecasting

Existing (2019) traffic volumes were used to develop traffic forecasts for the Central Segment for the following future year scenarios:

- Opening Year 2030
- Design Year 2050

An annual growth rate of 1.5 percent was recommended to be utilized to project the Opening Year 2030 traffic volumes (2016 – 2030) and to project the Design Year 2050 volumes (2016 – 2050), and 1.0 percent was recommended to be utilized to project the Horizon Year (2050+) volumes along the I-35 Central section (SH 71 to US 290 E) for this study. The recommended annual growth rates translate to an approximate increase of 15 percent traffic volumes between 2019 and 2030 and 45 percent between 2019 and 2050 for the Central segment.

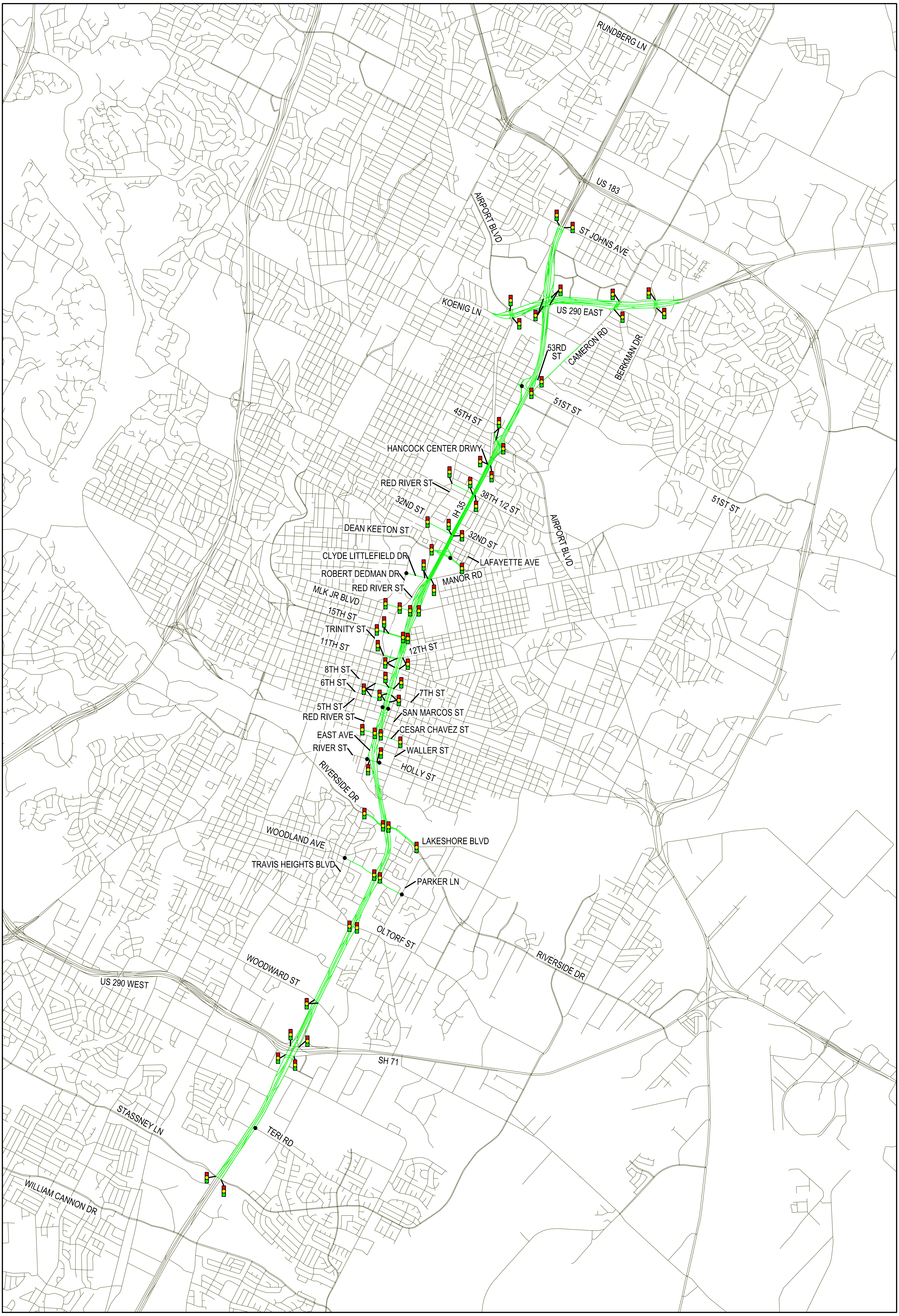
Vissim Modeling

The study corridor for this analysis was simulated using the *Vissim* software (version 11.00). *Vissim* is a microscopic traffic simulation software that models vehicles and other components as individual units and updates them every time step (usually multiple times per simulation second). After defining the street geometry, traffic control (e.g., stop signs, signals), and vehicular volumes, *Vissim* outputs measures of effectiveness (e.g., average delay, queue lengths, speeds) that can then be used as a basis for comparison of alternatives. *Vissim* also has the capability of modeling various modes of transit, such as bus and rail.

Existing (2019) AM peak and PM peak period traffic conditions along the I-35 corridor were first modeled to provide base condition models. Future year (2030 and 2050) No Build condition models were then constructed and used as points of comparison for the Build alternative models. The Central No Build Alternative *Vissim* model incorporates the Build improvements of the North and South Build Capital Express project schematics.

The I-35 Capital Express Central project has identified potential schematic improvements in the area of US 290 E to US 290 W/SH 71 to improve mobility throughout the project. Using the Central No Build Alternative *Vissim* model (incorporating mainlanes, high-occupancy vehicle (HOV) managed lanes, ramps, interchanges, frontage roads, and select cross streets between St Johns Avenue and Stassney Lane, as shown in Figure 2) and 2030/2050 peak volumes, HDR coded two Build alternatives to determine traffic operational impacts compared to No Build. The three alternatives analyzed are:

1. No Build Alternative
2. Build Alternative 2
3. Modified Build Alternative 3



CENTRAL SEGMENT
INTERSTATE 35
AREA OF INFLUENCE

N

LEGEND

🟩 IH 35 MAIN LANE/FRONTAGE ROAD STUDY AREA

🚦 SIGNALIZED INTERSECTION

● INTERSECTION

Texas Department of Transportation

FIGURE 2

Results

Table 1 provides a comparison of network-wide average delay per vehicle between the No Build Alternative and the two Build Alternatives for the AM and PM peak hours. The average delay per vehicle metric is the total delay on mainlanes, HOV managed lanes, frontage roads, ramps, and cross streets (including latent delay) divided by all vehicles present at any point during the simulation analysis period (including latent demand).

Table 1: Average Delay per Vehicle (Sec)

Peak Period	No Build	Build Alternative	
		2	3 MOD
AM	414.0	174.1	167.4
% change compared to No Build		-58%	-60%
PM	708.2	428.8	465.5
% change compared to No Build		-39%	-34%

Table 2 provides a comparison of corridor travel times (between US 290 E and US 290 W/SH 71) among the alternatives during the PM peak hour, which is the most congested time period during a typical weekday. For the EIS, mainlane (general purpose) and HOV managed lane travel times were obtained within the Central study area for the 2030 p.m. peak hour for all three alternatives.

Table 2: Corridor Travel Time Comparison

Alternative		Northbound (SH 71 to US 290 East)		Southbound (US 290 East to SH 71)		Average Northbound/Southbound	
		Travel Time (min)	%	Travel Time (min)	%	Travel Time (min)	%
No Build	GP	19.8	-	20.0	-	19.9	-
2	GP	8.6	-57%	8.4	-58%	8.5	-57%
	HOV	8.2	-	9.3	-	8.8	-
Modified 3	GP	8.5	-57%	8.8	-56%	8.6	-57%
	HOV	7.8	-	9.6	-	8.7	-

Person-Carrying Capacity

Person-Carrying Capacity along Mainlanes and HOV Managed Lanes, Including Vehicles and Transit

	No-Build	Alt 2		Alt 3 MOD	
		GP	ML	GP	ML
FFS (mph)	51.2	53.3	55.9	52.8	55.9
Base FFS (mph)	60	60	60	60	60
fLW (mph)	0	1.9	1.9	1.9	1.9
Lane Width (ft)	12	11	11	11	11
fRLC (mph)	0	0	0	0	0
Right-side Lateral Clearance (ft)	> 6	> 6	> 6	> 6	> 6
TRD (ramps/mi)	3.31	1.625	0.63	1.8125	0.63
Bidirectional total # ramps	53	26	10	29	10
vp (pc/hr/ln)	2,212	2,233	2,259	2,228	2,259
# Lanes	6	6	4	6	4
PHF	0.98	0.98	0.98	0.98	0.98
fHV	0.93	0.93	1.00	0.93	1.00
PT	0.062	0.062	0.0007	0.062	0.0007
Bus Frequency (bus/hr)	-	-	6	-	6
ET	2.23	2.23	2.39	2.23	2.39
V (veh/hr)	12,083	12,195	8,848	12,170	8,848
HOV (veh/hr)	-	-	8,842	-	8,842
Bus (veh/hr)	-	-	6	-	6

Person-Carrying Capacity (person/hr)	13,492	13,618	20,030	13,590	20,030
Total Person-Carrying Capacity (person/hr)	13,500	33,600		33,600	
% Change	-	149%		149%	

Total Person-Carrying Capacity (person/day)	324,000	806,400		806,400	

HCM Exhibit 12-26 (0% grade)

%HV	PCE
6%	2.24
8%	2.17

Vehicle Occupancy Assumptions (person/veh)

GP	1.12
ML HOV	2.24
ML Bus	45.40