Appendix D

Traffic Operations Analysis

FM 76 (North Loop Drive) Feasibility Study

November 2023

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1. Introduction

The Farm to Market (FM) 76 (North Loop Drive (Dr)) Feasibility Study is studying options to improve mobility and safety throughout 12.5 miles of FM 76 (North Loop Dr) between FM 1281 (Horizon Boulevard (Blvd)) and State Highway (SH) 20 (Alameda Avenue (Ave)) in Fabens, Texas. FM 76 (North Loop Dr) Feasibility Study limits are shown in **Figure 1.** The operational analysis presented in this ***Existing and No-Build Analysis*** report will support the scoped Subtask 110.B.1 "Traffic Engineering Studies," which will conduct a capacity and level-of-service analysis for existing (2019) and future (2045) No-Build conditions. The short term proposals will adress the interim year requirements.

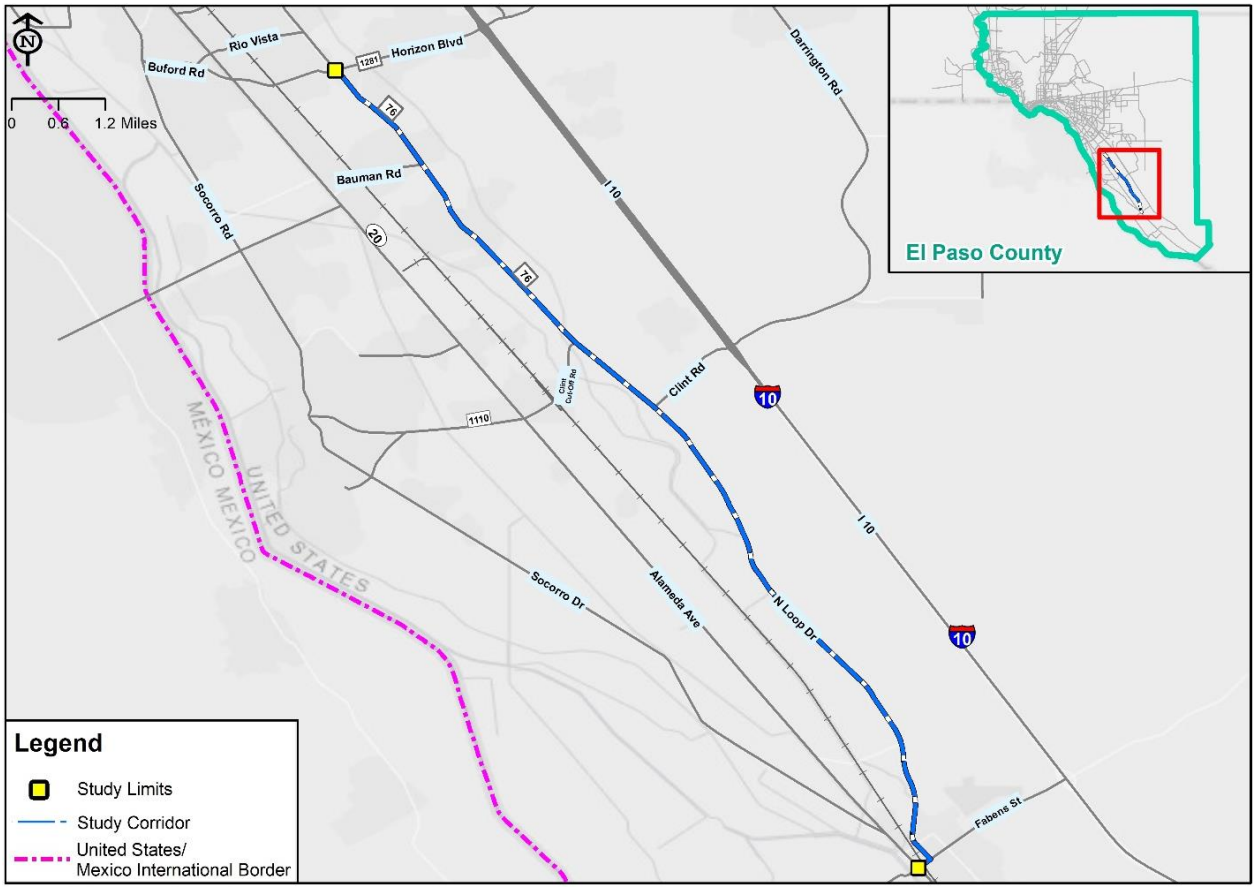


Figure 1: Study Corridor and Limits

2. Transportation Facilities

The 12.6-mile FM 76 corridor is part of the Farm-to-Market roadway system. The corridor is located southwest of El Paso to the west of Interstate 10 between the Socorro and Fabens communities.

Roadway Network

The FM 76 corridor is a two-lane undivided roadway classified as a minor arterial from FM 1281 to FM 1110 intersection and major collector from FM 1110 to the end of project corridor at Fabens and is part of the TxDOT roadway system. TxDOT owns the transportation right-of-way (ROW) for the length of the corridor. Interstate 10 runs parallel and to the east of the FM 76 corridor with two general purpose lanes in each direction totaling four lanes and frontage roads. Alameda Ave (SH 20) is a two-lane undivided arterial road running parallel and to the west of the FM 76 corridor. FM 1110 and FM 1281 are two-lane roads that connect FM 76 to Interstate 10 and Alameda Ave. FM 76, Alameda Ave, and Interstate 10 provide routes from the City of El Paso to the southeastern El Paso County. **Figure 2** depicts the roadway network near the FM 76 corridor.

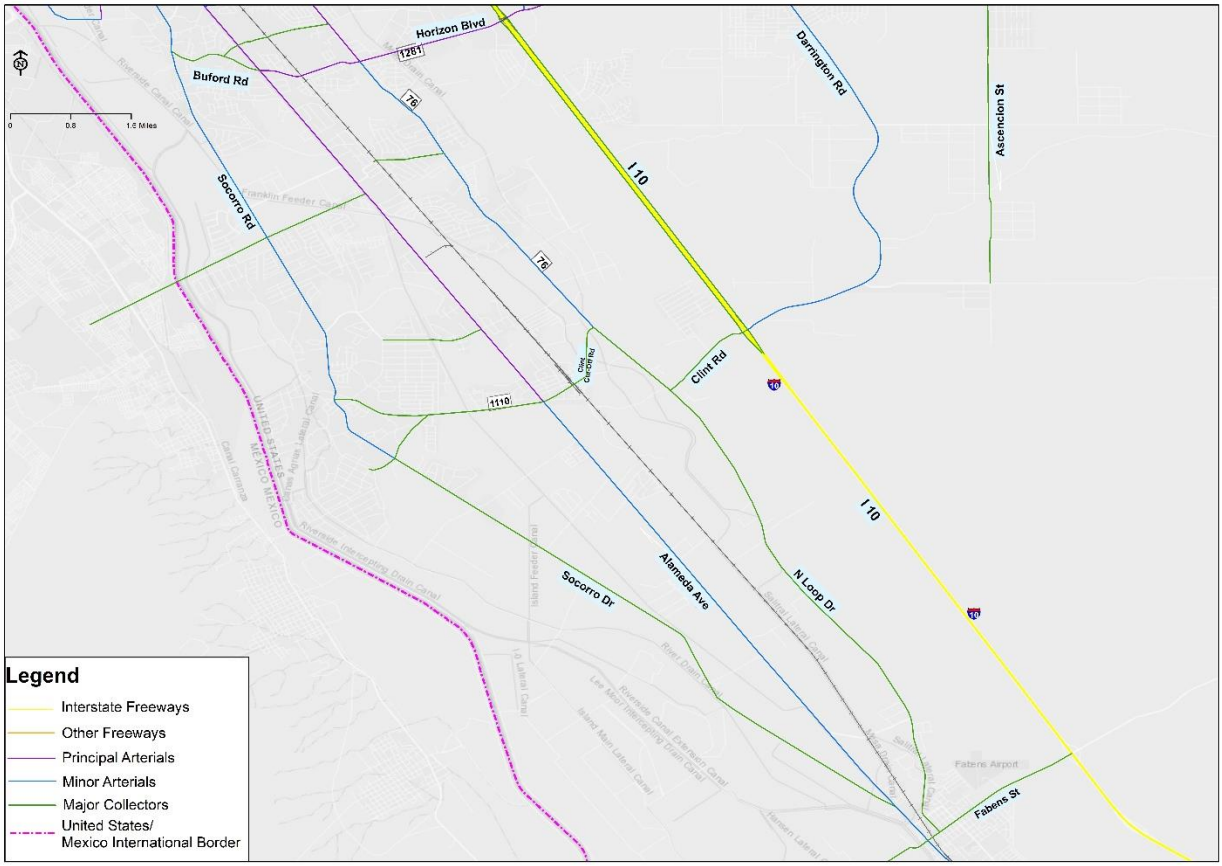


Figure 2: Existing Road Network

Intersections

Along the project corridor, 31 intersections are selected for assessment out of which 25 are 3-legged intersections and six intersections are 4-legged intersections. There are five signalized intersections on FM 76 at FM 1281, FM 1110 (Clint Cut-Off Road (Rd)), FM 1110 (Clint-San Elizario), Camp Street (St) at Fabens, and Alameda Ave. **Table 1** lists the intersections on FM 76 selected for operational analysis and the intersection control.

Table 1: Key Signalized and Unsignalized Intersections on FM 76

No.	Intersection	Intersection Control	Intersection Configuration
1	FM 76 and Horizon Blvd	Signal	4 leg
2	FM 76 and Milo Dr[1]	Stop*	3 leg
3	FM 76 and Sudan Dr[1]	Stop*	3 leg
4	FM 76 and Clems Rd	Stop*	3 leg
5	FM 76 and Liahona Dr	Stop*	3 leg
6	FM 76 and Sunhaven Dr	Stop*	3 leg
7	FM 76 and Barnhart Dr	Stop*	3 leg
8	FM 76 and McAdoo Dr	Stop*	3 leg
9	FM 76 and Jewel Dr	Stop*	3 leg
10	FM 76 and Bauman Rd	Stop*	3 leg
11	FM 76 and Worsham Rd	Stop*	3 leg
12	FM 76 and Wellettka Dr	Stop*	3 leg
13	FM 76 and Hureque Dr	Stop*	3 leg
14	FM 76 and Richardson Rd	Stop*	3 leg
15	FM 76 and Rancho Viejo Dr	Stop*	3 leg
16	FM 76 and Anderson Rd	Stop*	3 leg
17	FM 76 and Young John St	Stop*	3 leg
18	FM 76 and Estate Dr	Stop*	3 leg
19	FM 76 and Pickard Rd	Stop*	3 leg
20	FM 76 and FM 1110 (Clint Cut-Off Rd)	Signal	4 leg
21	FM 76 and Fenter Rd	Stop*	3 leg
22	FM 76 and Roberts Ranch Rd	Stop*	3 leg
23	FM 76 and Celum Rd	Stop*	3 leg
24	FM 76 and Clint-San Elizario	Signal	3 leg
25	FM 76 and Porter Rebb Rd	Stop*	3 leg
26	FM 76 and 5th St	Stop*	3 leg
27	FM 76 and 3rd St	Stop*	4 leg
28	FM 76 and 1st St	Stop*	4 leg
29	Fabens Rd and Camp St	Signal	4 leg
30	Fabens Rd and Bryan St	Stop*	3 leg
31	Island Rd and Alameda Ave	Signal	4 leg

*stop on the intersecting routes and not stop on FM 76

The existing layout and peak hour traffic volumes of the signalized intersections on the FM 76 corridor are shown in **Figure 3** through **Figure 7**. Development of the peak hour determination and turning movement counts are discussed in **Section 3.5** and **Section 4.1**.

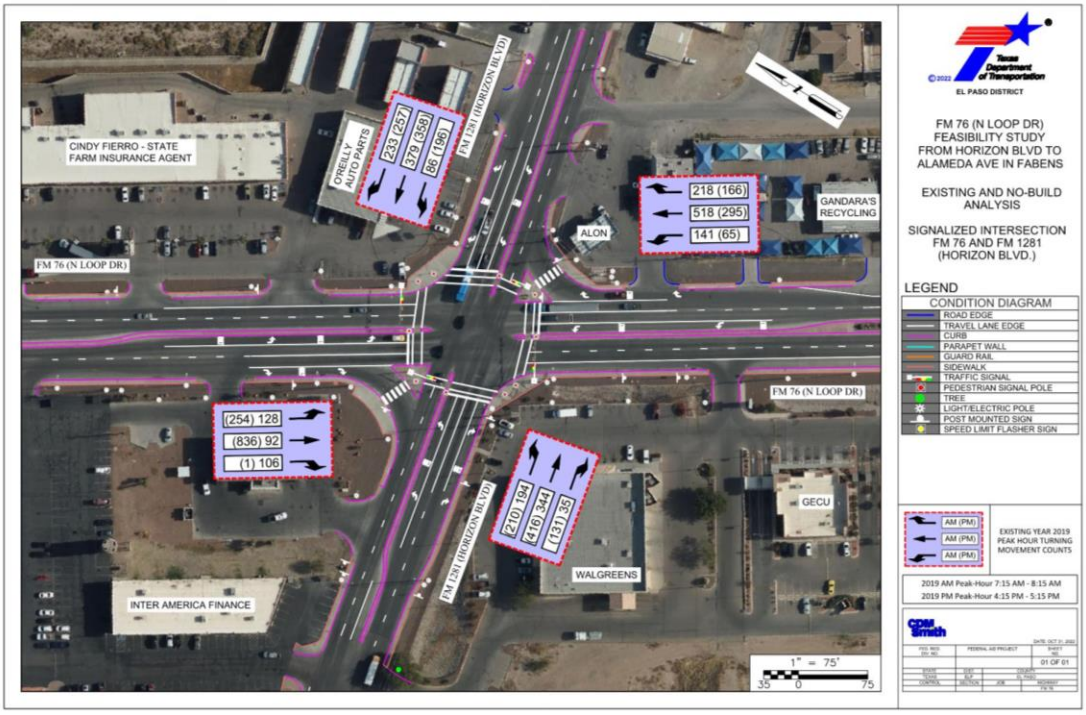


Figure 3: Existing Layout and Peak Hour Traffic Volumes of FM 76 at FM 1281

Figure 4: Existing Layout and Peak Hour Traffic Volumes of FM 76 at Clint Cut-off Rd

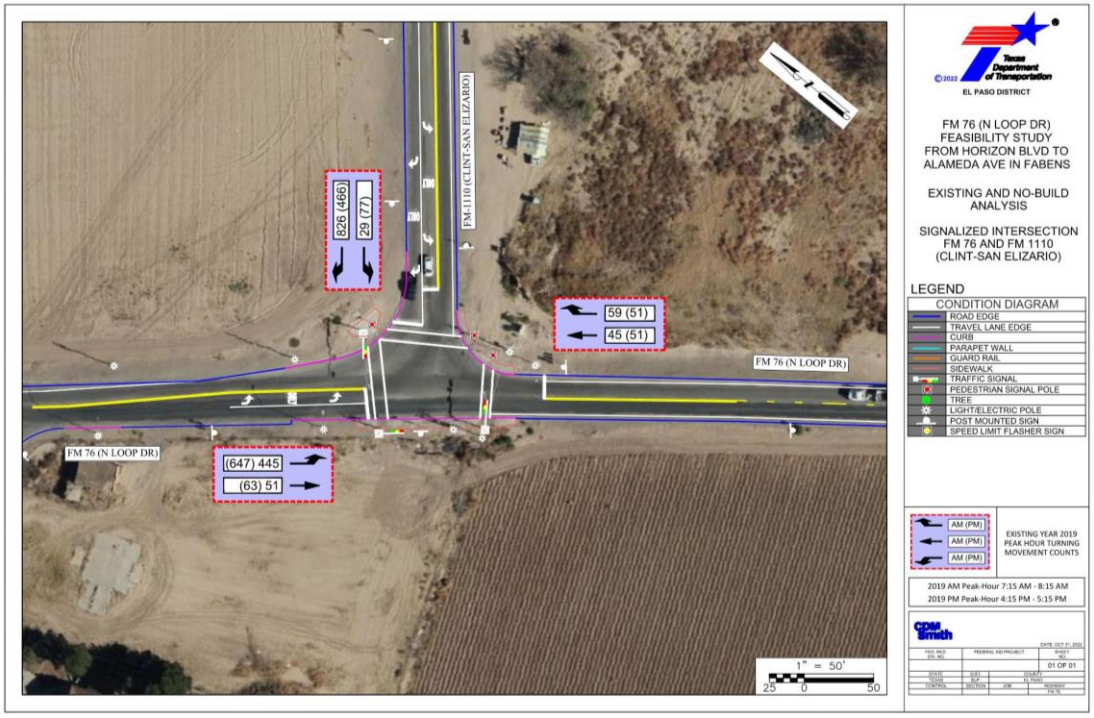


Figure 5: Existing Layout and Peak Hour Traffic Volumes of FM 76 at Clint-San Elizario

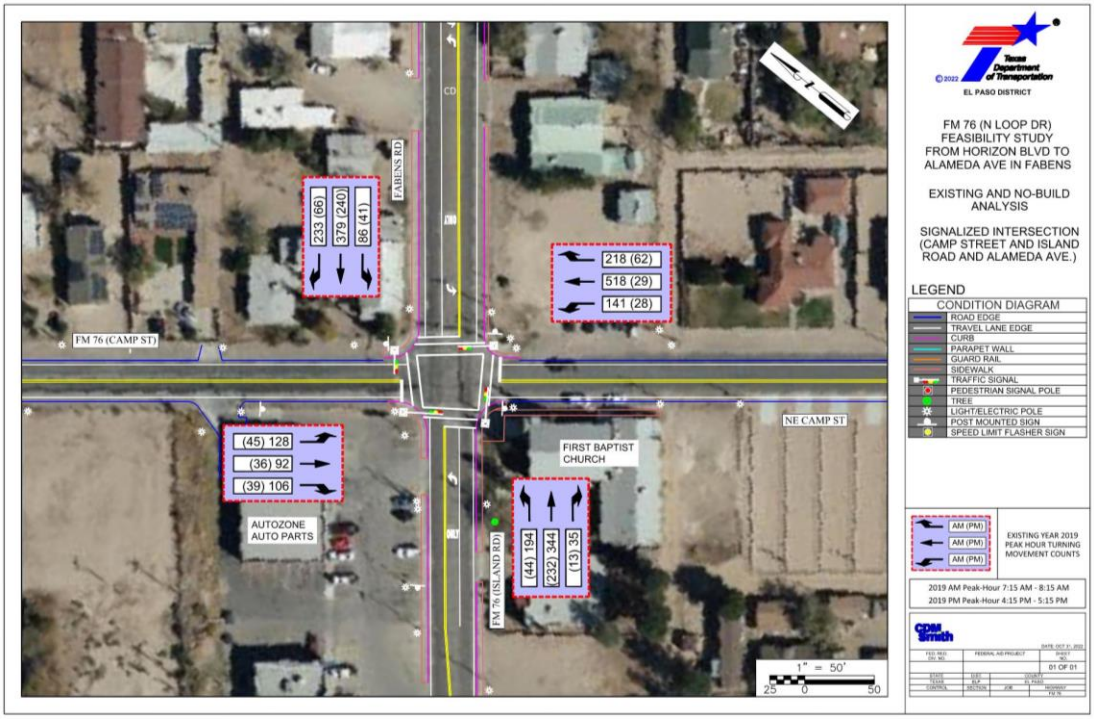


Figure 6: Existing Layout and Peak Hour Traffic Volumes of Camp St (FM 76) at Fabens Rd

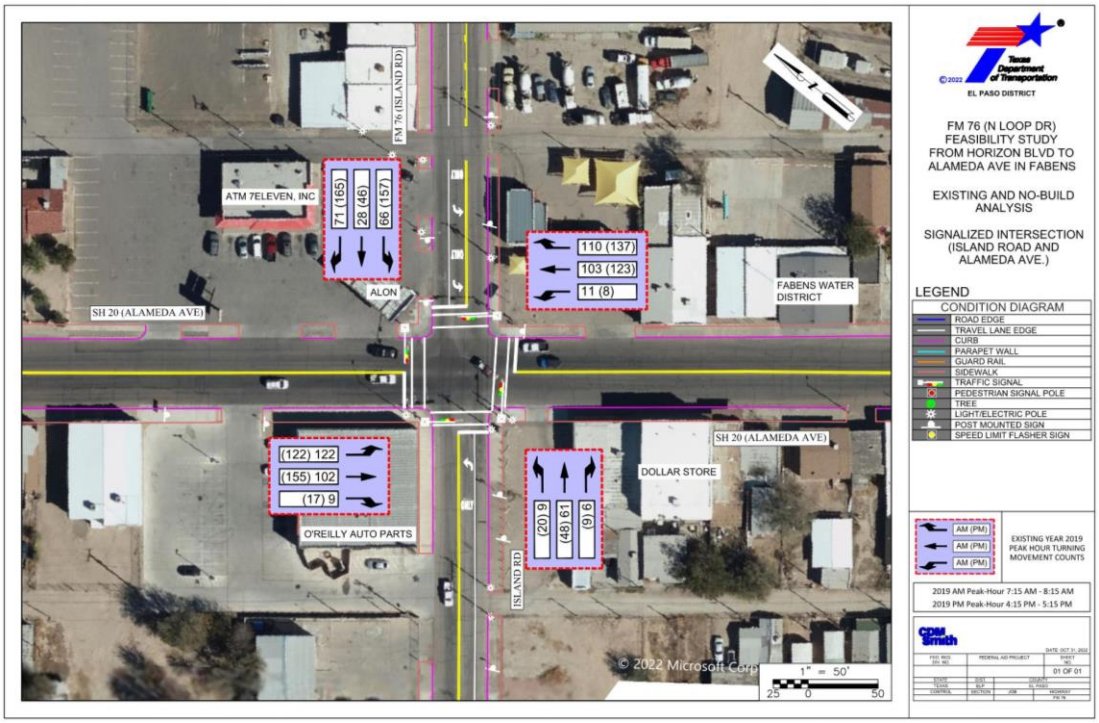


Figure 7: Existing Layout and Peak Hour Traffic Volumes of Island Rd (FM 76) at Alameda Ave

Corridor Characteristics

2.3.1 Configuration

The existing ROW on FM 76 in the corridor limits is in the range of 50 feet (ft) to 60 ft for around 63% of the project length. Near the intersection with FM 1281, for a length of 0.29 miles, The FM 76 corridor has a ROW of 135 ft. The project corridor has a two-lane undivided road configuration throughout the study limits. For 0.2 miles between FM 1281 and Milo Dr, FM 76 consists of a 4-lane section with 11 to 14 ft lanes, median, and paved shoulders approximately 11 ft wide on both sides. A 5 ft wide sidewalk is also observed on both sides along this section. For the rest of the corridor, two lanes were observed with lane widths varying between 11 ft and 12 ft with a paved shoulder of 3 to 4 ft wide on both sides. Near signalized intersections, additional turn lanes are observed.

2.3.2 Speed limits

Posted speeds on FM 76 corridor range from 35 miles per hour (mph) to 55 mph, at curve locations the speeds are further reduced. Posted speed of 45 mph is observed between FM 1281 (Horizon Blvd) and Anderson Rd for a length of 3.1 miles and from Anderson Rd to 5th St at Fabens the speed limit is 55 mph. From there, the speed reduces to 45 mph up to 3rd St and further reduces to 35 mph until the end of the project corridor. Speed limits along the corridor are as shown in **Figure 8**.

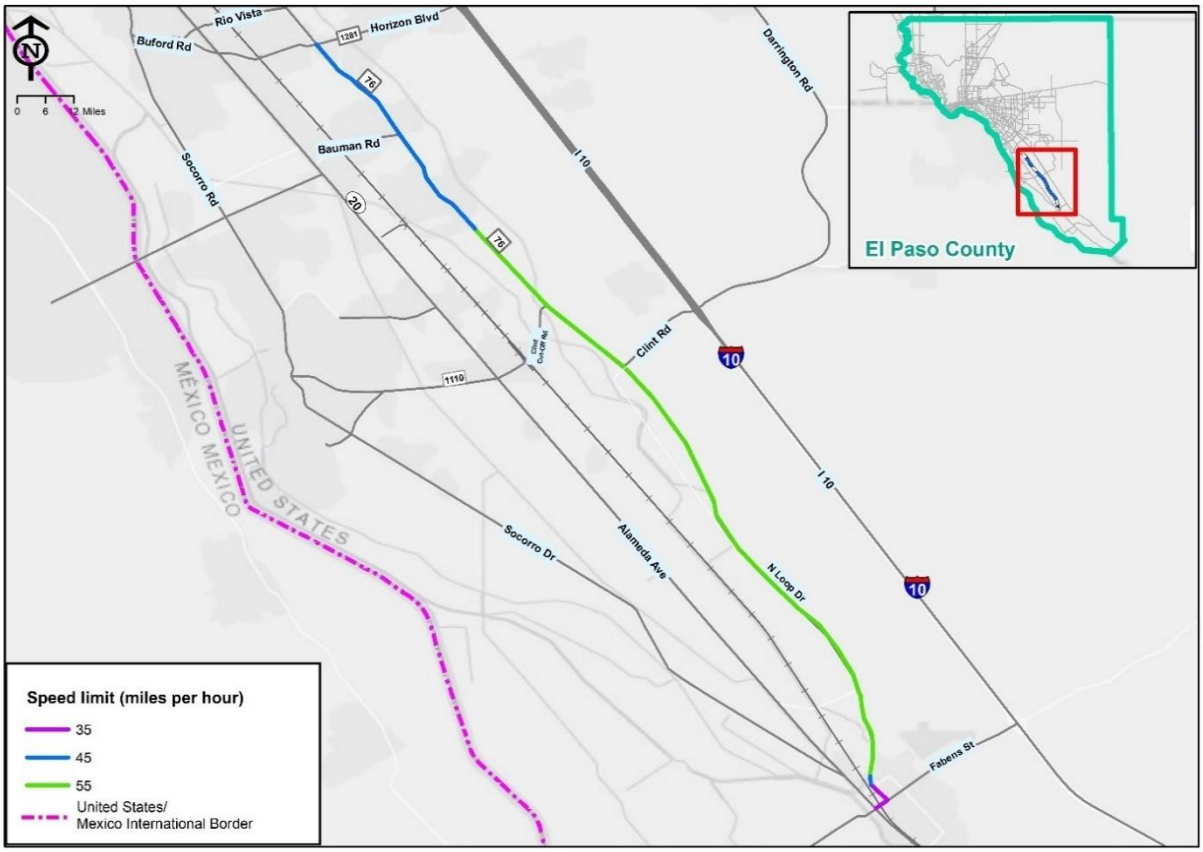


Figure 8: Speed limits along FM 76 corridor

Pedestrian and Bicycle Facilities

According to the 2016 American Community Survey (ACS), approximately 7 percent to 10 percent of households within the Fabens, Clint, and Socorro communities do not own an automobile, leaving some residents dependent on other modes of travel such as transit, walking, and bicycling for transportation. Hence, it is important to assess the bicycle and pedestrian infrastructure available to better understand the needs and issues for non-motorized transportation modes along the FM 76 corridor.

Throughout the FM 76 corridor, there is limited sidewalk connectivity to the surrounding communities. Apart from the FM 1281 intersection and the 0.2-mile section from the Fabens Rd intersection to Alameda Ave, there are no sidewalks present along FM 76 corridor. Sidewalks are also not present along most crossings or intersecting streets. During field investigation, minimal pedestrian activities were observed within the urban areas. No bicycle facilities were found along the FM 76 corridor.

Transit

El Paso County provides rural transit services to the City of Socorro and Fabens. The transit routes run along Alameda Ave and Horizon Blvd. There are no transit routes or bus stop facilities along FM 76

within the study limits. The average monthly ridership for the rural transit services combined ranges from 3,000 to 4,000.

Rail

The Union Pacific Railroad Line runs along the entire FM 76 corridor limits. At times the Union Pacific operates trains that stretch up to a mile long. All of the railroad crossings are at-grade crossings.

3. Traffic Data Acquisition and Synthesis

Traffic data from 2019 was chosen as the existing year for the study, additional traditional data collection was not undertaken for this study and instead data fusion techniques were utilized to take advantage of TxDOT's traffic data resources, including historical traffic counts, probe-vehicle data, and location-based traffic data. The following subsections describe how each data element was synthesized utilizing the aforementioned sources.

Demographics

Population data for the City of El Paso and El Paso County were extracted from the U. S. Census data for the years 2010 and 2020. The data shows the city and county populations are growing at an annual rate of 0.46% and 0.81% respectively. The El Paso MPO Destino Travel Demand Model (TDM) also contains population information for the model years 2017, 2022, 2032, 2040, and 2045. **Table 2** summarizes the population growth from U.S. Census and the TDM.

Table 2: Population Growth Rate

Source	Source	Years	Annual Linear Growth Rate
El Paso City, Texas- Population	Census	2010-2020	0.46%
El Paso County, Texas- Population	Census	2010-2020	0.81%
El Paso County, Texas- Population	TDM	2017-2045	1.64%

Source: https://www.census.gov/quickfacts/fact/table/elpasocitytexas,elpasocountytexas/PST045221)

Source of Traffic Counts

To develop the existing year (2019) traffic and classification counts, traffic data from the following sources were used:

- TxDOT count data
- Streetlight™ Origin-destination (O-D) data

3.2.1 Traffic Counts from TxDOT

The primary source of historical traffic count data from TxDOT is the Statewide Traffic Analysis and Reporting System (STARS II)[1]. The STARS II system can be accessed online and contains a Traffic Count Database System (TCDS) of historical traffic data, including mid-block volume counts, classification counts, and speed data. The data contained in STARS II are of varying resolution and detail ranging from Annual Average Daily Traffic (AADT) estimates of two-way traffic to 15-minute Federal Highway Administration (FHWA) 13 vehicle classification directional volumes.

3.2.2 Traffic Counts from StreetLight™

The third-party data considered to complement the 2019 counts whenever counts are not available are from StreetLight data. Each data source is based on probe data collected from cell-phone location-based services and Global Positioning System (GPS) device data processed by the vendor into anonymized traffic data estimates.

StreetLight data provides various travel metrics that stem from trip estimations from passively collected vehicle probe data. Trip data can be acquired through the StreetLight InSight platform maintained by StreetLight through various analysis types, which can be used to estimate traffic volumes and travel times. The finest level of detail available is 15-minute intervals for traffic volumes. The data are acquired by specifying zones or segments that reflect locations (e.g., a single intersection leg), by type of data (volume and speeds), and by any analysis period. StreetLight InSight only provides an estimate of total traffic.

Traffic Counts on Segments

An evaluation of TxDOT count trends was conducted as one measure of traffic growth, **Figure 9** and **Table 3** shows the TxDOT count trends between 1999 and 2019. TxDOT counts between 1999 and 2019 were obtained for the FM 76 (North Loop Dr) study corridor and connecting roadway segments. **Figure 10** shows the summary of 2000, 2010, 2015 and 2019 TxDOT counts in the FM 76 (North Loop Dr) study area.

[1] "Statewide Traffic Analysis and Reporting System," Statewide Traffic Analysis and Reporting System (Texas Department of Transportation), accessed June 17, 2021, https://www.txdot.gov/inside-txdot/division/transportation-planning/stars.html

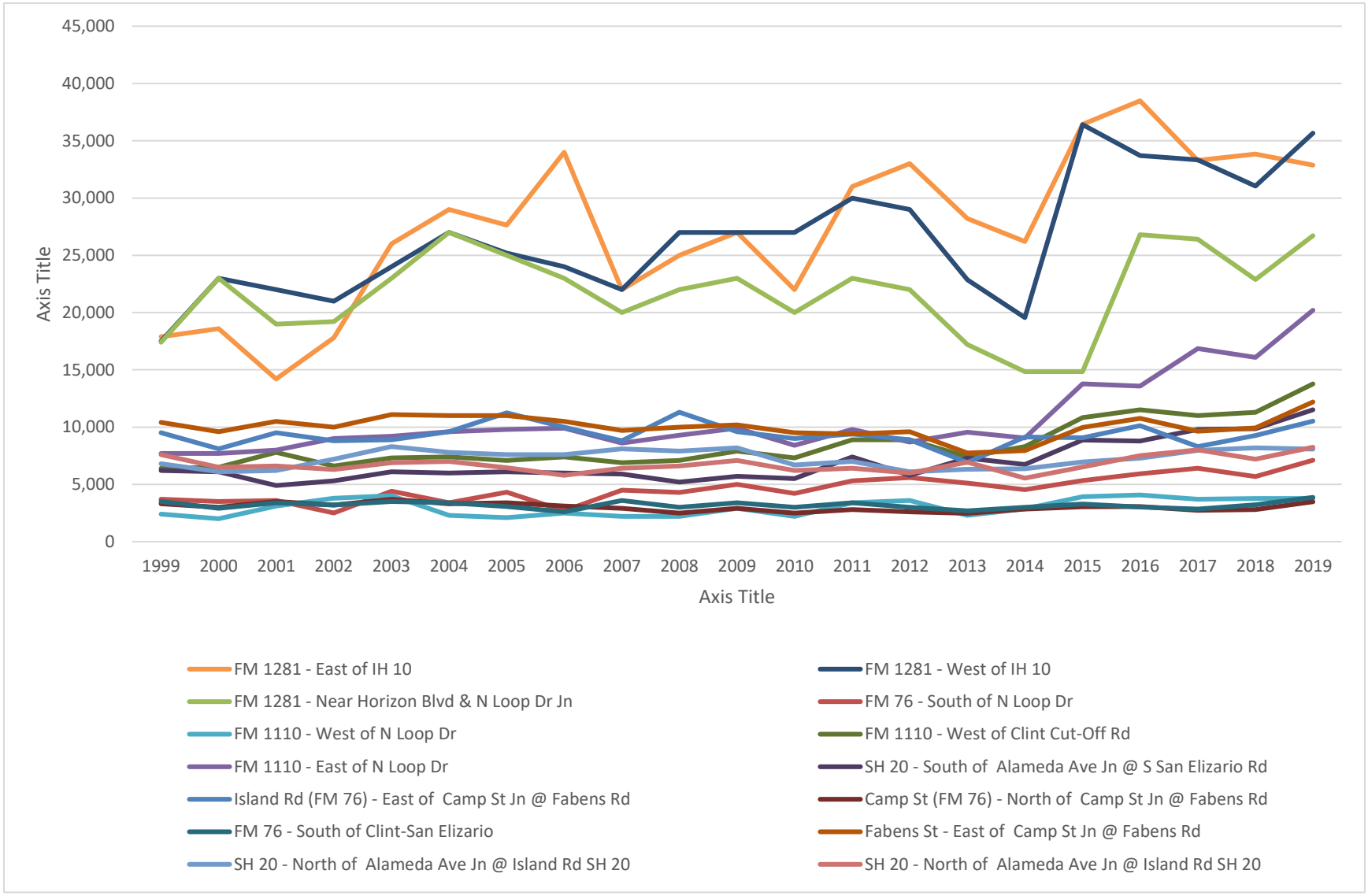


Figure 9: TxDOT Historic Count Trends for the Purposes of the Study

Table 3: TxDOT Historic Count Summary

Location ID	Location	Annual Average Daily Traffic (AADT)							Linear Annual Growth Rate	
		1999	2000	2010	2015	2017	2018	2019	1999-2019	2000-2019
72H53	FM 1281 – East of IH 10	17,900	18,600	22,000	36,443	33,289	33,850	32,862	4.2%	4.0%
72H53A	FM 1281 – West of IH 10	17,500	23,000	27,000	36,412	33,324	31,045	35,674	5.2%	2.9%
72H53B	FM 1281 – Near Horizon Blvd and N Loop Dr Jn	17,400	23,000	20,000	14,841	26,399	22,881	26,703	2.7%	0.8%
72H57	FM 76 – South of N Loop Dr	3,700	3,500	4,200	5,324	6,398	5,681	7,110	4.6%	5.4%
72H56	FM 1110 – West of N Loop Dr	2,400	2,000	2,200	3,931	3,710	3,757	3,757	2.8%	4.6%
72H66	FM 1110 – West of Clint Cut-Off Rd	6,400	6,500	7,300	10,839	11,004	11,301	13,769	5.8%	5.9%
72H67	SH 20 – South of Alameda Ave Jn @ S San Elizario Rd	6,200	6,100	5,500	8,870	9,787	9,867	11,512	4.3%	4.7%
72H55A	FM 1110 – East of N Loop Dr	7,700	7,700	8,400	13,770	16,851	16,085	20,203	8.1%	8.5%
72H214B	FM 76 – South of Clint-San Elizario	3,500	2,900	3,000	3,292	2,840	3,208	3,864	0.5%	1.7%
72T10	Island Rd (FM 76) – East of Camp St Jn @ Fabens Rd	9,500	8,100	9,000	9,079	8,293	9,258	10,527	0.5%	1.6%
72T12	Camp St (FM 76)– North of Camp St Jn @ Fabens Rd	3,300	3,000	2,500	3,051	2,732	2,805	3,477	0.3%	0.8%
72T13	Fabens Rd – East of Camp St Jn @ Fabens Rd	10,400	9,600	9,500	9,966	9,647	9,919	12,194	0.9%	1.4%
72T18	SH 20 – North of Alameda Ave Jn @ Island Rd	6,800	6,100	6,700	6,953	7,973	8,196	8,086	0.9%	1.7%
72T15	SH 20 – North of Alameda Ave Jn @ Island Rd	7,600	6,500	6,200	6,509	8,024	7,194	8,244	0.4%	1.4%

Source: Statewide Traffic Analysis and Reporting System (STARS II) (txdot.gov)

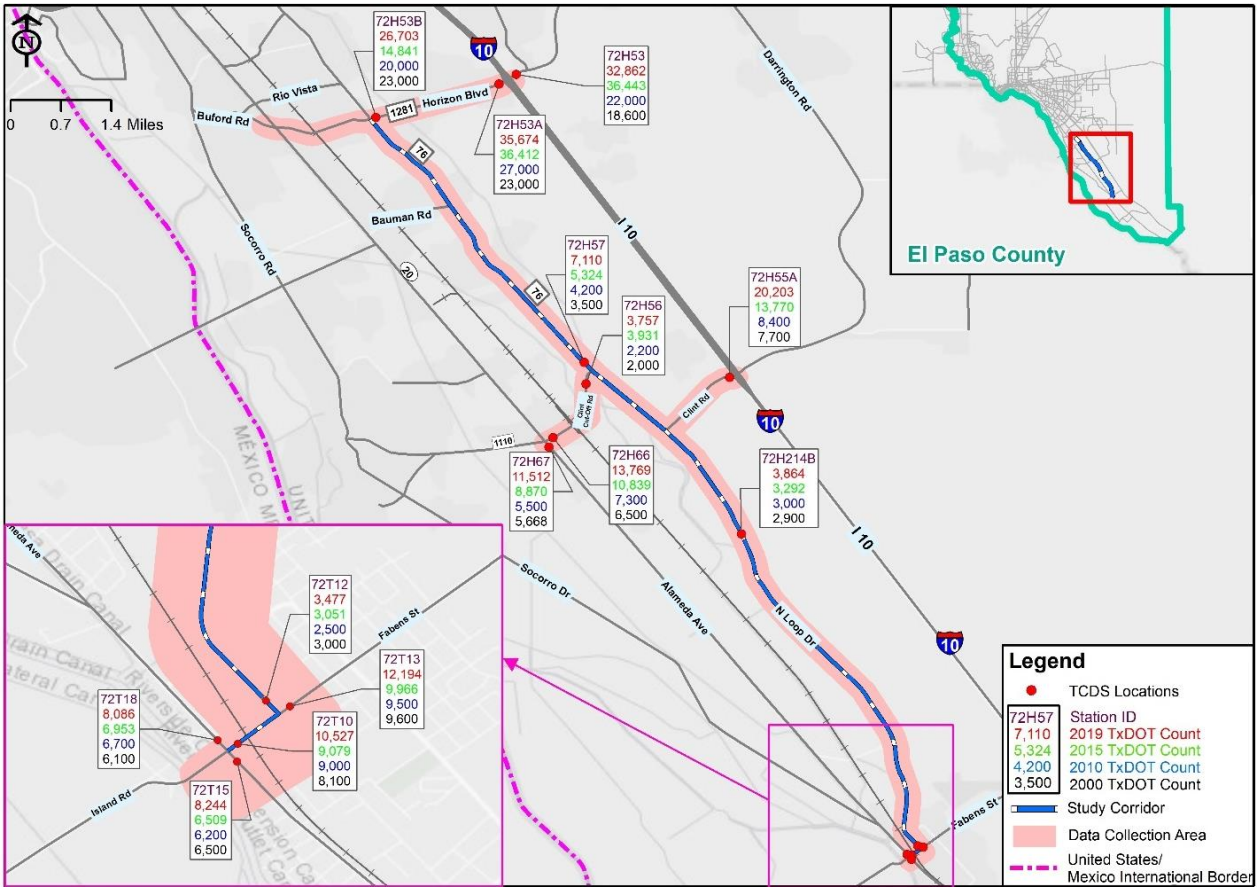


Figure 10: TxDOT Historic Counts Near Study Area

Traffic Counts at Intersections

The TCDS does not contain the turning movement counts (TMCs) in the study area. Therefore, the existing year TMCs at the intersections on the FM 76 corridor were obtained using StreetLight Origin-Destination (O-D) data. The preliminary top routes analysis of FM 76 traffic was used to determine key route decision points to conduct TMCs within the corridor limits. The 31 selected TMC locations are shown in **Figure 11**. TMCs were acquired for 24 hours representing a workday when schools are in session. The TMCs were scaled to reflect observed count data. STARS II and StreetLight counts for work days are used at common location IDs along the FM 76 corridor to derive scaling factors. Scaling factors are applied to the TMCs developed from StreetLight OD data to adjust the TMCs to the STARS II data, which is considered as the more reliable counted data.

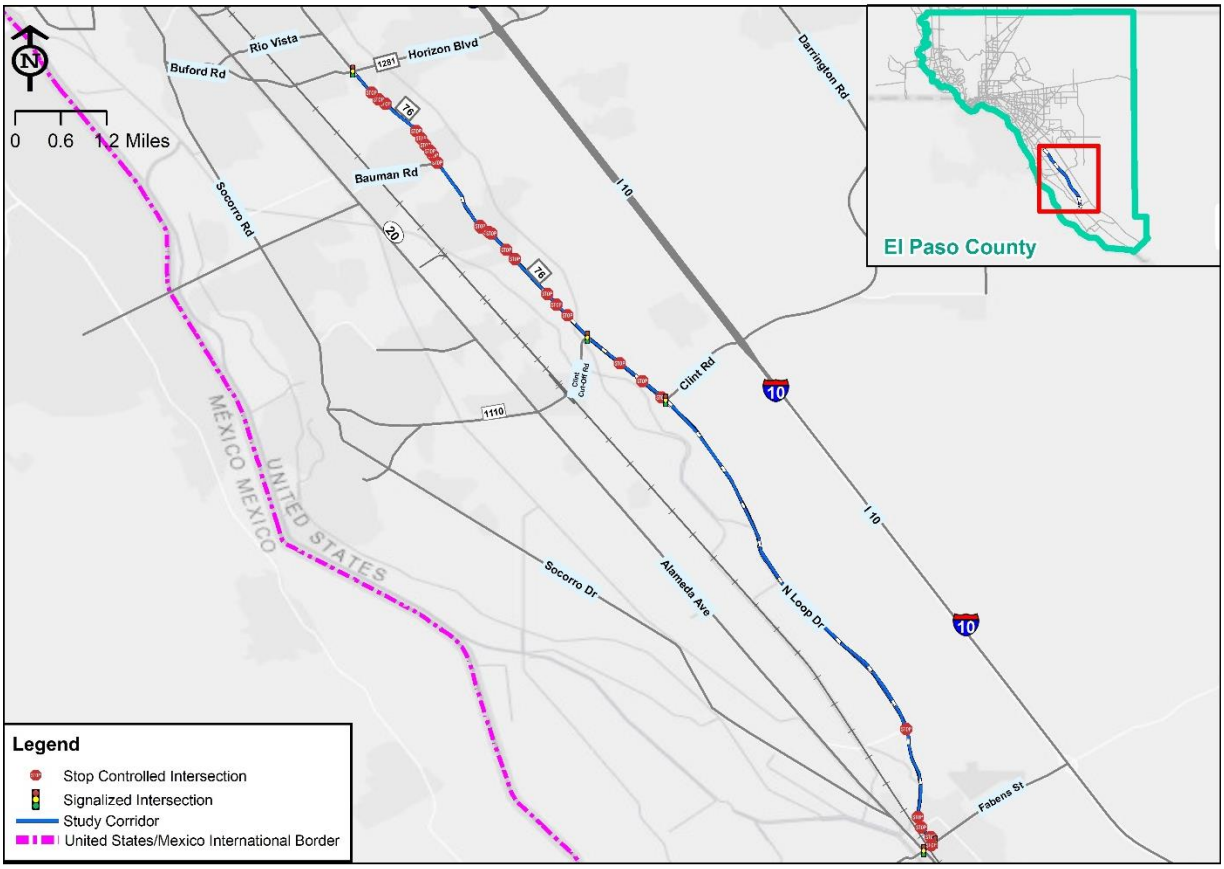


Figure 11: TMC Locations on FM 76

TMCs were collected via a StreetLight InSight Origin-Destination (O-D) analysis at each location. Peak-hour volumes for each turning movement were scaled utilizing the same daily factors developed for segment counts.

Peak Period

Hourly traffic counts from STARS II were consolidated and analyzed to identify the morning and evening peak hours. **Figure 12** shows the peak hours determination chart comparing the count start hour to the sum of all traffic counts from working days in 2019. The morning peak hour was identified as 7:15 AM – 8:15 AM and the evening peak hour was determined to be 4:15 PM – 5:15 PM.

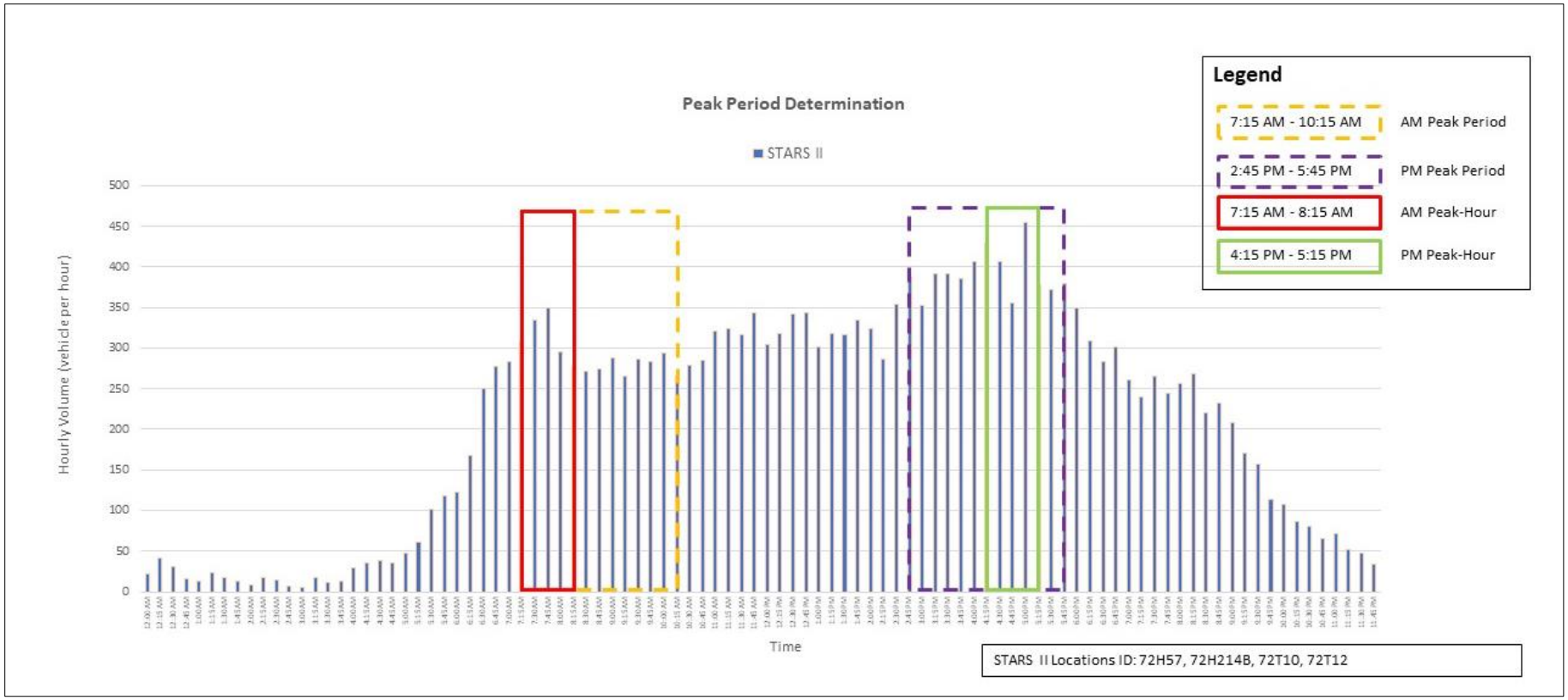


Figure 12: Morning and Afternoon Peak Hour and Peak Period on FM 76

Travel Time Data

The National Performance Management Research Data Set (NPMRDS) was used for obtaining recurring congestion which means the same type of congestion will occur regularly at the same time period during all working days. While limiting the analysis to the preset NPMRDS segment definitions and coverage, using NPMRDS allowed for more efficient analysis of disaggregate time periods and the analysis of the distribution of travel time observations throughout the year. The disaggregate travel time data enabled the congestion analysis presented in **Section 4**.

Summary of Traffic Data Acquisition

Table 4 summarizes the sources used for each data element developed and presented in this report. The ***Traffic Growth Rate Determination*** memorandum, data and analyses presented in this report, and stakeholder input to identify the existing and future performance of the corridor. In addition, the traffic counts and turning movement data presented within this report is vital in assessing multiple metrics for various corridor development and access management alternatives.

Table 4: TxDOT Historic Count Summary

Data Type	Source
Traffic Counts (AADT, Classification, TMCs)	STARS II, StreetLight Data
O-D Data	StreetLight Data
Travel Time Data	NPMRDS

4. Existing Year 2019 Traffic Conditions

After completing the data collection and synthesis detailed in **Section 3**, capacity analyses were prepared to illustrate the existing traffic conditions in the FM 76 corridor. The existing traffic conditions represent a typical workday when schools are in session.

Existing 2019 Traffic Volumes

The AADT volume for the existing year is obtained from the STARS II, which is the TCDS of TxDOT. A map of the TCDS location identifications (ID) with their 2019 AADT along FM 76 and other corridors in the study area vicinity are presented in **Figure 13.**

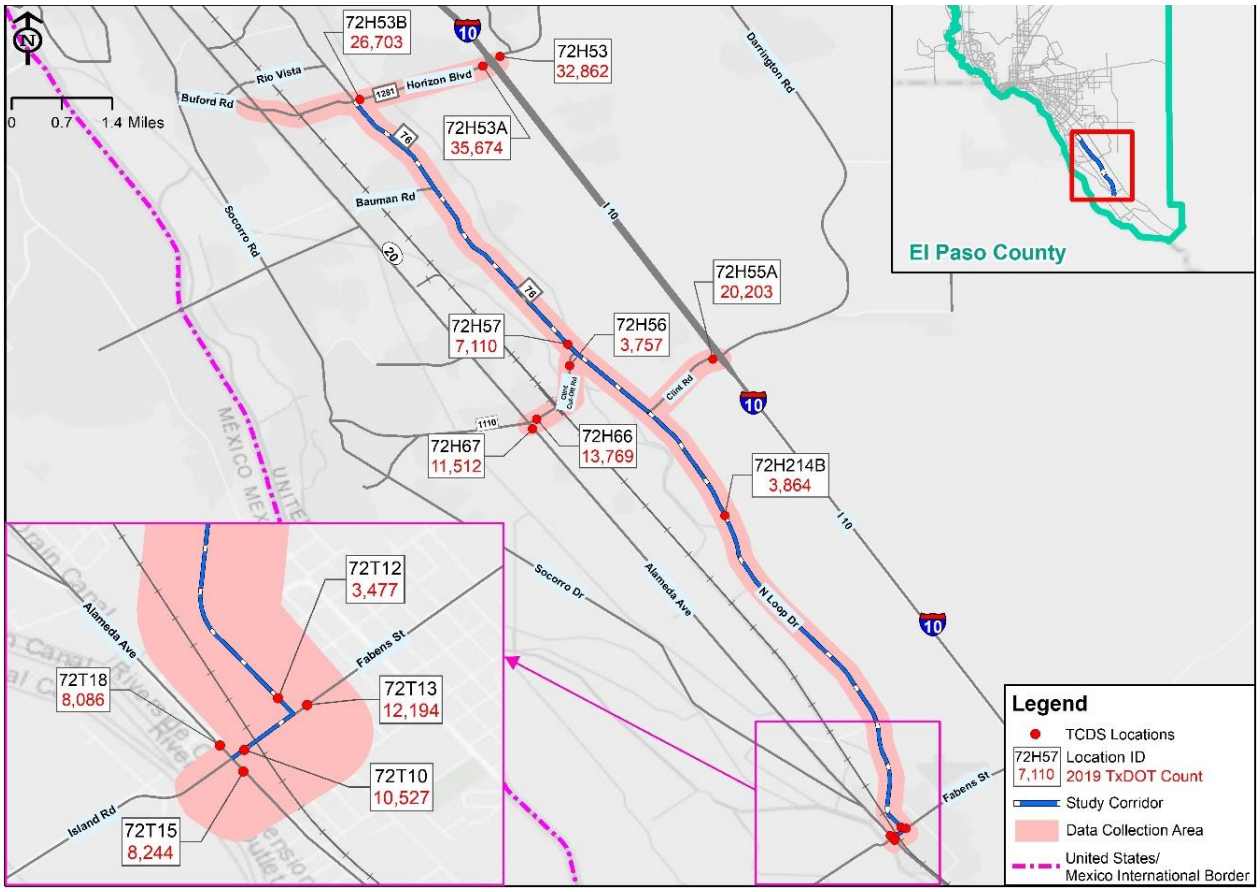


Figure 13: TCDS Locations Referenced for the Study

Considering STARS II data as reliable counted data, scaling factors were developed to adjust the TMC data. Existing 2019 peak hour traffic volumes at the key intersections on the FM 76 corridor are presented in a Straight Line Diagram (SLD) in **Appendix D.1.**

The vehicle classification data is available at one FM 76 location is presented in **Appendix D.2.**

Capacity and Level of Service Analysis for Existing 2019 Conditions

The capacity analysis was performed for the FM 76 corridor segments and for selected intersections (shown in **Table 2.2**) along the corridor within the study limits.

4.2.1 Measure of Effectiveness (MOE)

Level of service (LOS) is a qualitative measure of traffic operations, ranging from LOS A through LOS F. LOS A-C represents traffic ranging from free-flow conditions to stable flow conditions causing minor traffic flow disruptions. LOS D represents unstable traffic flow conditions with significantly reduced travel speeds. LOS E represents noticeable traffic congestion with travel demand approaching or at

roadway capacity and LOS F represents severe traffic congestion with travel demand exceeding roadway capacity causing stop-and-go traffic flow conditions.

4.2.1.1 Intersection MOE

The 2010 Highway Capacity Manual (HCM) provides measures of effectiveness used to determine level of service for signalized intersections, which are shown in **Table 5**. Level of service is determined using the average delay (in seconds per vehicle) for the intersections.

Table 5: Intersection LOS Criteria

LOS	Average Control Delay (second/vehicle)	Description
A	≤ 10	Very low vehicle delays, free traffic flow, signal progression extremely favorable, most vehicles arrive during given signal phase.
B	> 10 to ≤ 20	Good traffic flow, good signal progression, more vehicles stop and experience higher delays than for LOS A.
C	> 20 to ≤ 35	Stable traffic flow, fair signal progression, significant number of vehicles stop at signals.
D	>35 to ≤ 55	Noticeable traffic congestion, longer delays and unfavorable signal progression, many vehicles stop at signals.
E	>55 to ≤ 80	Unstable traffic flow, poor signal progression, significant congestion, traffic near Roadway capacity, frequent traffic signal cycle failures.
F	> 80	Unacceptable delay, extremely unstable flow, heavy congestion, traffic exceeds Roadway capacity, stop-and-go conditions.

Other measures of effectiveness (MOE) for intersections are as follows:

- Volume-Capacity (V/C) Ratio (unitless) – Indicates the amount of congestion for each lane group.
- 95th Percentile Queue Length (vehicles per lane) –Provides the appropriate storage length requirement of turn pocket.
- 95th Percentile Queue Storage Ratio (unitless) - It is the ratio of the predicted queue length to the available storage length.
- Control Delay (seconds per vehicle) – Control delay is used as the basis for determining LOS. Intersection control delay is generally computed as a weighted average of the average control delay for all lane groups based on the amount of volume within each lane group.

The traffic analysis software such as Synchro v.11 and Highway Capacity Software (HCS) was utilized to analyze the existing condition MOEs for signal-controlled and stop-controlled intersections respectively.

4.2.1.2 Segment MOE

In addition to intersections, segment level analysis was also conducted using HCS Streets module. As per HCM 2016 Chapter 18, a segment is defined as length of a roadway between two boundary points, where a control on the roadway through movement such as a stop-control on major approach or a signalized intersection would act as a boundary. Five segments were present on FM 76 corridor between Horizon Blvd and Alameda Ave. Corridor segments were analyzed using the two-lane highway analysis based on HCM 2010. The LOS criteria for two-lane highways are shown in **Table 6** adopted from HCM Exhibit 15-3.

Table 6: Level of Service Criteria for Segment Analysis

LOS	Percent Time Spent Following (%)
A	≤40
B	>40–55
C	>55–70
D	>70–85
E	>85
F	Demand exceeds capacity

Two-lane link analysis was performed for the project road segments using HCS and the performance MOEs are presented as Percent Time Spent Following (PTSF) and LOS. This provides the average percentage of travel time that vehicles must travel behind slower vehicles due to lack of passing oppurtunities. Lack of passing opportunities may be due to roadway geometry or opposing traffic.

4.2.2 Input Parameters

Table 7 displays the input parameter assumptions that were used in the corridor. Signal-controlled and two-way stop-controlled (TWSC) intersections in the corridor were analyzed utilizing single period peak-hour methodology compliant with the HCM.

Table 7: Synchro and HCS Input Parameter Assumptions

HCS Input Parameters	Model Coded Values	
	Signalized Intersection	TWSC
Duration	1 hour (peak hour)	1 hour (peak hour)
No. of Periods	N/A	N/A

HCS Input Parameters	Model Coded Values	
	Signalized Intersection	TWSC
Peak Hour Factor (PHF)	1	1
Volume/ Demand	Arrivals by 0.25 hours (12 periods for the entire peak period)	Arrivals by peak hour
Lane Width	12 ft	12 ft
Storage Length	Measured	Measured
Heavy Vehicles	1 hour (peak hour)	1 hour (peak hour)
Saturation Flow Rate	Default	Default
Grade	N/A	N/A
Arrival Type	3	3
Initial Queue	0	N/A
Detector	As per TSI Sheets	N/A
RTOR	0	N/A
Phasing and Timing	As per TSI Sheets	N/A
Lanes	Geometric Field Check Forms	Geometric Field Check Forms
Access Points	N/A	N/A
Optimization	Full Optimization conducted for 2040	N/A
Minimum Cycle	60 s	N/A
Maximum Cycle	120 s	N/A
Objective Function	Overall Delay	N/A
Optimized Parameters	Splits, Phasing Sequence	N/A
Interchanges and Alternative Intersections	N/A	N/A
Segments	N/A	N/A
Critical Headway	Default	As per HCM 2016, Chapter 20, Equation 20-30 and Exhibit 20-12
Follow-up Headway	Default	As per HCM 2016, Chapter 20, Equation 20-31 and Exhibit 20-13
Platoon factors and parameters	Default	N/A
Any Adjustments	Default	Default

4.2.3 Segments

For the segment analysis, the FM 76 corridor was broken down into 4 segments:

- Segment 1 is from FM 2181 to Clint Cut-Off Rd
- Segment 2 is from Clint Cut-Off Rd to Clint-San Elizario
- Segment 3 is from Clint-San Elizario to Camp St at Fabens Rd/Island Rd
- Segment 4 is from Fabens Rd/Island Rd to Island Rd at Alameda Ave

HCS results of the segment analysis is presented in **Table 8** and **Table 9** and illustrated in **Figure 14** and **Figure 15**. HCS output of the FM 76 corridor segment analysis for 2019 existing year is included in **Appendix D.3**. The segment analysis results shows that all the segments perform with LOS D or better except the segment of FM 76 (North Loop Dr) from Horizon Blvd to Clint Cut-Off Rd which is performing with LOS E in the PM peak hour.

Table 8: Segment Analysis Results for Existing Year 2019 AM Peak

Segment	From	To	Direction	Peak Hour Volume	Volume Capacity Ratio	Percent TimeSpent Following (%)	LOS
1	FM 76 (North Loop Dr) at Horizon Blvd	Clint Cut-Off Rd/FM 76 and FM 1110	SB	326	0.22	51.9	B
	Clint Cut-Off Rd/FM 76 and FM 1110	FM 76 (North Loop Dr) at Horizon Blvd	NB	945	0.60	82.4	D
2	Clint Cut-Off Rd/FM 76 and FM 1110	Clint-San Elizario (FM1110)	SB	496	0.32	64.9	C
	Clint-San Elizario (FM1110)	Clint Cut-Off Rd/FM 76 and FM 1110	NB	871	0.56	83.4	D
3	Clint-San Elizario (FM1110)	Camp St at Fabens Rd/Island Rd	SB	219	0.14	46.7	B
	Camp St at Fabens Rd/Island Rd	Clint San Elizario (FM1110)	NB	146	0.09	33.4	A
4	Camp St at Fabens Rd/Island Rd	Island Rd at Alameda Ave	SB	165	0.10	34.7	A
	Island Rd at Alameda Ave	Camp St at Fabens Rd/Island Rd	NB	293	0.19	53.5	B

Table 9: Segment Analysis Results for Existing Year 2019 PM Peak

Segment No.	From	To	Direction	Peak Hour Volume	Volume to Capacity Ratio	Percent TimeSpent Following (%)	LOS
1	FM 76 (North Loop Dr) at Horizon Blvd	Clint Cut-Off Rd/FM 76 and FM 1110	SB	1,055	0.67	88.1	E
	Clint Cut-Off Rd/FM 76 and FM 1110	FM 76 (North Loop Dr) at Horizon Blvd	NB	762	0.49	80.2	D
2	Clint Cut-Off Rd/FM 76 and FM 1110	Clint-San Elizario (FM1110)	SB	710	0.45	77.7	D
	Clint-San Elizario (FM1110)	Clint Cut-Off Rd/FM 76 and FM 1110	NB	517	0.33	66.6	C
3	Clint San Elizario (FM1110)	Camp St at Fabens Rd/Island Rd	SB	140	0.09	34.9	A
	Camp St at Fabens Rd/Island Rd	Clint-San Elizario (FM1110)	NB	139	0.09	34.7	A
4	Camp St at Fabens Rd/Island Rd	Island Rd at Alameda Ave	SB	368	0.23	59.2	C
	Island Rd at Alameda Ave	Camp St at Fabens Rd/Island Rd	NB	307	0.20	52.7	B

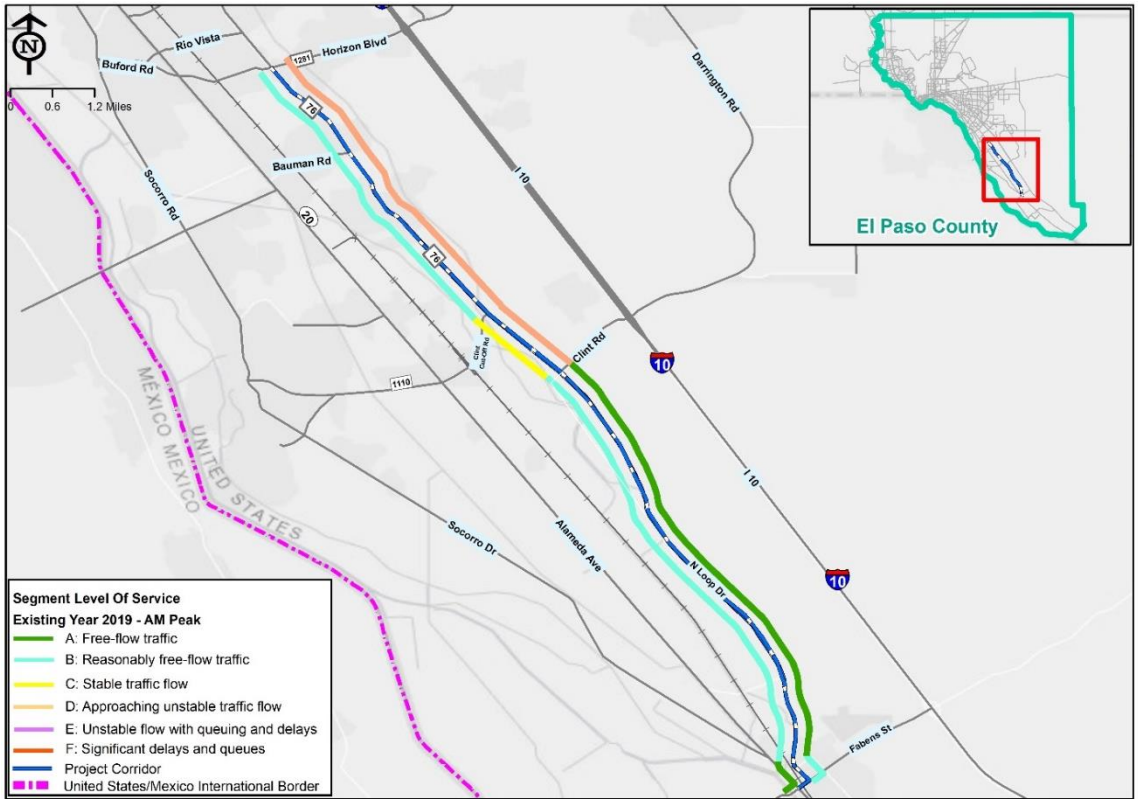


Figure 14: Segment LOS for Existing Year 2019 AM Peak

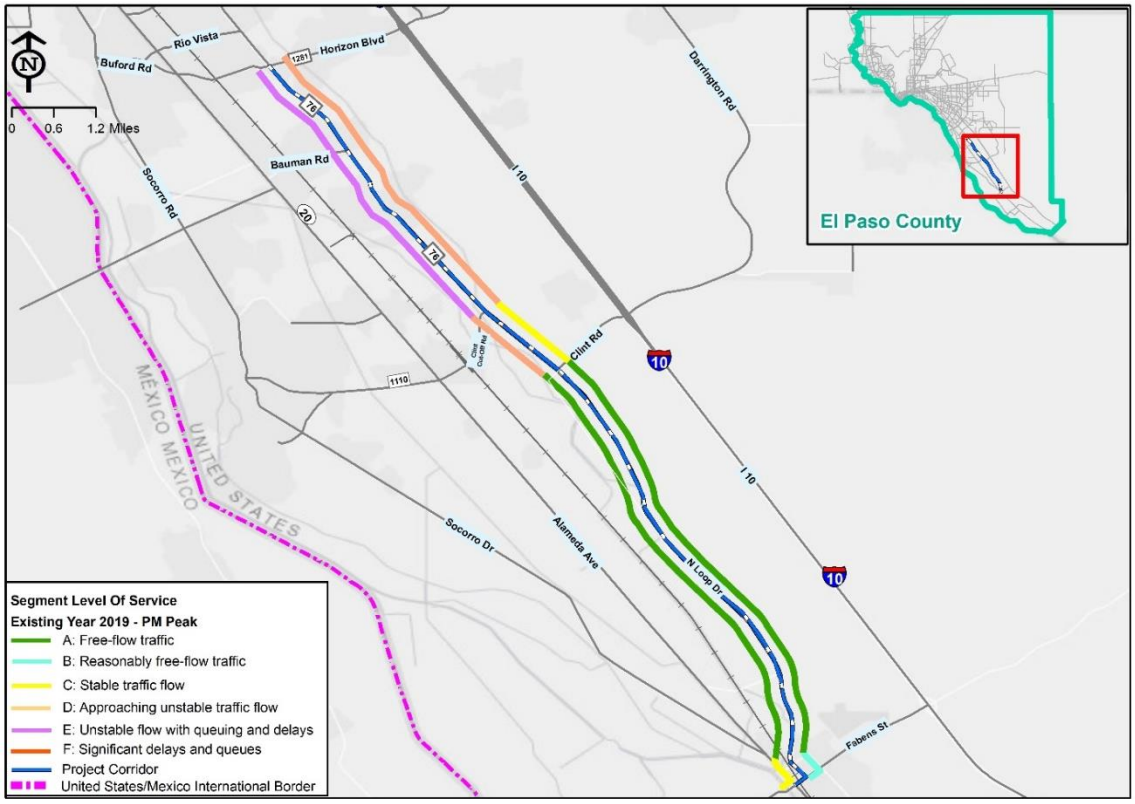


Figure 15: Segment LOS for Existing Year 2019 PM Peak

4.2.4 Intersections

The traffic analysis software Synchro v.11 was utilized to analyze the existing conditions at 5 signalized intersections along the FM 76 corridor. These 5 intersections include:

- FM 76 at FM 1281
- FM 76 at FM Clint Cut-Off Rd
- FM 76 at Clint-San Elizario
- Fabens Rd at Camp St
- Fabens Rd/Island Rd at Alameda Ave

The traffic counts in the AM (7:15 AM to 8:15 AM) and PM (4:15 PM to 5:15 PM) peak hours, existing geometry, and signal timings were coded into the Synchro software to develop a baseline of existing conditions.

The unsignalized intersections analysis were performed using the HCS software. If the resulting delay exceeded allowances in the HCS software, then the unsignalized intersection analysis were conducted using the Synchro software.

A summary of the intersection capacity analysis for the signalized and unsignalized intersections is shown in **Table 10**.

Table 10: Intersection Capacity Analysis Summary for Existing 2019 Conditions

Intersection No.	Intersection	Intersection Control	AM Peak Hour		PM Peak Hourr	
			Delay (s)	LOS	Delay (s)	LOS
1	FM 76 at Horizon Blvd	Signal	24.6	C	27.9	C
2	FM 76 at Milo Dr	Stop*	22.4	C	29	D
3	FM 76 at Sudan Dr	Stop*	24.5	C	24	C
4	FM 76 at Clems Rd	Stop*	19.9	C	18.9	C
5	FM 76 at Liahona Dr	Stop*	24.4	C	24.6	C
6	FM 76 at Sunhaven Dr	Stop*	14.9	B	17.1	C
7	FM 76 at Barnhart Dr	Stop*	27.0	D	22.8	C
8	FM 76 at McAdoo Dr	Stop*	15.6	C	16.1	C
9	FM 76 at Jewel Dr	Stop*	18.3	C	26.7	D

Intersection No.	Intersection	Intersection Control	AM Peak Hour		PM Peak Hourr	
			Delay (s)	LOS	Delay (s)	LOS
10	FM 76 at Bauman Rd	Stop*	39.5	E	28	D
11	FM 76 at Worsham Rd	Stop*	15.4	C	25.9	D
12	FM 76 at Wellettka Dr	Stop*	16.9	C	18.4	C
13	FM 76 at Hureque Dr	Stop*	18.6	C	14.5	B
14	FM 76 at Richardson Rd	Stop*	12.8	B	14.2	B
15	FM 76 at Rancho Viejo Dr	Stop*	11.8	B	13.9	B
16	FM 76 at Anderson Rd	Stop*	12.1	B	12.5	B
17	FM 76 at Young John St	Stop*	13.1	B	13.1	B
18	FM 76 at Estate Dr	Stop*	24.5	C	15.4	C
19	FM 76 at Pickard Rd	Stop*	11.1	B	11.6	B
20	FM 76 at Clint Cut-Off Rd	Signal	27	C	29.6	C
21	FM 76 at Fenter Rd	Stop*	26.7	D	15.8	C
22	Roberts Ranch Rd	Stop*	16.9	C	12.7	B
23	FM 76 at Celum Rd	Stop*	431.7	F	17.3	C
24	FM 76 at Clint-San Elizario	Signal	13.7	B	17.5	B
25	FM 76 at Porter Rebb Rd	Stop*	9.2	A	9.6	A
26	FM 76 at 5th St	Stop*	9.6	A	9.6	A
27	FM 76 at 3rd St	Stop*	10.6	B	10.7	B
28	FM 76 at 1st St	Stop*	10.4	B	10.5	B
29	Fabens Rd at Camp St	Signal	14.2	B	13.6	B
30	Fabens Rd at Bryan St	Stop*	13.4	B	14	B
31	Island Rd at Alameda Ave	Signal	9.8	A	11.2	B

*stop on the intersecting routes and not stop on FM 76

Note: For stop-controlled intersections delay and LOS shown are for approaches with maximum delay

The existing intersection analysis indicates that all the study intersections are operating at level of service D or better during both the AM and PM peak hours except FM 76 at Bauman Rd and FM 76 at Celum Rd which are performing with level of service E and F respectively during the AM peak hour. **Figure 16** and **Figure 17** presents the LOS for the signalized intersections on the FM 76 corridor for the existing year morning and evening peak hours.

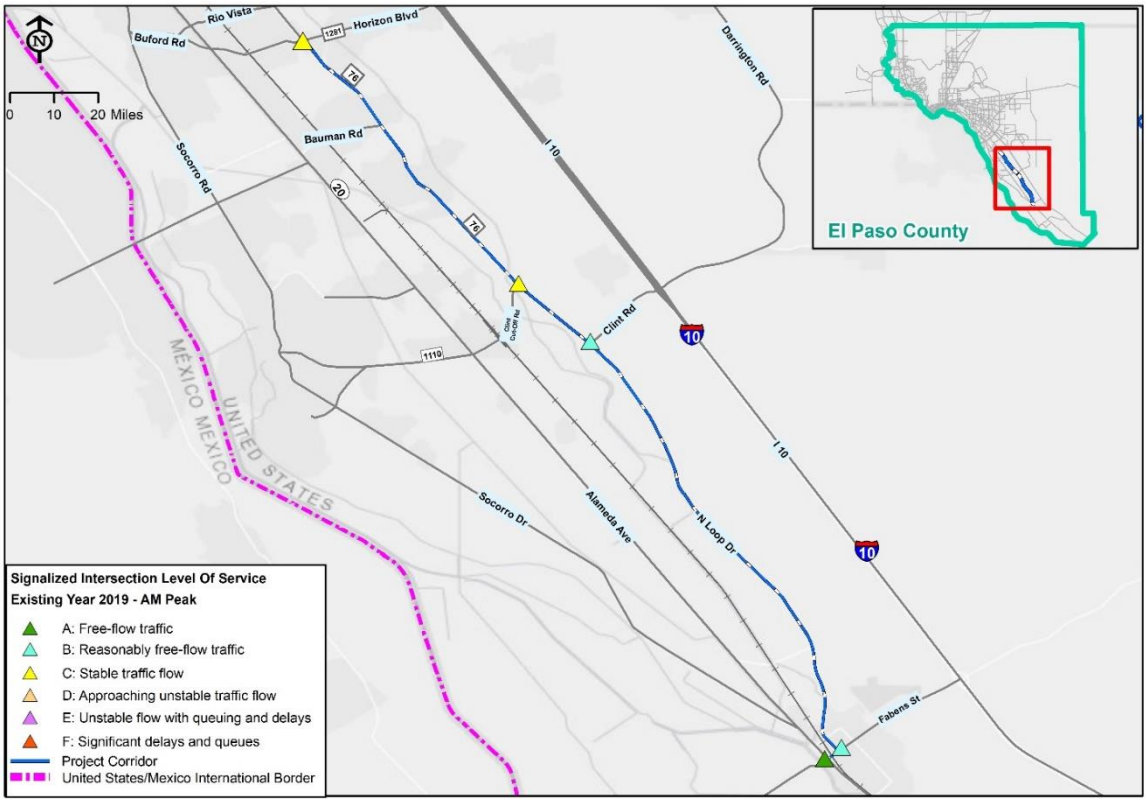


Figure 16: Signalized Intersection Level of Service For Existing Year 2019 AM Peak

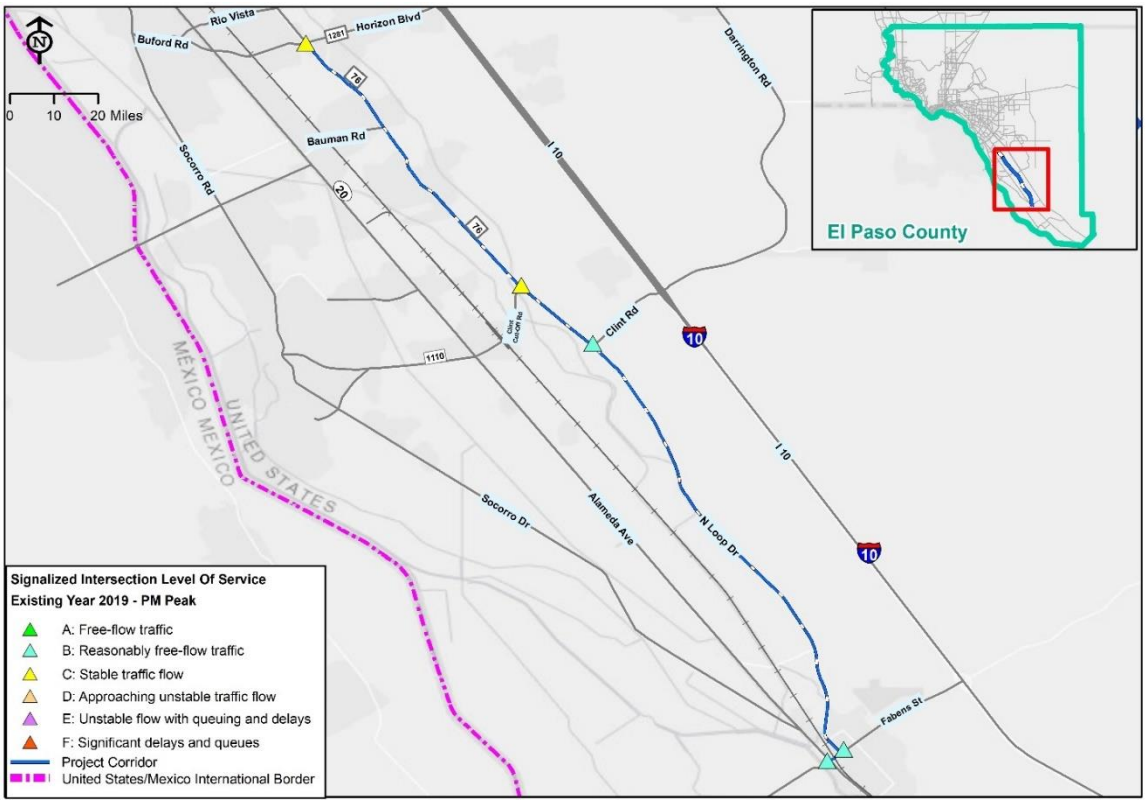


Figure 17: Signalized Intersection Level of Service for Existing Year 2019 PM Peak

Synchro (signalized and unsignalized intersections) and HCS outputs (TWSC) of the 2019 intersection capacity analysis are included in **Appendix D.3** and highlighted in the following subsections.

4.2.4.1 FM 76 at FM 1281 (Horizon Blvd)

FM 76 at FM 1281 is a 4-legged signalized intersection. The intersection layout is shown in **Figure 3**. The left-turn movements have a leading left-turn protected-permitted phasing.

Table 11 contains the Synchro output for the intersection MOEs for approaches and turning movements during the AM and PM peak hours. Except for the southbound left turn movement, results indicate queues do not exceed the available storage. None of the traffic movements operate at LOS F during the peak hours.

Table 11: Operation Analysis of FM 76 and FM 1281 Intersection – Existing 2019 Peak Hours

Peak Hour	Parameter	Eastbound			Westbound			Northbound			Southbound			Overall
		L	T	R	L	T	R	L	T	R	L	T	R	
AM	Inbound Volume (veh/hr)	194	344	35	86	379	233	141	518	218	128	92	106	-
	V/C Ratio	0.51	0.38	0.07	0.25	0.6	0.5	0.33	0.65	0.42	0.41	0.10	0.22	0.65
	Movement wise Delay (sec/veh)	23.6	30.5	0.2	20.3	38	8.2	19.7	35	6.5	19.8	24.5	4.6	24.6
	Approach Delay (sec/veh)	26.4			25.9			25.4			16.2			
	Movement wise LOS	C	C	A	C	D	A	B	C	A	B	C	A	C
	Approach LOS	C			C			C			B			
	Existing Storage Length (ft)	190	-	180	240	-	140	260	-	260	260	260	-	-
	Queue Length – 95th Percentile (ft)	159	168	0	76	190	65	104	241	58	95	45	31	-
PM	Inbound Volume (veh/hr)	210	416	131	196	358	257	65	295	166	363	426	266	-
	V/C Ratio	0.56	0.51	0.28	0.54	0.64	0.44	0.2	0.44	0.39	0.97	0.51	0.47	0.97
	Movement wise Delay (sec/veh)	21	28.9	5.4	22.6	33.9	7.7	18.8	31.6	7.4	64.7	31.1	6.5	27.9
	Approach Delay (sec/veh)	22.6			25.1			22.4			36.5			
	Movement wise LOS	C	C	A	C	C	A	B	C	A	E	C	A	C

Peak Hour	Parameter	Eastbound			Westbound			Northbound			Southbound			Overall
		L	T	R	L	T	R	L	T	R	L	T	R	
	Approach LOS	C			C			C			D			
	Existing Storage Length (ft)	190	-	180	240	-	140	260	-	260	260	-	260	-
	Queue Length – 95th Percentile (ft)	145	-	38	135	-	60	57	-	52	417	-	63	

4.2.4.2 FM 76 at Clint Cut-Off Rd

FM 76 at Clint Cut Off Rd is a 3-legged signalized intersection with a drive access on the fourth leg. The intersection layout is shown in **Figure 4**. The left-turn movements have a leading left-turn protected-permitted phasing.

Table 12 contains the Synchro output for the intersection MOEs for approaches and turn movements during the AM and PM peak hours. Northbound left turn queue exceeds the available storage in the morning peak hour. None of the traffic movements operate at LOS F during the peak hours.

Table 12: Operation Analysis of FM 76 and Clint Cut-Off Rd Intersection – Existing 2019 Peak Hours

Peak Hour	Parameter	Eastbound			Westbound			Northbound			Southbound			Overall
		L	T	R	L	T	R	L	T	R	L	T	R	
AM	Inbound Volume (veh/hr)	169	10	113	10	10	10	337	105	10	10	64	116	-
	V/C Ratio	-	0.67	-	-	0.15	-	0.68	0.18	-	0.05	0.53	-	0.68
	Movement wise Delay (sec/veh)	-	29.3	-	-	26	-	30.9	18.8	-	25.5	21.5	-	27
	Approach Delay (sec/veh)	29.3			26			27.8			21.7			
	Movement wise LOS	-	C	-	-	C	-	C	B	-	C	C	-	C
	Approach LOS	C			C			C			C			
	Existing Storage Length (ft)	-	-	-	-	-	-	100	-	-	100	-	-	-
	Queue Length – 95th Percentile (ft)	-	-	-	-	-	-	387	-	-	17	-	-	-
PM	Inbound Volume (veh/hr)	169	10	178	10	10	10	99	155	10	10	127	154	-
	V/C Ratio	-	0.73	-	-	0.16	-	0.23	0.29	-	0.04	0.7	-	0.73
	Movement wise Delay (sec/veh)	-	35.4	-	-	29.1	-	21.0	20.4	-	23.2	31	-	29.6

Peak Hour	Parameter	Eastbound			Westbound			Northbound			Southbound			Overall
		L	T	R	L	T	R	L	T	R	L	T	R	
	Approach Delay (sec/veh)	35.4			29.1			20.6			30.8			
	Movement wise LOS	-	D	-	-	C	-	C	C	-	C	C	-	C
	Approach LOS	D			C			C			C			
	Existing Storage Length (ft)	-	-	-	-	-	-	100	-	-	100	-	-	-
	Queue Length – 95th Percentile (ft)	-	-	-	-	-	-	88	-	-	16	-	-	

4.2.4.3 FM 76 at Clint-San Elizario

FM 76 at Clint-San Elizario is a 3-legged signalized intersection. the intersection layout is shown in **Figure 5**. The left-turn movements have a leading left-turn protected-permitted phasing.

Table 13 contains the Synchro output for the intersection MOEs for approaches and turn movements during the AM and PM peak hours. The southbound left turn queue exceeds the available storage. None of the traffic movements operate at LOS F during the peak hours.

Table 13: Operation Analysis of FM 76 and Clint-San Elizario Intersection – Existing 2019 Peak Hours

Peak Hour	Parameter	Eastbound			Westbound			Northbound			Southbound			Overall
		L	T	R	L	T	R	L	T	R	L	T	R	
AM	Inbound Volume (veh/hr)				29	-	826	-	45	59	445	51	-	-
	V/C Ratio				0.08	-	0.85	-	0.3	-	0.7	0.06	-	0.85

Peak Hour	Parameter	Eastbound			Westbound			Northbound			Southbound			Overall
		L	T	R	L	T	R	L	T	R	L	T	R	
	Movement wise Delay (sec/veh)				16.9	-	11.2	-	14.3	-	18.6	8.9	-	13.7
	Approach Delay (sec/veh)				11.4			14.3			17.6			
	Movement wise LOS				B	-	B	-	B	-	B	A	-	B
	Approach LOS				B			B			B			
	Existing Storage Length (ft)				110	-	-	-	-	-	130	-	-	-
	Queue Length – 95th Percentile (ft)				28	-	-	-	-	-	207	-	-	-
PM	Inbound Volume (veh/hr)				77	-	466	-	51	51	647	63	-	-
	V/C Ratio				0.28		0.73	-	0.30	-	0.85	0.07	-	0.85
	Movement wise Delay (sec/veh)				25.1		9.9		17.7	-	23.2	6.4	-	17.5
	Approach Delay (sec/veh)				12			17.7			21.7			
	Movement wise LOS				C	-	A	-	B	-	C	A	-	B
	Approach LOS				B			B			C			
	Existing Storage Length (ft)				110	-	-	-	-	-	130	-	-	-
	Queue Length – 95th Percentile (ft)				72	-	-	-	-	-	347	-	-	-

4.2.4.4 Fabens Rd at Camp St (FM 76)

Fabens Rd at Camp St is a 4-legged signalized intersection. The intersection layout is shown in **Figure 6**. The left-turn movements have a leading left-turn protected-permitted phasing.

Table 14 contains the Synchro output for the intersection MOEs for approaches and turn movements during the AM and PM peak hours. Turning movement queues do not exceed the available storage. None of the traffic movements operate at LOS F during the peak hours.

Table 14: Operation Analysis of Fabens Rd and Camp St Intersection – Existing 2019 Peak Hours

Peak Hour	Parameter	Eastbound			Westbound			Northbound			Southbound			Overall
		L	T	R	L	T	R	L	T	R	L	T	R	
AM	Inbound Volume (veh/hr)	22	213	10	128	131	29	10	73	66	27	81	14	-
	V/C Ratio	0.04	0.34	-	0.2	0.18	-	-	0.41	-	-	0.37	-	0.41
	Movement wise Delay (sec/veh)	6.9	16.8	-	7.8	10.6	-	-	15.9	-	-	19.9	-	14.2
	Approach Delay (sec/veh)	15.9			9.4			15.9			19.9			
	Movement wise LOS	A	B	-	A	B	-	-	B	-	-	B	-	B
	Approach LOS	B			A			B			B			
	Existing Storage Length (ft)	120	-	-	90	-	-	-	-	-	-	-	-	-
	Queue Length – 95th Percentile (ft)	12	-	-	44	-	-	-	-	-	-	-	-	-
PM	Inbound Volume (veh/hr)	44	232	13	41	240	66	28	29	62	45	36	39	-
	V/C Ratio	0.07	0.33	-	0.06	0.4	-	-	0.34	-	-	0.38	-	0.40
	Movement wise Delay (sec/veh)	5.9	14.9	-	5.3	13.6	-	-	12.9	-	-	17.5	-	13.6
	Approach Delay (sec/veh)	13.5			12.6			12.9			17.5			
	Movement wise LOS	A	B	-	A	B	-	-	B	-	-	B	-	B
	Approach LOS	B			B			B			B			
	Existing Storage Length (ft)	120	-	-	90	-	-	-	-	-	-	-	-	-
	Queue Length – 95th Percentile (ft)	19	-	-	18	-	-	-	-	-	-	-	-	-

4.2.4.5 Island Rd (FM 76) at Alameda Ave

Island Rd at Alameda Ave is a 4-legged signalized intersection. The intersection layout is shown in **Figure 7**. The left-turn movements have a leading left-turn protected-permitted phasing.

Table 15 contains the Synchro output for the intersection MOEs for approaches and turn movements during the AM and PM peak hours. Results indicate queues do not exceed the available storage. None of the traffic movements operate at LOS F during the peak hours.

Table 15: Operation Analysis of Island Rd and Alameda Ave Intersection – Existing 2019 Peak Hours

Peak Hour	Parameter	Eastbound			Westbound			Northbound			Southbound			Overall
		L	T	R	L	T	R	L	T	R	L	T	R	
AM	Inbound Volume (veh/hr)	10	61	10	66	28	71	11	103	110	122	102	10	-
	V/C Ratio	0.03	0.15	-	0.17	0.17	-	-	0.15	-	-	0.19	-	0.19
	Movement wise Delay (sec/veh)	7.9	13.8	-	8.9	6.5	-	-	7.6	-	-	12.5	-	9.8
	Approach Delay (sec/veh)	13.1			7.5			7.6			12.5			
	Movement wise LOS	A	B	-	A	A	-	-	A	-	-	B	-	A
	Approach LOS	B			A			A			B			
	Existing Storage Length (ft)	80	-	-	80	-	-	-	-	-	-	-	-	-
	Queue Length – 95th Percentile (ft)	8	42	-	28	28	-	-	35	-	-	55	-	-
PM	Inbound Volume (veh/hr)	20	48	10	157	46	165	10	123	137	122	155	17	-
	V/C Ratio	0.06	0.17	-	0.31	0.35	-	-	0.34	-	-	0.49	-	0.49
	Movement wise Delay (sec/veh)	9.1	15.3	-	10.9	6.2	-	-	8.5	-	-	16.8		11.2
	Approach Delay (sec/veh)	13.7			8.2			8.5			16.8			
	Movement wise LOS	A	B	-	B	A	-	-	A	-	-	B	-	B
	Approach LOS	B			A			A			B			
	Existing Storage Length (ft)	80	-	-	80	-	-	-	-	-	-	-	-	
	Queue Length – 95th Percentile (ft)	14	41	-	65	60	-	-	42	-	-	71	-	

4.2.4.6 Stop-Controlled Intersections

Most of the approaches at the stop-controlled intersections have one lane in each direction.

Table 16 presents the MOEs for existing year 2019 peak hour conditions. The MOEs indicates that all stop-controlled intersections will perform at LOS D or better except for the intersections FM 76 at Bauman Rd and FM 76 at Celum Rd which performs at LOS E and LOS F respectively during the AM peak hour and for the eastbound (EB) approach. FM 76 at Celum Rd has a V/C ratio greater than 1 and performing with LOS F which is not acceptable. Figure 16 and Figure 17 presents the LOS of stop-controlled intersections by approach for existing year 2019 peak hour conditions.

Table 16: Stop-Controlled Intersection Analysis MOE Results For Existing 2019 Peak Hour

Intersection No.	Intersection	Approach	MOE	AM	PM
2	FM 76 and Milo Dr	WB	V/C Ratio	0.25	0.48
			95% Queue Length, Q_{95} (veh)	1	2.7
			Control Delay (sec/veh)	22.4	29
			Level of Service (LOS)	C	D
		SB	V/C Ratio	0.01	0.05
			95% Queue Length, Q_{95} (veh)	0	0.1
			Control Delay (sec/veh)	9.9	8.5
			Level of Service (LOS)	A	A
3	FM 76 and Sudan Dr	WB	V/C Ratio	0.34	0.24
			95% Queue Length, Q_{95} (veh)	1.5	0.9
			Control Delay (sec/veh)	24.5	24
			Level of Service (LOS)	C	C
		SB	V/C Ratio	0.01	0.04
			95% Queue Length, Q_{95} (veh)	0	0.1
			Control Delay (sec/veh)	9.7	8.5
			Level of Service (LOS)	A	A
4	FM 76 and Clems Dr	WB	V/C Ratio	0.08	0.07
			95% Queue Length, Q_{95} (veh)	0.2	0.2
			Control Delay (sec/veh)	19.9	18.9
			Level of Service (LOS)	C	C
		SB	V/C Ratio	0.01	0.01

Intersection No.	Intersection	Approach	MOE	AM	PM
			95% Queue Length, Q_{95} (veh)	0	0
			Control Delay (sec/veh)	9.7	8.4
			Level of Service (LOS)	A	A
5	FM 76 and Liahona Dr	EB	V/C Ratio	0.32	0.21
			95% Queue Length, Q_{95} (veh)	1.4	0.8
			Control Delay (sec/veh)	24.4	24.6
			Level of Service (LOS)	C	C
		NB	V/C Ratio	0.01	0.01
			95% Queue Length, Q_{95} (veh)	0	0
			Control Delay (sec/veh)	7.9	9.2
			Level of Service (LOS)	A	A
6	FM 76 and Sunhaven Dr	EB	V/C Ratio	0.11	0.1
			95% Queue Length, Q_{95} (veh)	0.4	0.3
			Control Delay (sec/veh)	14.9	17.1
			Level of Service (LOS)	B	C
		NB	V/C Ratio	0.03	0.02
			95% Queue Length, Q_{95} (veh)	0.1	0.1
			Control Delay (sec/veh)	7.8	9.1
			Level of Service (LOS)	A	A
7	FM 76 and Barnhart Dr	EB	V/C Ratio	0.49	0.27
			95% Queue Length, Q_{95} (veh)	2.8	1.1
			Control Delay (sec/veh)	27	22.8
			Level of Service (LOS)	D	C
		NB	V/C Ratio	0.02	0.01
			95% Queue Length, Q_{95} (veh)	0.1	0
			Control Delay (sec/veh)	7.8	9.1
			Level of Service (LOS)	A	A
8	FM 76 and McAdoo Dr	WB	V/C Ratio	0.15	0.07
			95% Queue Length, Q_{95} (veh)	0.5	0.2
			Control Delay (sec/veh)	15.6	16.1
			Level of Service (LOS)	C	C
		SB	V/C Ratio	0.03	0.03
			95% Queue Length, Q_{95} (veh)	0.1	0.1
			Control Delay (sec/veh)	9.3	8.4
			Level of Service (LOS)	A	A
9		WB	V/C Ratio	0.18	0.31

Intersection No.	Intersection	Approach	MOE	AM	PM
	FM 76 and Jewel Dr		95% Queue Length, Q_{95} (veh)	0.7	1.3
			Control Delay (sec/veh)	18.3	26.7
			Level of Service (LOS)	C	D
		SB	V/C Ratio	0.01	0.03
			95% Queue Length, Q_{95} (veh)	0	0.1
			Control Delay (sec/veh)	9.1	8.5
			Level of Service (LOS)	A	A
10	FM 76 and Bauman Rd	EB	V/C Ratio	0.65	0.56
			95% Queue Length, Q_{95} (veh)	5.2	3.7
			Control Delay (sec/veh)	39.5	28
			Level of Service (LOS)	E	D
		NB	V/C Ratio	0.08	0.03
			95% Queue Length, Q_{95} (veh)	0.3	0.1
			Control Delay (sec/veh)	8.1	9.1
			Level of Service (LOS)	A	A
11	FM 76 and Worsham Rd	WB	V/C Ratio	0.2	0.35
			95% Queue Length, Q_{95} (veh)	0.8	1.6
			Control Delay (sec/veh)	15.4	25.9
			Level of Service (LOS)	C	D
		SB	V/C Ratio	0.01	0.05
			95% Queue Length, Q_{95} (veh)	0	0.1
			Control Delay (sec/veh)	8.7	8.2
			Level of Service (LOS)	A	A
12	FM 76 and Wellettka Dr	EB	V/C Ratio	0.27	0.19
			95% Queue Length, Q_{95} (veh)	1.1	0.7
			Control Delay (sec/veh)	16.9	18.4
			Level of Service (LOS)	C	C
		NB	V/C Ratio	0.02	0.03
			95% Queue Length, Q_{95} (veh)	0.1	0.1
			Control Delay (sec/veh)	7.7	8.9
			Level of Service (LOS)	A	A
13	FM 76 and Huereque Dr	EB	V/C Ratio	0.22	0.18
			95% Queue Length, Q_{95} (veh)	0.9	0.7
			Control Delay (sec/veh)	18.6	14.5
			Level of Service (LOS)	C	B
		NB	V/C Ratio	0.06	0.01

Intersection No.	Intersection	Approach	MOE	AM	PM
			95% Queue Length, Q_{95} (veh)	0.2	0
			Control Delay (sec/veh)	7.8	8.5
			Level of Service (LOS)	A	A
14	FM 76 and Richardson Rd	WB	V/C Ratio	0.11	0.05
			95% Queue Length, Q_{95} (veh)	0.4	0.2
			Control Delay (sec/veh)	12.8	14.2
			Level of Service (LOS)	B	B
		SB	V/C Ratio	0.01	0.05
			95% Queue Length, Q_{95} (veh)	0	0.2
			Control Delay (sec/veh)	8.5	8.2
			Level of Service (LOS)	A	A
15	FM 76 and Rancho Viejo Dr	EB	V/C Ratio	0.04	0.05
			95% Queue Length, Q_{95} (veh)	0.1	0.1
			Control Delay (sec/veh)	11.8	13.9
			Level of Service (LOS)	B	B
		NB	V/C Ratio	0.01	0.02
			95% Queue Length, Q_{95} (veh)	0	0.1
			Control Delay (sec/veh)	7.6	8.3
			Level of Service (LOS)	A	A
16	FM 76 and Anderson Rd	WB	V/C Ratio	0.12	0.06
			95% Queue Length, Q_{95} (veh)	0.4	0.2
			Control Delay (sec/veh)	12.1	12.5
			Level of Service (LOS)	B	B
		SB	V/C Ratio	0.01	0.01
			95% Queue Length, Q_{95} (veh)	0	0
			Control Delay (sec/veh)	8.3	8.2
			Level of Service (LOS)	A	A
17	FM 76 and Young John St	WB	V/C Ratio	0.2	0.06
			95% Queue Length, Q_{95} (veh)	0.7	0.2
			Control Delay (sec/veh)	13.1	13.1
			Level of Service (LOS)	B	B
		SB	V/C Ratio	0.01	0.02
			95% Queue Length, Q_{95} (veh)	0	0.1
			Control Delay (sec/veh)	8.2	8.1
			Level of Service (LOS)	A	A
18		EB	V/C Ratio	0.59	0.31

Intersection No.	Intersection	Approach	MOE	AM	PM
	FM 76 and Estate Dr		95% Queue Length, Q_{95} (veh)	4.1	1.4
			Control Delay (sec/veh)	24.5	15.4
			Level of Service (LOS)	C	C
		NB	V/C Ratio	0.16	0.06
			95% Queue Length, Q_{95} (veh)	0.6	0.2
			Control Delay (sec/veh)	8.2	8.3
			Level of Service (LOS)	A	A
19	FM 76 and Pickard Rd	WB	V/C Ratio	0.06	0.04
			95% Queue Length, Q_{95} (veh)	0.2	0.1
			Control Delay (sec/veh)	11.1	11.6
			Level of Service (LOS)	B	B
		SB	V/C Ratio	0.01	0.01
			95% Queue Length, Q_{95} (veh)	0	0
			Control Delay (sec/veh)	7.8	7.9
			Level of Service (LOS)	A	A
21	FM 76 and Fenter Rd	EB	V/C Ratio	0.64	0.49
			95% Queue Length, Q_{95} (veh)	5	2.8
			Control Delay (sec/veh)	26.7	15.8
			Level of Service (LOS)	D	C
		NB	V/C Ratio	0.19	0.13
			95% Queue Length, Q_{95} (veh)	0.7	0.4
			Control Delay (sec/veh)	8.2	8.3
			Level of Service (LOS)	A	A
22	FM 76 and Roberts Ranch Rd	WB	V/C Ratio	0.06	0.07
			95% Queue Length, Q_{95} (veh)	0.2	0.2
			Control Delay (sec/veh)	16.9	12.7
			Level of Service (LOS)	C	B
		SB	V/C Ratio	0.04	0.01
			95% Queue Length, Q_{95} (veh)	0.1	0
			Control Delay (sec/veh)	9	8
			Level of Service (LOS)	A	A
23	FM 76 and Celum Rd	EB	V/C Ratio	1.18	0.38
			95% Queue Length, Q_{95} (veh)	32.7	1.9
			Control Delay (sec/veh)	431.7	17.3
			Level of Service (LOS)	F	C
		NB	V/C Ratio	0.26	0.17

Intersection No.	Intersection	Approach	MOE	AM	PM
			95% Queue Length, Q_{95} (veh)	1	0.6
			Control Delay (sec/veh)	9	9.3
			Level of Service (LOS)	A	A
25	FM 76 and Porter Rebb Rd	EB	V/C Ratio	0.02	0.02
			95% Queue Length, Q_{95} (veh)	0.1	0.1
			Control Delay (sec/veh)	9.2	9.6
			Level of Service (LOS)	A	A
		NB	V/C Ratio	0.01	0.02
			95% Queue Length, Q_{95} (veh)	0	0.1
			Control Delay (sec/veh)	7.4	7.6
			Level of Service (LOS)	A	A
26	FM 76 and 5th St	WB	V/C Ratio	0.06	0.06
			95% Queue Length, Q_{95} (veh)	0.2	0.2
			Control Delay (sec/veh)	9.6	9.6
			Level of Service (LOS)	A	A
		SB	V/C Ratio	0.01	0.01
			95% Queue Length, Q_{95} (veh)	0	0
			Control Delay (sec/veh)	7.5	7.5
			Level of Service (LOS)	A	A
27	FM 76 and 3rd St	EB	V/C Ratio	0.08	0.11
			95% Queue Length, Q_{95} (veh)	0.3	0.4
			Control Delay (sec/veh)	10.6	10.6
			Level of Service (LOS)	B	B
		WB	V/C Ratio	0.05	0.06
			95% Queue Length, Q_{95} (veh)	0.2	0.2
			Control Delay (sec/veh)	10.4	10.7
			Level of Service (LOS)	B	B
		NB	V/C Ratio	0.01	0.01
			95% Queue Length, Q_{95} (veh)	0	0
			Control Delay (sec/veh)	7.5	7.5
			Level of Service (LOS)	A	A
		SB	V/C Ratio	0.01	0.01
			95% Queue Length, Q_{95} (veh)	0	0
			Control Delay (sec/veh)	7.4	7.5
			Level of Service (LOS)	A	A
28	FM 76 and 1st St	EB	V/C Ratio	0.04	0.04

Intersection No.	Intersection	Approach	MOE	AM	PM
			95% Queue Length, Q_{95} (veh)	0.1	0.1
			Control Delay (sec/veh)	10.3	10.4
			Level of Service (LOS)	B	B
		WB	V/C Ratio	0.04	0.04
			95% Queue Length, Q_{95} (veh)	0.1	0.1
			Control Delay (sec/veh)	10.4	10.5
			Level of Service (LOS)	B	B
		NB	V/C Ratio	0.01	0.01
			95% Queue Length, Q_{95} (veh)	0	0
			Control Delay (sec/veh)	7.5	7.5
			Level of Service (LOS)	A	A
		SB	V/C Ratio	0.01	0.01
			95% Queue Length, Q_{95} (veh)	0	0
			Control Delay (sec/veh)	7.5	7.5
			Level of Service (LOS)	A	A
30	FM 76 and Bryan St	WB	V/C Ratio	0.09	0.01
			95% Queue Length, Q_{95} (veh)	0.3	0
			Control Delay (sec/veh)	8.2	7.9
			Level of Service (LOS)	A	A
		SB	V/C Ratio	0.13	0.15
			95% Queue Length, Q_{95} (veh)	0.5	0.5
			Control Delay (sec/veh)	13.4	14
			Level of Service (LOS)	B	B

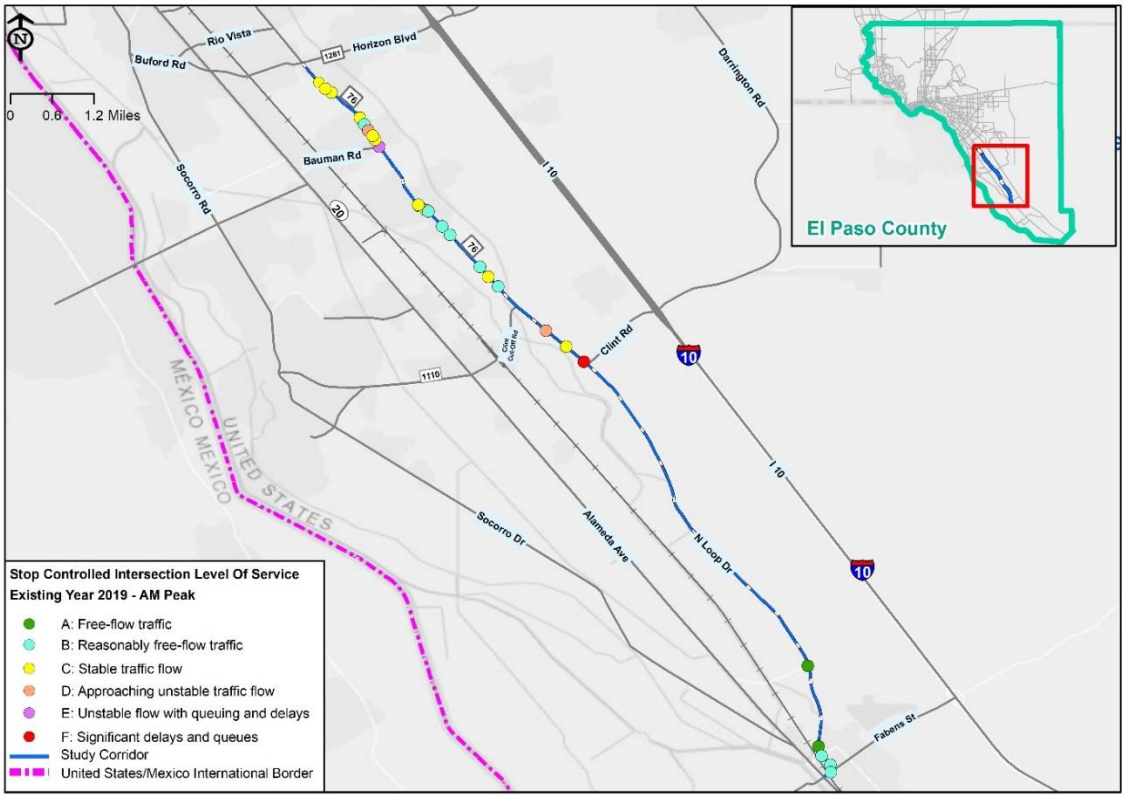


Figure 18: Stop-Controlled Intersection Level of Service for Existing Year 2019 AM Peak

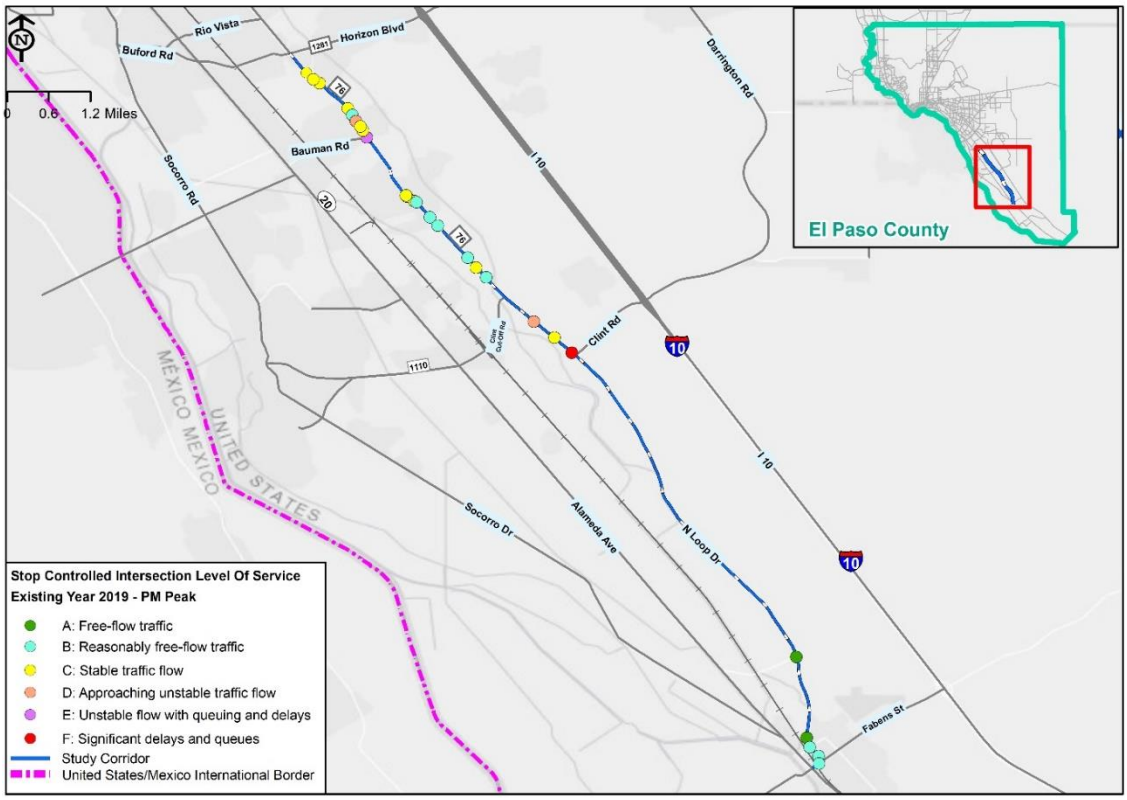


Figure 19: Stop-Controlled Intersection Level of Service for Existing Year 2019 PM Peak

Travel Speeds

While V/C ratio identifies roadways that may need expansion to accommodate traffic growth, congestion is more directly measured and categorized by utilizing travel times. Utilizing travel times from NPMRDS, congestion in the study area was quantified and categorized using the metric of Travel Time Index (TTI).

TTI quantifies congestion based on user experienced travel time for a given time interval. TTI is defined as the ratio between the observed travel time to free flow travel time, which represents the percentage increase in travel time compared to free flow conditions. The formula for TTI is presented below:

$$TTI = \frac{Observed\ Travel\ Time}{Free\ Flow\ Travel\ Time}$$

A TTI value greater that 1.33 indicates levels of congestion that affect reliability[2].

Figure 20 shows average TTI during the evening peak hour during periods of recurring congestion in the study area. The figure illustrates that the FM 76 corridor experiences moderate congestion near the intersections during the evening peak. And also from the intersection capacity analysis results, the intersections FM 76 at Bauman Rd and FM 76 at Celum Rd which performs at LOS E and LOS F respectively during the AM peak hour and for the eastbound (EB) approach were experience congestion.

[2] Transportation Research Board. (2016). *Highway Capacity Manual - A Guide for Multimodal Mobility Analysis (6th Edition) - 11.2.2.3 Travel Time Distribution and Reliability Performance Measures*. Transportation Research Board. Retrieved from https://app.knovel.com/hotlink/pdf/id:kt011AG0V1/highway-capacity-manual/travel-time-distribution

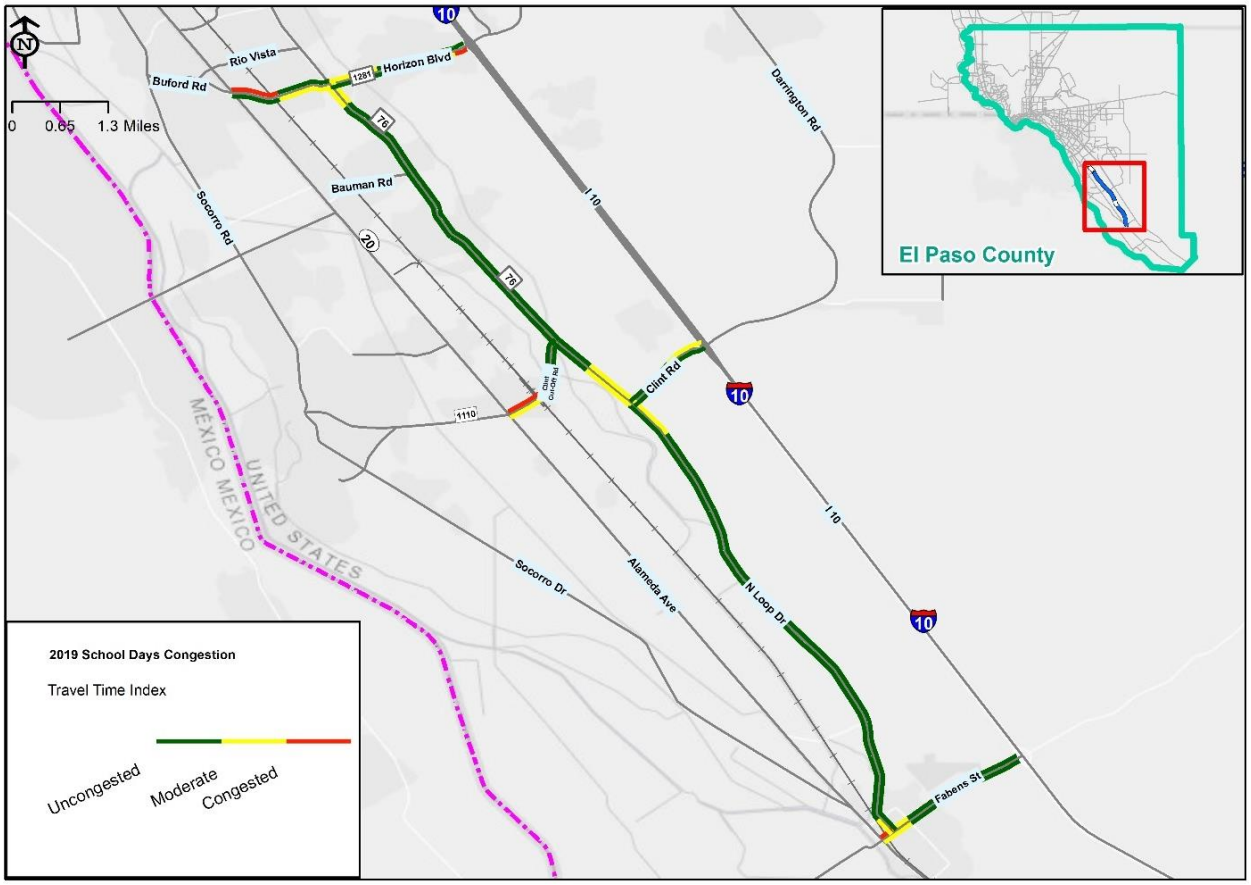


Figure 20: Recurring Congestion on FM 76 for Existing Year 2019 Evening Peak Hour

5. Future Year 2045 No-Build Traffic Conditions

The future year 2045 No-Build conditions represent the 2045 background projects including those E+C projects intersecting with the corridor or development projects such as Eastwind Ave (on SLDs as "New Road From Eastwind Development"). The Destino TDM also show additional connections to FM 76 to Interstate 10 and Alameda Ave. The analysis would not include projects in the vicinity of the corridor that are not intersecting the project as this is not a system level analysis but a corridor level analysis. Conditions with improvement alternatives will be presented in the subsequent submissions. The future year 2045 No-Build condition also facilitates comparison between improvement alternatives by establishing a baseline alternative.

Future Year (2045) No-Build Traffic Forecasts

Two previous submittals, the ***Methodology Report*** and the ***Growth Rate Determination Report***, present the traffic forecasting methodology and the future year (2045) traffic forecast for the No-Build conditions. Future year 2045 FM 76 traffic forecast for the No-Build conditions is obtained by combining the 2045 baseline and other development generated traffic. The baseline traffic is obtained by applying a linear growth rate. Development generated traffic is obtained from the

development trip generation. The most significant development affecting the corridor traffic in the future is the Eastwind Development. Other potential developments discussed affecting the study area, such as the proposed development along Darrington Rd north of Interstate 10, have not progressed far enough along in its development to be defined for this study. These other developments are accounted for in overall traffic growth rates developed for the 2045 No-Build condition.

Considering the available traffic data and traffic demand models for the study area, a linear growth rate of 2.6% up to 2039 and 2.0% thereafter have been recommended. Trip generation for the Eastwind Development has been estimated based on the approved Traffic Impact Study for the Eastwind Development which included the detailed land use and layout plan.

Peak hour future year 2045 No-Build traffic in the form of a line diagram is presented in **Appendix D.4**.

Capacity and Level of Service Analysis for Future 2045 No-Build Conditions

The future 2045 capacity analysis was performed for the FM 76 corridor segments and for selected intersections (shown in **Table 17**) along the corridor within the study limits.

5.2.1 Segments

FM 76 and Bauman Rd intersection has been approved for signalization in 2023. The segments considered for the analysis are updated as follows:

- Segment 1 is from FM 2181 to Bauman Rd
- Segment 2 is from Bauman Rd to Clint Cut-Off Rd
- Segment 3 is from Clint Cut-Off Rd to Clint-San Elizario
- Segment 4 is from Clint-San Elizario to Camp St at Fabens Rd/Island Rd
- Segment 5 is from Fabens Rd/Island Rd to Island Rd at Alameda Ave

The results of the segment analysis are presented in **Table 17** and

Table 18 and illustrated in Figure 21 and Figure 22. Operational issues were noted for the segment 1 (FM 76 between FM 1281 and Bauman Rd) during morning and evening peak hours.

Table 17: Segment Analysis Results for Future Year 2045 No-Build AM Peak

Segment No.	From	To	Direction	Peak Hour Volume	Volume to Capacity Ratio	Percent Time-Spent Following (%)	LOS
1	FM 76 (North Loop Dr) at Horizon Blvd	Bauman Rd	SB	1025	0.66	88.2	F
	Bauman Rd	FM 76 (North Loop Dr) at Horizon Blvd	NB	2075	1.33	100.0	F
2	Bauman Rd	Clint Cut-Off Rd/FM 76 and FM 1110	SB	850	0.54	83.6	F
	Clint Cut-Off Rd/FM 76 and FM 1110	Bauman Rd	NB	1625	1.04	96.2	F
3	Clint Cut-Off Rd/FM 76 and FM 1110	Clint-San Elizario (FM1110)	SB	825	0.53	83.0	D
	Clint-San Elizario (FM1110)	Clint Cut-Off Rd/FM 76 and FM 1110	NB	1425	0.91	93.8	E
4	Clint-San Elizario (FM1110)	Camp St at Fabens Rd/Island Rd	SB	400	0.26	62.0	C
	Camp St at Fabens Rd/Island Rd	Clint-San Elizario (FM1110)	NB	300	0.19	51.3	B
5	Camp St at Fabens Rd/Island Rd	Island Rd at Alameda Ave	SB	300	0.19	49.3	B
	Island Rd at Alameda Ave	Camp St at Fabens Rd/Island Rd	NB	500	0.32	67.3	C

Table 18: Segment Analysis Results for Future 2045 No-Build PM Peak

Segment No.	From	To	Direction	Future No-Build PM Peak - 2045			
				Peak Hour Volume	Volume to Capacity Ratio	Percent Time-Spent Following (%)	LOS
1	FM 76 (North Loop Dr) at Horizon Blvd	Bauman Rd	SB	2350	1.50	100.0	F
	Bauman Rd	FM 76 (North Loop Dr) at Horizon Blvd	NB	1925	1.23	98.7	F
2	Bauman Rd	Clint Cut-Off Rd/FM 76 and FM 1110	SB	1650	1.05	97.1	F
	Clint Cut-Off Rd/FM 76 and FM 1110	Bauman Rd	NB	1325	0.85	93.4	F
3	Clint Cut-Off Rd/FM 76 and FM 1110	Clint-San Elizario (FM1110)	SB	1175	0.75	90.3	E
	Clint-San Elizario (FM1110)	Clint Cut-Off Rd/FM 76 and FM 1110	NB	875	0.56	84.2	D
4	Clint-San Elizario (FM1110)	Camp St at Fabens Rd/Island Rd	SB	325	0.21	56.8	C
	Camp St at Fabens Rd/Island Rd	Clint-San Elizario (FM1110)	NB	300	0.19	53.4	B
5	Camp St at Fabens Rd/Island Rd	Island Rd at Alameda Ave	SB	600	0.38	73.3	D
	Island Rd at Alameda Ave	Camp St at Fabens Rd/Island Rd	NB	500	0.32	66.2	C

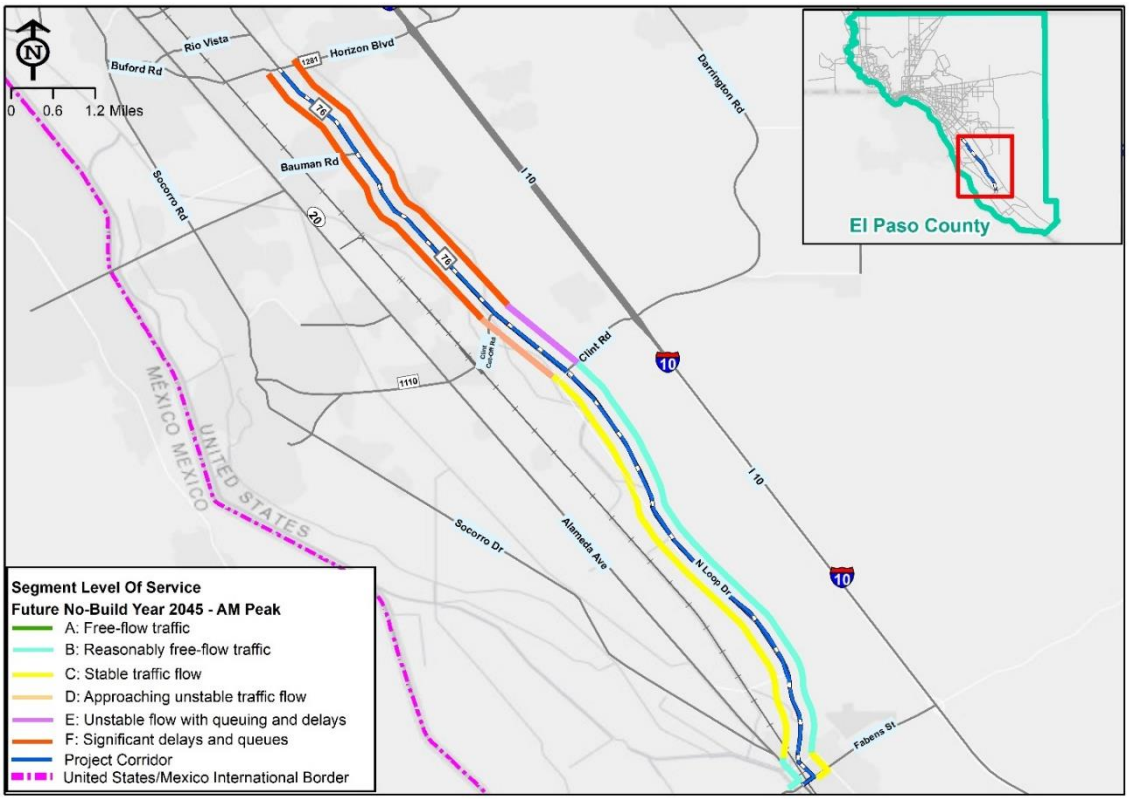


Figure 21: Segment LOS for Future Year 2045 No-Build AM Peak

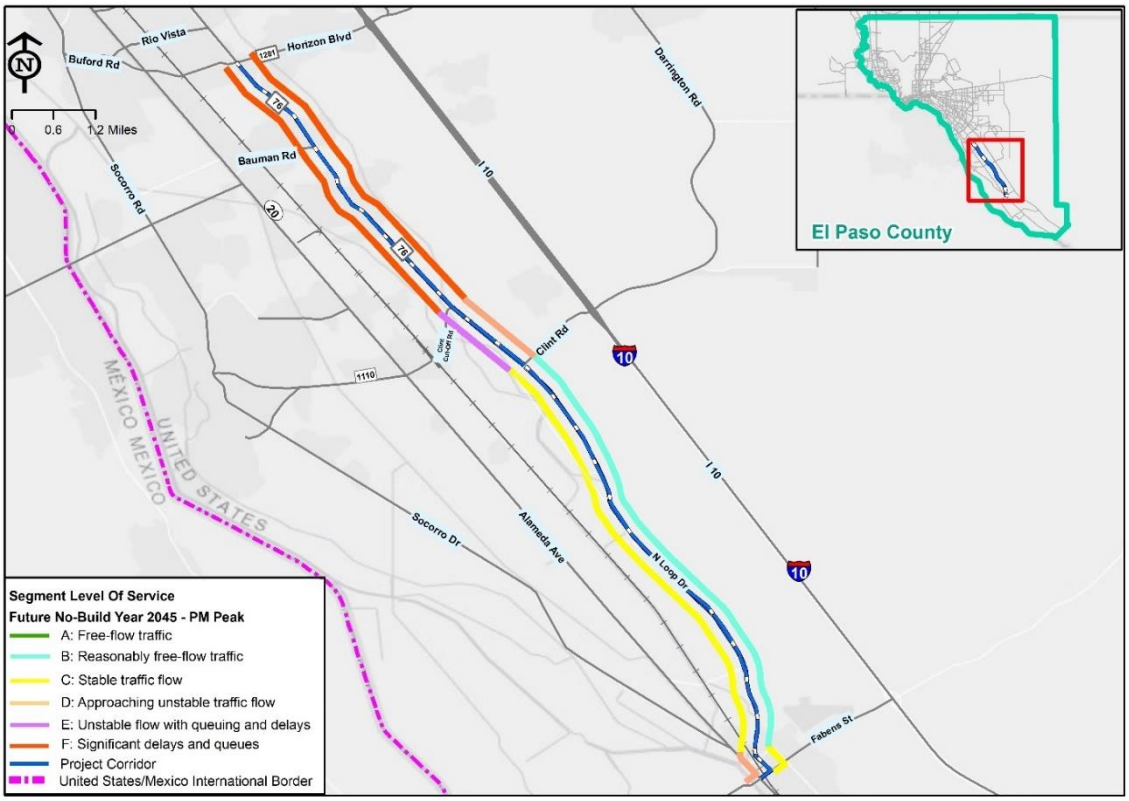


Figure 22: Segment LOS for Future Year 2045 No-Build PM Peak

Figure 23 and **Figure 24** illustrates the V/C ratio for the study corridor obtained from the El Paso Destino TDM. The Destino model shows higher V/C ratios in segment 1 of the FM 76 corridor for the 2045 conditions which indicate that the corridor traffic volume is approaching capacity.

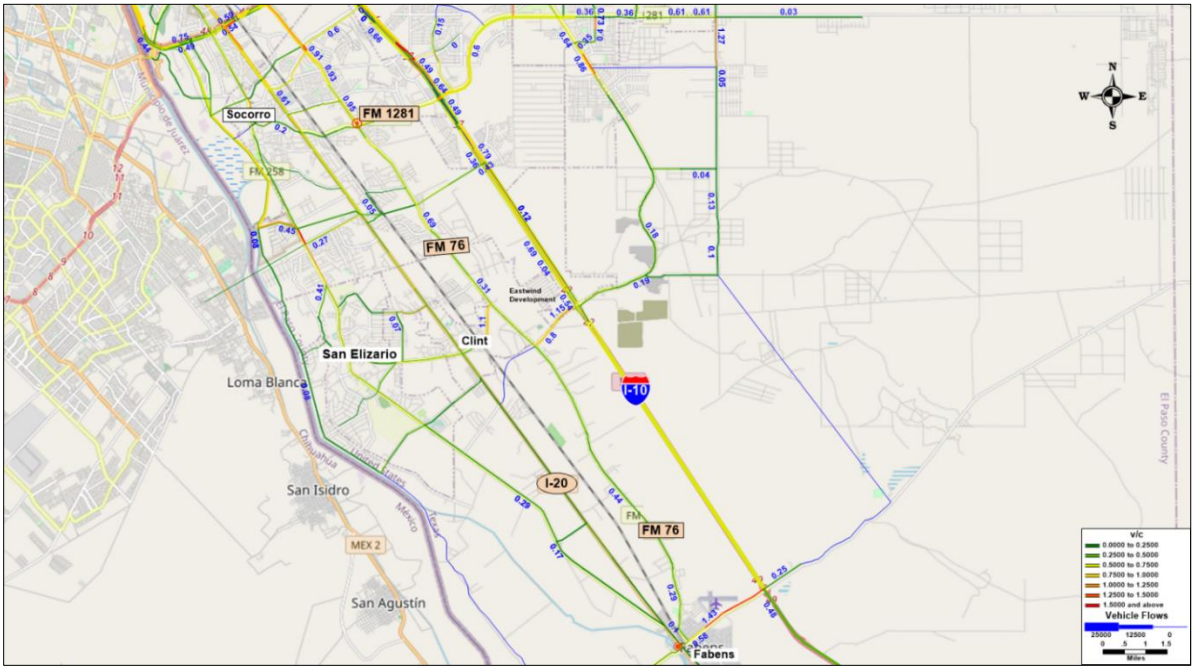


Figure 23: Volume-Capacity Ratio - Destino Model 2045 AM Peak

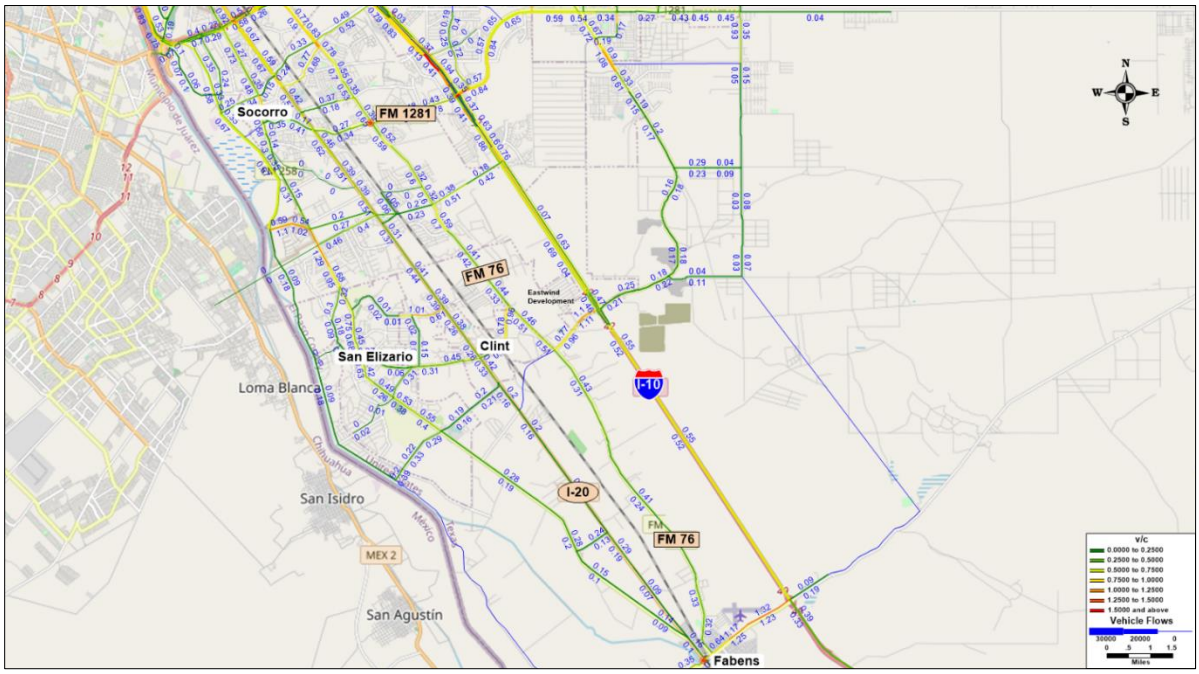


Figure 24: Volume-Capacity Ratio - Destino Model 2045 PM Peak

5.2.2 Intersections

The traffic analysis software Synchro v.11 and HCS were utilized to analyze the future 2045 No-Build conditions and measure the forecasted operations at the intersections along the FM 76 corridor. A summary of the intersection capacity analysis for the signalized and unsignalized intersections is shown in **Table 19**.

Table 19: Intersection Capacity Analysis Summary for Future Year 2045 Conditions

No.	Intersection	Intersection Control	AM Peak Hr		PM Peak Hr	
			Delay (s)	LOS	Delay (s)	LOS
1	FM 76 at Horizon Blvd	Signal	70.1	E	126.7	F
2	FM 76 at Milo Dr[1]	Stop*	420.6	F	626.5	F
3	FM 76 at Sudan Dr[1]	Stop*	653.9	F	626.5	F
4	FM 76 at Clems Rd[1]	Stop*	248.4	F	142.2	F
5	FM 76 at Liahona Dr[1]	Stop*	254.9	F	296.9	F
6	FM 76 at Sunhaven Dr[1]	Stop*	345.9	F	232.2	F
7	FM 76 at Barnhart Dr[1]	Stop*	1016.6	F	453.5	F
8	FM 76 at McAdoo Dr[1]	Stop*	449.6	F	229.6	F
9	FM 76 at Jewel Dr[1]	Stop*	360.9	F	382.3	F
10	FM 76 at Bauman Rd	Signal	261.4	F	583	F
11	FM 76 at Worsham Rd[1]	Stop*	63.5	F	575.5	F
12	FM 76 at Wellettka Dr[1]	Stop*	917.9	F	414.8	F
13	FM 76 at Hureque Dr[1]	Stop*	533.6	F	521.9	F
14	FM 76 at Richardson Rd[1]	Stop*	14.1	B	273.4	F
15	FM 76 at Rancho Viejo Dr[1]	Stop*	19.6	C	24.4	C
16	FM 76 at Anderson Rd[1]	Stop*	15	C	458.2	F
17	FM 76 at Young John[1] St	Stop*	1014.2	F	21.4	C
18	FM 76 at Estate Dr[1]	Stop*	2065.7	F	1077.3	F
19	FM 76 at Pickard Rd	Stop*	425.4	F	235.2	F
20	FM 76 at Clint Cut-off Rd	Signal	452.6	F	638.9	F
21	FM 76 at Fenter Rd[1]	Stop*	241.1	F	125.4	F
22	Roberts Ranch Rd	Stop*	55.1	F	25	D
23	FM 76 at Celum Rd[1]	Stop*	1926.7	F	94.6	F
24	FM 76 at Clint-San Elizario	Signal	138.1	F	47.2	D
25	FM 76 at Porter Rebb Rd	Stop*	10.5	B	11.7	B
26	FM 76 at 5th St	Stop*	13.6	B	13.3	B
27	FM 76 at 3rd St	Stop*	15.3	C	15.4	C
28	FM 76 at 1st St	Stop*	14.1	B	14.6	B
29	Fabens Rd at Camp St	Signal	27.6	C	29.7	C
30	Fabens Rd at Bryan St	Stop*	23.1	C	14	B
31	Fabens Rd at Alameda Ave	Signal	12.7	B	15.1	B

Note: For stop-controlled intersections delay and LOS shown are for approaches with maximum delay

*stop on the intersecting routes and not stop on FM 76

[1]Delay estimates using Synchro model

Figure 25 and **Figure 26** present the LOS for the intersections on FM 76 corridor for the future year 2045 morning and evening peak hours for No-Build conditions.

The 2045 No-Build intersection analysis indicates that the following signalized intersections in the study limits are forecasted to operate at LOS E or F with excessive delays.

- FM 76 and FM 1281
- FM 76 and Bauman Rd
- FM 76 and Clint Cut-Off Rd
- FM 76 and Clint-San Elizario

The remaining signalized intersections in Fabens are expected to operate at LOS C or better. Synchro and HCS outputs of the future year 2045 No-Build intersection capacity analysis are included in **Appendix D.5** and highlighted in the following sub sections.

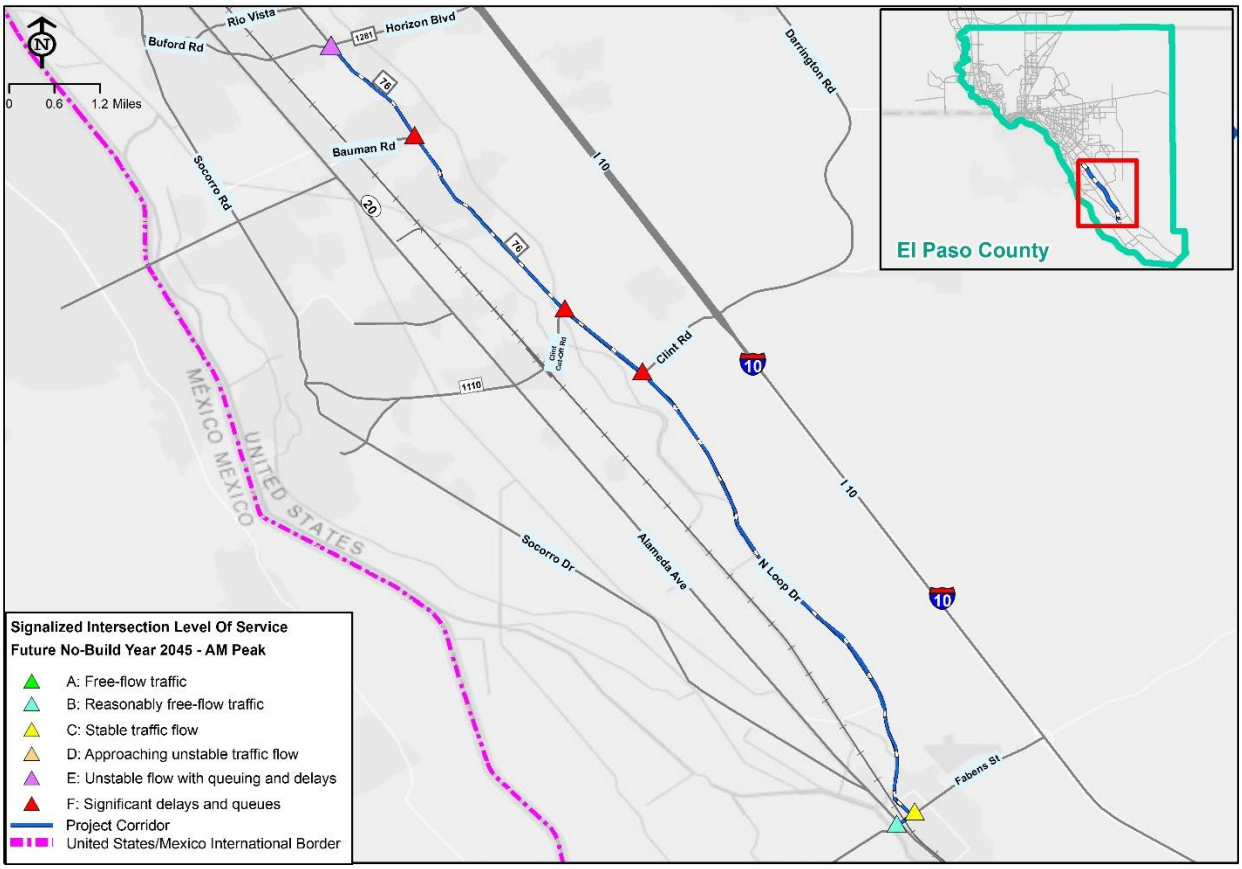


Figure 25: Signalized Intersection Level of Service for Future Year 2045 No-Build AM Peak

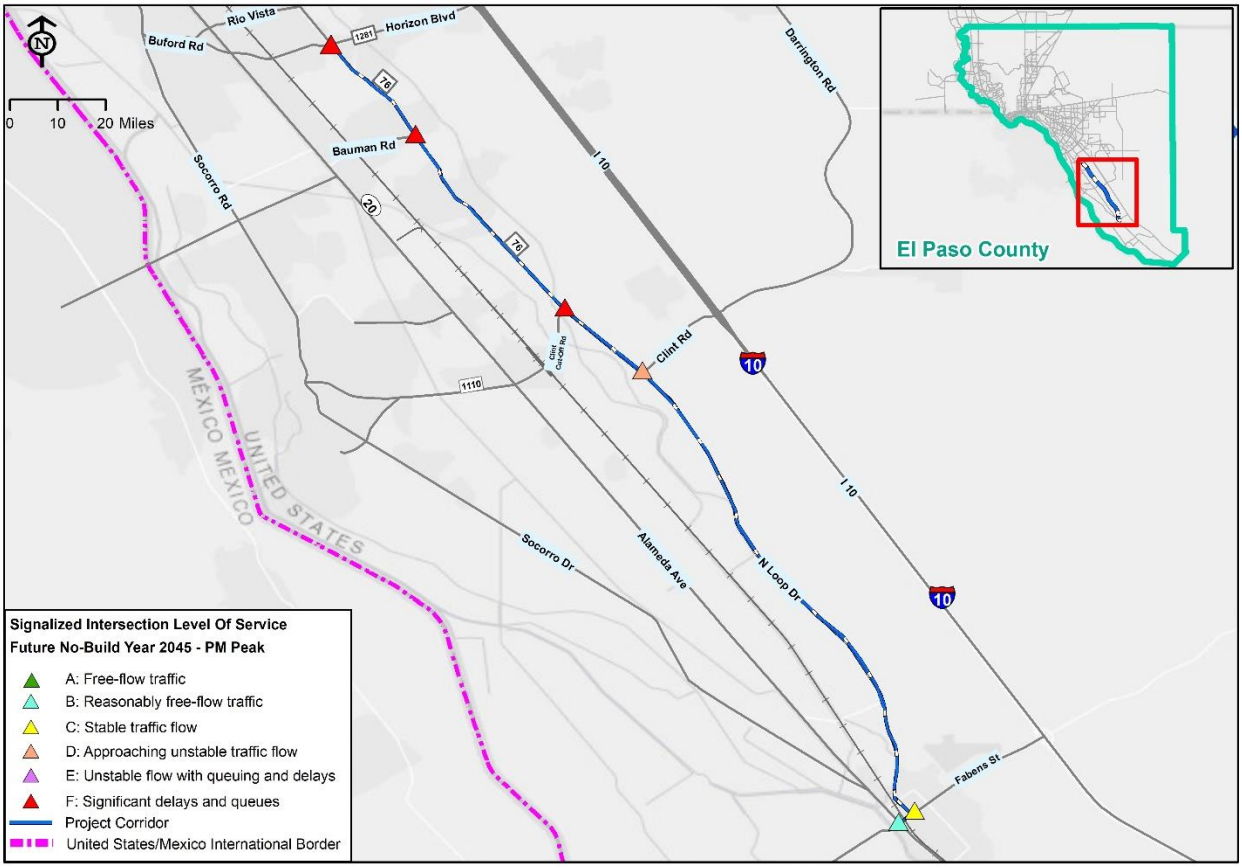


Figure 26: Signalized Intersection Level of Service for Future Year 2045 No-Build PM Peak

5.2.2.1 FM 76 at FM 1281 (Horizon Blvd)

Table 20 contains a summary of the Synchro output for the FM 76 at FM 1281 intersection during the AM and PM peak hours. The eastbound and westbound left, westbound right, and southbound left turn movements are projected to have 95th percentile queue that exceeds the available storage. The eastbound left, northbound through, westbound left and through, and southbound left turn movements are projected to operate at LOS F during the peak hours with excessive delays which will require mitigation.

Table 20: Operation Analysis of FM 76 and FM 1281 Intersection – Future No-Build 2045 Peak Hours

Peak Hour	Parameter	Eastbound			Westbound			Northbound			Southbound			Overall
		L	T	R	L	T	R	L	T	R	L	T	R	
AM	Inbound Volume (veh/hr)	325	575	75	150	625	375	225	1,375	350	200	650	175	-
	V/C Ratio	1.21	0.69	0.16	0.61	0.92	0.87	0.68	1.1	0.51	1.19	0.57	0.28	1.21
	Movement wise Delay (sec/veh)	160.2	52.9	0.6	40	74	51.2	29.7	95.9	15.4	161.2	40.7	5.5	70.1
	Approach Delay (sec/veh)	84.6			62.1			73.8			58.1			
	Movement wise LOS	F	D	A	D	E	D	C	F	B	F	D	A	E
	Approach LOS	F			E			E			E			
	Existing Storage Length (ft)	190	-	180	240	-	140	260	-	260	260	260	-	-
	Queue Length - 95th Percentile (ft)	561	-	0	158	446	417	185	978	203	375	364	55	-
PM	Inbound Volume (veh/hr)	350	675	225	350	575	425	100	1,150	275	600	1325	425	-
	V/C Ratio	1.56	0.93	0.51	1.56	1.01	0.65	0.81	1.27	0.53	1.64	0.95	0.55	1.64
	Movement wise Delay (sec/veh)	303.1	73.7	20	303.1	88.8	19.9	69.5	173.5	20.6	329.1	54.4	12.1	126.7
	Approach Delay (sec/veh)	128.2			128.7			139.1			116.9			
	Movement wise LOS	F	E	C	F	F	B	E	F	C	F	D	B	F
	Approach LOS	F									F			
	Existing Storage Length (ft)	190	-	180	240	-	140	260	-	260	260	-	260	-
	Queue Length - 95th Percentile (ft)	668	-	151	668	-	202	157	-	190	1,087	-	205	-

5.2.2.2 FM 76 at Bauman Rd

FM 76 at Bauman Rd is a 3-legged intersection which is approved for signalization in the year 2023. At this intersection, Bauman Rd is a two-lane undivided road. The northbound left movement is shared with the through movement as it has single lane configuration. The southbound movement has separate through and right turn pocket lane. Synchro analysis has been performed for this intersection for the future 2045 No-Build conditions.

Table 21 contains the Synchro output for the FM 76 at Bauman Rd intersection MOEs for approaches and turning movements during the AM and PM peak hours. All the traffic movements are projected to operate at LOS F during the peak hours with excessive delays which will require mitigation except for southbound during the AM peak hour which operates at LOS A.

Table 21: Operation Analysis of FM 76 and Bauman Rd Intersection – Future No-Build 2045 Peak Hours

Peak Hour	Parameter	Eastbound			Westbound			Northbound			Southbound			Overall
		L	T	R	L	T	R	L	T	R	L	T	R	
AM	Inbound Volume (veh/hr)	300	-	75				175	1,450	-	-	725	225	
	V/C Ratio	1.34	-	-				-	1.89	-	-	0.56	0.2	1.89
	Movement wise Delay (sec/veh)	210.9	-	-				-	422.2	-	-	8.1	0.8	261.4
	Approach Delay (sec/veh)	210.9						422.2			6.4			
	Movement wise LOS	F	-	-				-	F	-	-	A	A	F
	Approach LOS	F						F			A			
	Existing Storage Length (ft)	-	-	-				-	-	-	-	-	230	-
	Queue Length - 95th Percentile (ft)	-	-	-				-	-	-	-	-	18	-
PM	Inbound Volume (veh/hr)	175	-	125				50	1,275	-	-	1,475	275	-
	V/C Ratio	0.98	-	-				-	3.96	-	-	1.18	0.24	3.96
	Movement wise Delay (sec/veh)	83.5	-	-				-	-	-	-	105.3	1.3	583
	Approach Delay (sec/veh)	83.5						1,348			89.4			
	Movement wise LOS	F	-	-				-	F	-	-	F	-	F
	Approach LOS	F						F			F			
	Existing Storage Length (ft)	-	-	-				-	-	-	-	-	230	-
	Queue Length - 95th Percentile (ft)	-	-	-				-	-	-	-	-	28	-

5.2.2.3 FM 76 at Clint Cut-Off Rd

Table 22 contains a summary of the Synchro output for the FM 76 at Clint Cut-Off Rd intersection during the AM and PM peak hours. The northbound and southbound left movements are projected to have 95th percentile queue that exceed the available storage. All the traffic movements are projected to operate at LOS E or LOS F during the peak hours with excessive delays which will require mitigation.

Table 22: Operation Analysis of FM 76 and Clint Cut-Off Rd Intersection – Future No-Build 2045 Peak Hours

Peak Hour	Parameter	Eastbound			Westbound			Northbound			Southbound			Overall
		L	T	R	L	T	R	L	T	R	L	T	R	
AM	Inbound Volume (veh/hr)	275	425	200	25	300	550	525	175	25	525	100	200	-
	V/C Ratio	-	1.98	-	-	2.01	-	2.12	0.66	-	2.29	0.94	-	2.29
	Movement wise Delay (sec/veh)	-	477.4	-	-	491.3	-	547.7	66.2	-	621	85.2	-	452.6
	Approach Delay (sec/veh)	477.4			491.3			415.1			426.3			
	Movement wise LOS	-	F	-	-	F	-	F	E	-	F	F	-	F
	Approach LOS	F			F			F			F			
	Existing Storage Length (ft)	-	-	-	-	-	-	100	-	-	100	-	-	-
	Queue Length - 95th Percentile (ft)	-	-	-	-	-	-	288	-	-	1075	-	-	-
PM	Inbound Volume (veh/hr)	300	475	325	50	550	700	150	250	25	650	200	250	-
	V/C Ratio	-	2.49	-	-	2.66	-	1.26	1.12	-	2.87	1.3	-	2.87
	Movement wise Delay (sec/veh)	-	701.8	-	-	773.9	-	217.7	146.7	-	874.6	195.6	-	638.9
	Approach Delay (sec/veh)	701.8			773.9			171.8			597			
	Movement wise LOS	-	F	-	-	F	-	F	F	-	F	F	-	F
	Approach LOS	F			F			F			F			
	Existing Storage Length (ft)	-	-	-	-	-	-	100	-	-	100	-	-	-
	Queue Length - 95th Percentile (ft)	-	-	-	-	-	-	353	-	-	1391	-	-	-

5.2.2.4 FM 76 at Clint-San Elizario

Table 23 contains a summary of the Synchro output for the FM 76 at Clint-San Elizario intersection during the AM and PM peak hours. The northbound and southbound left movements are projected to have 95th percentile queue that exceed the available storage. All the traffic movements are projected to operate at LOS E or LOS F during the peak hours with excessive delays which will require mitigation.

Table 23: Operation Analysis of FM 76 and Clint-San Elizario Intersection – Future No-Build 2045 Peak Hours

Peak Hour	Parameter	Eastbound			Westbound			Northbound			Southbound			Overall
		L	T	R	L	T	R	L	T	R	L	T	R	
AM	Inbound Volume (veh/hr)				100	-	1350	-	75	150	750	75	-	-
	V/C Ratio				0.14	-	1.24	-	0.88	-	1.34	0.10	-	1.34
	Movement wise Delay (sec/veh)				25.3	-	129.3	-	73.4	-	200.1	21.1	-	138.1
	Approach Delay (sec/veh)				122.1			73.4			183.7			
	Movement wise LOS				C	-	F	-	E	-	F	C	-	F
	Approach LOS				F			E			F			
	Existing Storage Length (ft)				110	-	-	-	-	-	130	-	-	-
	Queue Length - 95th Percentile (ft)				102	-	-	-	-	-	1092	-	-	-
PM	Inbound Volume (veh/hr)				200	-	800	-	75	125	1050	125	-	
	V/C Ratio				0.75	-	0.88	-	0.80	-	1.07	0.10	-	1.07
	Movement wise Delay (sec/veh)				65.8	-	14.7	-	61.30	-	70.6	6.1		47.2
	Approach Delay (sec/veh)				24.9			61.3			63.8			
	Movement wise LOS				E	-	B	-	E	-	E	A	-	D
	Approach LOS				C			E			E			
	Existing Storage Length (ft)				110	-	-	-	-	-	130	-	-	-
	Queue Length - 95th Percentile (ft)				262	-	-	-	-	-	1202	-	-	-

5.2.2.5 Fabens Rd at Camp St (FM 76)

Table 24 contains a summary of the Synchro output for the Fabens Rd at Camp St intersection during the AM and PM peak hours. Only the westbound left movement in the morning peak hour is projected to have 95th percentile queue to exceed the available storage. All the traffic movements are projected to operate at LOS D or better during the peak hours with tolerable delays.

Table 24: Operation Analysis of Fabens Rd and Camp St Intersection – Future No-Build 2045 Peak Hours

Peak Hour	Parameter	Eastbound			Westbound			Northbound			Southbound			Overall
		L	T	R	L	T	R	L	T	R	L	T	R	
AM	Inbound Volume (veh/hr)	50	350	50	200	225	50	25	175	100	75	150	50	-
	V/C Ratio	0.11	0.80	-	0.62	0.47	-	-	0.66	-	-	0.78	-	0.80
	Movement wise Delay (sec/veh)	10.2	32.7	-	24.7	20.3	-	-	24.8	-	-	35.5	-	27.6
	Approach Delay (sec/veh)	30.2			22.2			24.8			35.5			
	Movement wise LOS	B	C	-	C	C	-	-	C	-	-	D	-	C
	Approach LOS	C			C			C			D			
	Existing Storage Length (ft)	120	-	-	90	-	-	-	-	-	-	-	-	-
	Queue Length - 95th Percentile (ft)	28	-	-	102	-	-	-	-	-	-	-	-	-
PM	Inbound Volume (veh/hr)	75	375	25	75	400	150	25	75	100	75	125	100	-
	V/C Ratio	0.33	0.71	-	0.18	0.88	-	-	0.46	-	-	0.77	-	0.88
	Movement wise Delay (sec/veh)	17.2	27.6	-	10.6	36.7	-	-	18.7	-	-	35.1	-	29.7
	Approach Delay (sec/veh)	25.9			33.6			18.7			35.1			
	Movement wise LOS	B	C	-	B	D	-	-	B	-	-	D	-	C
	Approach LOS	C			C			B			D			
	Existing Storage Length (ft)	120	-	-	90	-	-	-	-	-	-	-	-	-
	Queue Length - 95th Percentile (ft)	37	-	-	37	-	-	-	-	-	-	-	-	-

5.2.2.6 Island Rd (FM 76) at Alameda Ave

Table 25 contains a summary of the Synchro output for the Island Rd at Alameda Ave intersection during the AM and PM peak hours. Only the westbound left movement in evening peak hour is projected to have 95th percentile queue to exceed the available storage. All the traffic movements are projected to operate at LOS C or better during the peak hours with tolerable delays.

Table 25: Operation Analysis of Fabens Rd and Alameda Ave Intersection – Future No-Build 2045 Peak Hours

Peak Hour	Parameter	Eastbound			Westbound			Northbound			Southbound			Overall
		L	T	R	L	T	R	L	T	R	L	T	R	
AM	Inbound Volume (veh/hr)	25	125	25	100	75	125	25	175	175	200	175	25	-
	V/C Ratio	0.07	0.36	-	0.25	0.35	-	-	0.29	-	-	0.43	-	0.43
	Movement wise Delay (sec/veh)	10.9	19.6	-	12.5	10.2	-	-	8.1	-	-	15.8	-	12.7
	Approach Delay (sec/veh)	18.4			11.0			8.1			15.8			
	Movement wise LOS	B	B	-	B	B	-	-	A	-	-	B	-	B
	Approach LOS	B			B			A			B			
	Existing Storage Length (ft)	80	-	-	80	-	-	-	-	-	-	-	-	-
	Queue Length - 95th Percentile (ft)	18	-	-	52	-	-	-	-	-	-	-	-	-
PM	Inbound Volume (veh/hr)	25	75	25	275	75	250	25	200	225	200	250	25	-
	V/C Ratio	0.10	0.29	-	0.54	0.52	-	-	0.46	-	-	0.71	-	0.71
	Movement wise Delay (sec/veh)	12.3	20.2	-	17.3	9.2	-	-	9.0	-	-	22.7	-	15.1
	Approach Delay (sec/veh)	18.6			12.9			9.0			22.7			
	Movement wise LOS	B	C	-	B	A	-	-	A	-	-	C	-	B
	Approach LOS	B			B			A			C			
	Existing Storage Length (ft)	80	-	-	80	-	-	-	-	-	-	-	-	-
	Queue Length - 95th Percentile (ft)	18	-	-	131	-	-	-	-	-	-	-	-	-

5.2.2.7 Stop-Controlled Intersections

Table 26 presents the LOS and delay at the stop-controlled intersections for future year 2045 No-Build AM and PM peak hours. As noted from the table, several intersections are projected to operate with LOS F due to more delays and queues which require mitigation. Most of the intersections delay is due to congested crossroads where most of the approaches at the stop-controlled intersections will continue to have one lane in each direction in the future year 2045, and traffic is not able to enter or depart from FM 76. **Figure 27** and **Figure 28** presents the LOS of stop-controlled intersections for future year 2045 peak hour conditions.

Table 26: Stop-Controlled Intersection Analysis MOE Results for 2045 Future No-Build Peak Hours

Intersection No.	Intersection	Approach	MOE	AM	PM
2	FM 76 and Milo Dr[1]	WB	V/C Ratio	9.29	36.46
			95% Queue Length, Q_{95} (veh)	*	*
			Control Delay (sec/veh)	*	*
			Level of Service (LOS)	F	F
		SB	V/C Ratio	0.22	0.34
			95% Queue Length, Q_{95} (veh)	21	37
			Control Delay (sec/veh)	11.9	1.2
			Level of Service (LOS)	B	A
3	FM 76 and Sudan Dr[1]	WB	V/C Ratio	13.65	36.46
			95% Queue Length, Q_{95} (veh)	*	*
			Control Delay (sec/veh)	*	*
			Level of Service (LOS)	F	F
		SB	V/C Ratio	0.11	0.34
			95% Queue Length, Q_{95} (veh)	9	37
			Control Delay (sec/veh)	5.7	1.2
			Level of Service (LOS)	A	A
4	FM 76 and Clems Dr[1]	WB	V/C Ratio	3.56	6.86
			95% Queue Length, Q_{95} (veh)	*	*
			Control Delay (sec/veh)	*	*
			Level of Service (LOS)	F	F
		SB	V/C Ratio	0.1	0.14
			95% Queue Length, Q_{95} (veh)	9	12
			Control Delay (sec/veh)	6	0.4
			Level of Service (LOS)	A	A
5	FM 76 and Liahona Dr[1]	EB	V/C Ratio	4.21	15.88
			95% Queue Length, Q_{95} (veh)	*	*
			Control Delay (sec/veh)	*	*
			Level of Service (LOS)	F	F

Intersection No.	Intersection	Approach	MOE	AM	PM
		NB	V/C Ratio	0.04	0.10
			95% Queue Length, Q_{95} (veh)	3	8
			Control Delay (sec/veh)	0.1	19.6
			Level of Service (LOS)	A	C
6	FM 76 and Sunhaven Dr[1]	EB	V/C Ratio	4.84	5.21
			95% Queue Length, Q_{95} (veh)	*	*
			Control Delay (sec/veh)	*	*
			Level of Service (LOS)	F	F
		NB	V/C Ratio	0.12	0.09
			95% Queue Length, Q_{95} (veh)	10	7
			Control Delay (sec/veh)	0.4	18.2
			Level of Service (LOS)	A	C
7	FM 76 and Barnhart Dr[1]	EB	V/C Ratio	13	13.2
			95% Queue Length, Q_{95} (veh)	*	*
			Control Delay (sec/veh)	*	*
			Level of Service (LOS)	F	F
		NB	V/C Ratio	0.08	0.09
			95% Queue Length, Q_{95} (veh)	6	7
			Control Delay (sec/veh)	0.3	15.9
			Level of Service (LOS)	A	C
8	FM 76 and McAdoo Dr[1]	WB	V/C Ratio	4.74	5.09
			95% Queue Length, Q_{95} (veh)	*	*
			Control Delay (sec/veh)	*	*
			Level of Service (LOS)	F	F
		SB	V/C Ratio	0.17	0.19
			95% Queue Length, Q_{95} (veh)	15	18
			Control Delay (sec/veh)	8.1	0.7
			Level of Service (LOS)	A	A
9	FM 76 and Jewel Dr[1]	WB	V/C Ratio	4.49	16.66
			95% Queue Length, Q_{95} (veh)	*	*
			Control Delay (sec/veh)	*	*
			Level of Service (LOS)	F	F
		SB	V/C Ratio	0.17	0.13
			95% Queue Length, Q_{95} (veh)	15	11
			Control Delay (sec/veh)	7.9	0.4
			Level of Service (LOS)	A	A
11	FM 76 and Worsham Dr[1]	WB	V/C Ratio	2.96	15.64
			95% Queue Length, Q_{95} (veh)	427	*
			Control Delay (sec/veh)	1044.3	*

Intersection No.	Intersection	Approach	MOE	AM	PM
			Level of Service (LOS)	F	F
		SB	V/C Ratio	0.07	0.17
			95% Queue Length, Q_{95} (veh)	6	15
			Control Delay (sec/veh)	2.5	13.8
			Level of Service (LOS)	A	B
12	FM 76 and Wellettka Dr[1]	EB	V/C Ratio	5.6	9.99
			95% Queue Length, Q_{95} (veh)	*	*
			Control Delay (sec/veh)	*	*
			Level of Service (LOS)	F	F
		NB	V/C Ratio	0.04	0.24
			95% Queue Length, Q_{95} (veh)	3	23
			Control Delay (sec/veh)	3.1	18.9
			Level of Service (LOS)	A	C
13	FM 76 and Huereque Dr[1]	EB	V/C Ratio	5.13	6.18
			95% Queue Length, Q_{95} (veh)	*	*
			Control Delay (sec/veh)	*	*
			Level of Service (LOS)	F	F
		NB	V/C Ratio	0.21	0.07
			95% Queue Length, Q_{95} (veh)	20	5
			Control Delay (sec/veh)	11	4.7
			Level of Service (LOS)	B	A
14	FM 76 and Richardson Rd[1]	WB	V/C Ratio	1.34	5.04
			95% Queue Length, Q_{95} (veh)	209	*
			Control Delay (sec/veh)	306.8	*
			Level of Service (LOS)	F	F
		SB	V/C Ratio	0.06	0.21
			95% Queue Length, Q_{95} (veh)	5	20
			Control Delay (sec/veh)	2.1	13.9
			Level of Service (LOS)	A	B
15	FM 76 and Rancho Viejo Dr[1]	EB	V/C Ratio	1.56	2.42
			95% Queue Length, Q_{95} (veh)	231	172
			Control Delay (sec/veh)	412.2	1011.4
			Level of Service (LOS)	F	F
		NB	V/C Ratio	0.03	0.19
			95% Queue Length, Q_{95} (veh)	3	17
			Control Delay (sec/veh)	2.6	13.4
			Level of Service (LOS)	A	B
16	FM 76 and Anderson Rd[1]	WB	V/C Ratio	1.28	5.38
			95% Queue Length, Q_{95} (veh)	230	*

Intersection No.	Intersection	Approach	MOE	AM	PM
			Control Delay (sec/veh)	253.1	*
			Level of Service (LOS)	F	F
		SB	V/C Ratio	0.06	0.27
			95% Queue Length, Q_{95} (veh)	4	27
			Control Delay (sec/veh)	1.8	14.7
			Level of Service (LOS)	A	B
17	FM 76 and Young John St[1]	WB	V/C Ratio	3.73	1.89
			95% Queue Length, Q_{95} (veh)	*	210
			Control Delay (sec/veh)	*	623.7
			Level of Service (LOS)	F	F
		SB	V/C Ratio	0.1	0.11
			95% Queue Length, Q_{95} (veh)	9	9
			Control Delay (sec/veh)	3.1	8.2
			Level of Service (LOS)	A	A
18	FM 76 and Estate Dr[1]	EB	V/C Ratio	6.3	10.4
			95% Queue Length, Q_{95} (veh)	*	*
			Control Delay (sec/veh)	*	*
			Level of Service (LOS)	F	F
		NB	V/C Ratio	0.15	0.29
			95% Queue Length, Q_{95} (veh)	13	29
			Control Delay (sec/veh)	4.4	14.3
			Level of Service (LOS)	A	B
19	FM 76 and Pickard Rd	WB	V/C Ratio	1.1	0.82
			95% Queue Length, Q_{95} (veh)	14.7	6.3
			Control Delay (sec/veh)	425.4	235.2
			Level of Service (LOS)	F	F
		SB	V/C Ratio	0.07	0.04
			95% Queue Length, Q_{95} (veh)	0.2	0.1
			Control Delay (sec/veh)	10.5	11.7
			Level of Service (LOS)	B	B
21	FM 76 and Fenter Rd[1]	EB	V/C Ratio	2.62	1.8
			95% Queue Length, Q_{95} (veh)	1162	975
			Control Delay (sec/veh)	780.6	401
			Level of Service (LOS)	F	F
		NB	V/C Ratio	0.34	0.36
			95% Queue Length, Q_{95} (veh)	39	42
			Control Delay (sec/veh)	6.5	7.8
			Level of Service (LOS)	A	A
22		WB	V/C Ratio	0.41	0.46

Intersection No.	Intersection	Approach	MOE	AM	PM
	FM 76 and Roberts Ranch Rd		95% Queue Length, Q_{95} (veh)	2	2.4
			Control Delay (sec/veh)	55.1	25
			Level of Service (LOS)	F	D
		SB	V/C Ratio	0.12	0.03
			95% Queue Length, Q_{95} (veh)	0.4	0.1
			Control Delay (sec/veh)	11.4	8.8
			Level of Service (LOS)	B	A
23	FM 76 and Celum Rd[1]	EB	V/C Ratio	16.44	2.24
			95% Queue Length, Q_{95} (veh)	*	678
			Control Delay (sec/veh)	*	631.5
			Level of Service (LOS)	F	F
		NB	V/C Ratio	0.57	0.49
			95% Queue Length, Q_{95} (veh)	94	68
			Control Delay (sec/veh)	13.8	13.2
			Level of Service (LOS)	B	B
25	FM 76 and Porter Robb Rd	EB	V/C Ratio	0.1	0.08
			95% Queue Length, Q_{95} (veh)	0.3	0.3
			Control Delay (sec/veh)	10.5	11.7
			Level of Service (LOS)	B	B
		NB	V/C Ratio	0.04	0.04
			95% Queue Length, Q_{95} (veh)	0.1	0.1
			Control Delay (sec/veh)	7.6	8
			Level of Service (LOS)	A	A
26	FM 76 and 5th St	WB	V/C Ratio	0.23	0.19
			95% Queue Length, Q_{95} (veh)	0.9	0.7
			Control Delay (sec/veh)	13.6	13.3
			Level of Service (LOS)	B	B
		SB	V/C Ratio	0.04	0.04
			95% Queue Length, Q_{95} (veh)	0.1	0.1
			Control Delay (sec/veh)	7.9	7.9
			Level of Service (LOS)	A	A
27	FM 76 and 3rd St	EB	V/C Ratio	0.3	0.23
			95% Queue Length, Q_{95} (veh)	1.3	0.9
			Control Delay (sec/veh)	15.3	13.4
			Level of Service (LOS)	C	B
		WB	V/C Ratio	0.17	0.22
			95% Queue Length, Q_{95} (veh)	0.6	0.9
			Control Delay (sec/veh)	15.1	15.4
			Level of Service (LOS)	C	C

Intersection No.	Intersection	Approach	MOE	AM	PM
		NB	V/C Ratio	0.04	0.02
			95% Queue Length, Q_{95} (veh)	0.1	0.1
			Control Delay (sec/veh)	7.7	7.8
			Level of Service (LOS)	A	A
		SB	V/C Ratio	0.04	0.02
			95% Queue Length, Q_{95} (veh)	0.1	0.1
			Control Delay (sec/veh)	7.8	7.8
			Level of Service (LOS)	A	A
28	FM 76 and 1st St	EB	V/C Ratio	0.16	0.17
			95% Queue Length, Q_{95} (veh)	0.6	0.6
			Control Delay (sec/veh)	14.1	14.6
			Level of Service (LOS)	B	B
		WB	V/C Ratio	0.16	0.17
			95% Queue Length, Q_{95} (veh)	0.6	0.6
			Control Delay (sec/veh)	14.1	14.6
			Level of Service (LOS)	B	B
		NB	V/C Ratio	0.02	0.02
			95% Queue Length, Q_{95} (veh)	0.1	0.1
			Control Delay (sec/veh)	7.8	7.8
			Level of Service (LOS)	A	A
		SB	V/C Ratio	0.02	0.02
			95% Queue Length, Q_{95} (veh)	0.1	0.1
			Control Delay (sec/veh)	7.8	7.8
			Level of Service (LOS)	A	A
30	FM 76 and Bryan St	WB	V/C Ratio	0.09	0.01
			95% Queue Length, Q_{95} (veh)	0.3	0
			Control Delay (sec/veh)	8.7	7.9
			Level of Service (LOS)	A	A
		SB	V/C Ratio	0.39	0.15
			95% Queue Length, Q_{95} (veh)	1.9	0.5
			Control Delay (sec/veh)	23.1	14
			Level of Service (LOS)	C	B

** indicate excessive values due to intersection demand exceeding capacity*

[1]Delay estimates using Synchro model

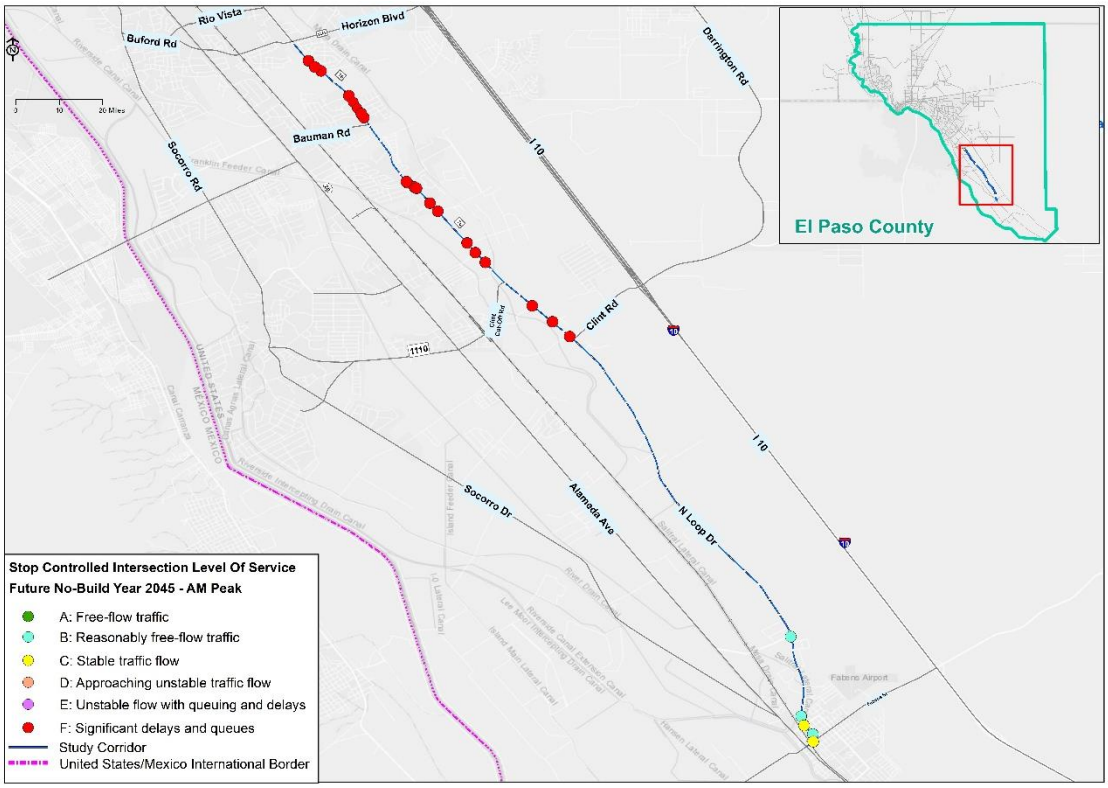


Figure 27: Stop-Controlled Intersection Level of Service for Future Year 2045 No-Build AM Peak

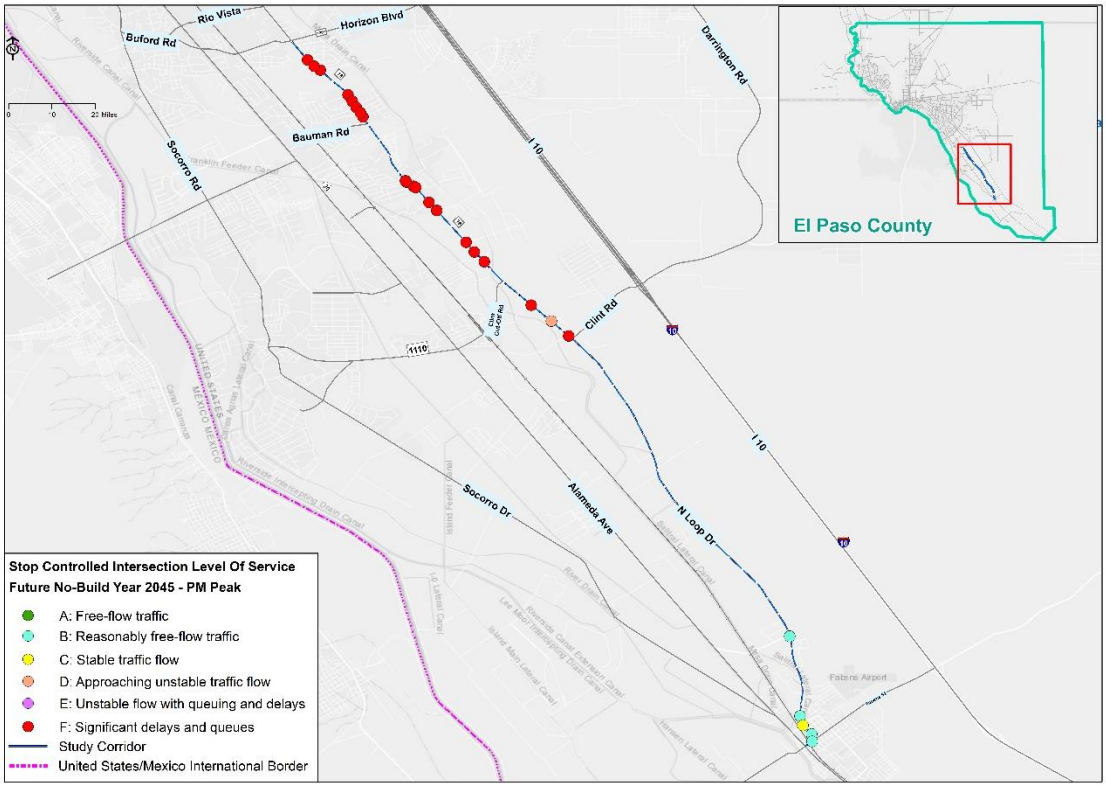
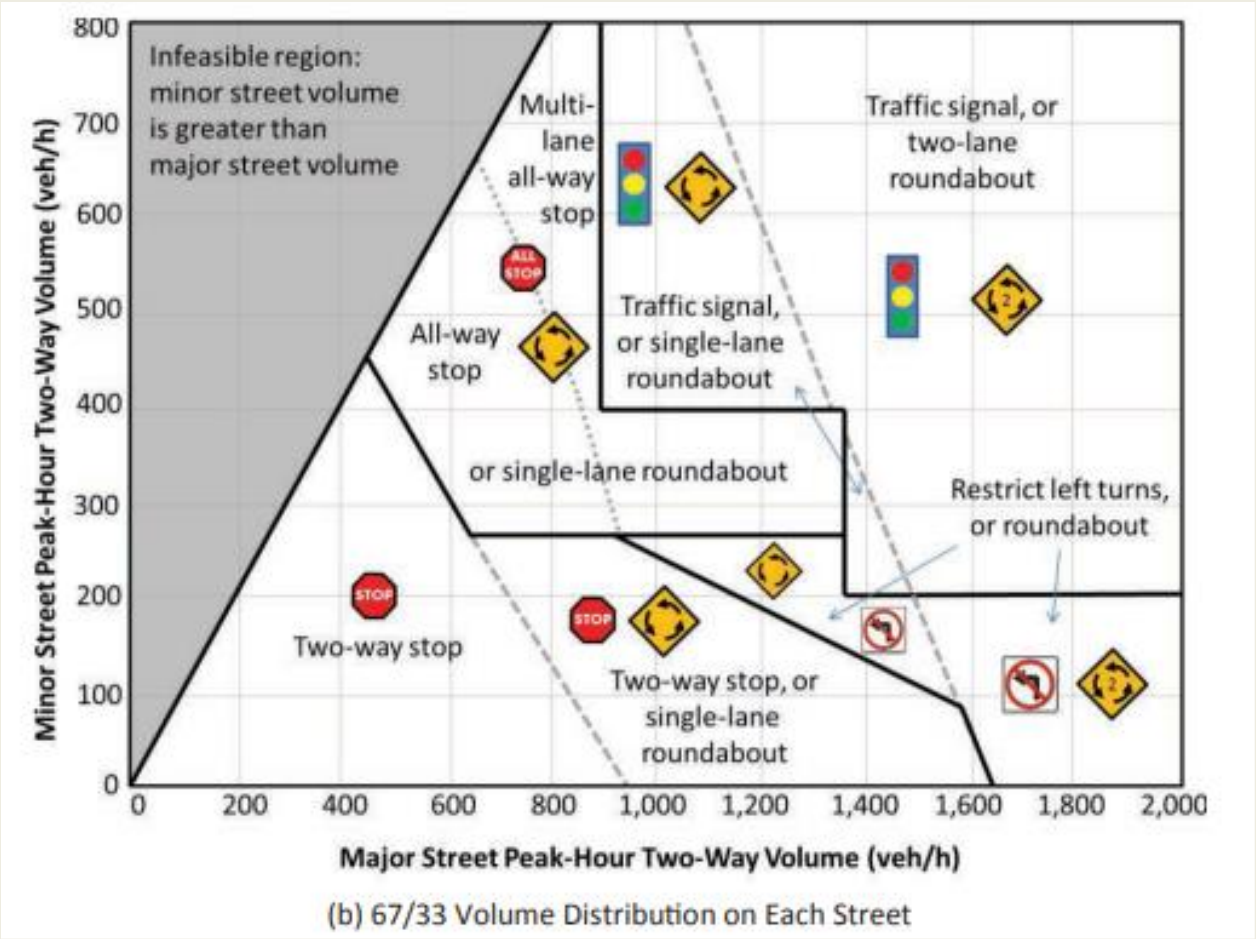


Figure 28: Stop-Controlled Intersection Level of Service for Future Year 2045 No-Build PM Peak

5.2.2.8 Intersection Control Type for Stop-controlled Intersections

Based on the LOS and delay estimates at the stop-controlled intersections for future year 2045 No-Build AM and PM peak hours, the study team identified the type of future intersection traffic control for stop-controlled intersections with high peak hour delays. The *Planning and Preliminary Engineering Applications Guide to the Highway Capacity Manual (NCHRP Report 825), Exhibit 17* is used to determine the likely future intersection traffic control at stop-controlled intersections. **Figure 29** shows a graphical representation of the NCHRP 825 guideline for intersection control and **Table 27** presents the NCHRP 825 suggested intersection control type for stop-controlled intersections in 2045.

Most of the recommendations are to consider a traffic signal / roundabout or to restrict left turns at the intersections. It is not recommended to signalize all these but to evaluate a feasible and coordinated corridor with a combination of signalization/roundabouts and access management.



Source: Planning and Preliminary Engineering Applications Guide to the Highway Capacity Manual (NCHRP Report 825)

Figure 29: Intersection Control type by peak hour volume

Table 27: Suggested Control Type for Stop-controlled Intersections in 2045

Intersection No.	Intersection Name	Existing Control Type	2045 Peak Hour two-way volume (Veh/h)				Suggested Control Type
			AM		PM		
			Major Street	Minor Street	Major Street	Minor Street	
2	FM 76 at Milo Dr	Stop*	2875	275	3375	425	Consider potential traffic signal/ roundabout or restrict left turn lanes
3	FM 76 at Sudan Dr	Stop*	2875	275	3375	250	Consider potential traffic signal/ roundabout or restrict left turn lanes
4	FM 76 at Clems Rd	Stop*	2950	125	3425	125	Restrict left turns
5	FM 76 at Liahona Dr	Stop*	2850	300	3375	275	Consider potential traffic signal/ roundabout or restrict left turn lanes
6	FM 76 at Sunhaven Dr	Stop*	2775	200	3250	125	Consider potential traffic signal/ roundabout or restrict left turn lanes
7	FM 76 at Barnhart Dr	Stop*	2650	425	3225	300	Consider potential traffic signal/ roundabout or restrict left turn lanes
8	FM 76 at McAdoo Dr	Stop*	2575	250	3175	200	Consider potential traffic signal/ roundabout or restrict left turn lanes
9	FM 76 at Jewel Dr	Stop*	2700	225	3150	225	Consider potential traffic signal/ roundabout or restrict left turn lanes
11	FM 76 at Worsham Rd	Stop*	2350	200	2900	275	Consider potential traffic signal/ roundabout or

							restrict left turn lanes
12	FM 76 at Wellettka Dr	Stop*	2225	325	2950	400	Consider potential traffic signal/ roundabout or restrict left turn lanes
13	FM 76 at Hureque Dr	Stop*	2250	300	2750	275	Consider potential traffic signal/ roundabout or restrict left turn lanes
14	FM 76 at Richardson Rd	Stop*	2200	150	2725	200	Restrict left turn lanes
16	FM 76 at Anderson Rd	Stop*	2075	175	2650	275	Consider potential traffic signal/ roundabout or restrict left turn lanes
17	FM 76 at Young John St	Stop*	2000	300	2600	200	Restrict left turn lanes
18	FM 76 at Estate Dr	Stop*	1825	750	2500	725	Consider potential traffic signal/ roundabout or restrict left turn lanes
21	FM 76 at Fenter Rd	Stop*	1400	1050	1275	1000	Consider potential traffic signal/ roundabout or restrict left turn lanes
23	FM 76 at Celum Rd	Stop*	2000	1050	1825	650	Consider potential traffic signal/ roundabout or restrict left turn lanes

*Note: *stop on the intersecting routes and not stop on FM 76*

6. Mobility Issues

Linkages

Direct links from FM 76 to Interstate 10 and Alameda Ave are available only through FM 1281, FM 1110, and Fabens Rd. These linkages are spaced more than 5.5 miles apart. It is essential to increase connectivity between FM 76 and Alameda Ave and Interstate 10 for improved mobility and traffic dissipation. The Destino TDM also show additional connections to FM 76 to Interstate 10 and Alameda Ave at Bauman Rd and Clint-San Elizario.

Segments

No operational issues were noted for the FM76 segments under existing conditions, but operational issues are noted under future No-Build conditions. In the No-Build condition, the FM 76 corridor capacity is not adequate to meet the traffic demand resulting in deteriorated volume-capacity ratio on the segments between signalized intersections in both peak periods. Furthermore, the existing road configuration does not provide the opportunity to implement left turn storage lanes at unsignalized intersections. To mitigate mobility and safety concerns, the FM 76 corridor will require additional capacity including provision of a median which can facilitate access management options, U-turns, and provision of left turns.

Intersections

In the future No-Build condition, FM 76 is expected to have unacceptable operating conditions with excessive control delays and queues in both peak periods at several signalized and unsignalized intersections. At signalized intersections, the available storage lane length is not adequate for many turn movements. As a result, traffic spill back onto through lanes affecting through traffic movement. Furthermore, the recurring congestion in the No-Build conditions can lead to a greater risk of vehicle crashes. The excessive queues will also affect access to the existing and future commercial establishments near the signalized intersections.

The signalized intersections require the following improvements to mitigate future No-Build conditions and reduce control delays, and improve LOS which will result in improved mobility and safety:

- FM 76 at FM 1281:
    - One additional storage lane for southbound left turn movement
    - One additional lane for southbound through movement
    - One additional lane for northbound through movement
    - One additional storage lane for eastbound left turn movement

- One additional storage lane for westbound left turn movement

- FM 76 at Bauman Rd:
  - One storage lane for northbound left turn movement
  - One storage lane for eastbound right turn movement
- FM 76 at Clint Cut-Off Rd:
  - Two additional storage lanes for southbound left turn movement
  - One storage lane for southbound right turn movement
  - One additional storage lane for southbound left and left turn shared with through movement
  - One additional storage lane for northbound left turn movement
  - One additional lane for northbound left turn shared with through movement
  - One storage lane for northbound right turn movement
  - One storage lanes for eastbound left turn movement
  - One additional lane for east bound through movement
  - One storage lane for eastbound right turn movement
  - One additional lane for westbound through movement
  - One storage lane for westbound right turn movement
- FM 76 at Clint-San Elizario
  - One additional lane for southbound left turn movement
  - One additional storage lane for westbound right turn movement

At all other signalized intersections existing lane configuration will be sufficient for the future 2045 No-Build conditions.

Increased traffic on the two-lane segment of the FM 76 corridor will result in fewer acceptable gaps for left turn traffic resulting in longer travel time and higher risk of angle collisions. At the unsignalized

intersections to mitigate the excessive delays in the No-Build conditions the following mitigation is required to improve mobility and safety:

- Provision of left turn storage lanes on minor street approaches
- Provision of left turn storage lane on FM 76
- Access management strategies such as converting some of the stop-controlled intersections into right in right out (RIRO) intersections, restricting direct connection to FM 76, etc.

Pedestrian and Cycle Facilities

Most of the signal-controlled and stop-controlled intersections do not have pedestrian or sidewalk facilities. Where these facilities are available there are significant gaps leading to discontinuity in the facilities. Sidewalks can reduce crashes involving pedestrians walking along the road by providing separation from motor vehicle traffic. Streets with inadequate or no sidewalks will discourage or limit safe pedestrian/bicycle movement. Continuous and connected sidewalk facilities must be provided on the FM 76 corridor in the Socorro and Fabens limits.

Transit

Currently, none of the transit/para transit services run along the FM 76 corridor though transit services are available between Fabens, Socorro, and El Paso. Improved transit services and associated transit facilities to the communities utilizing FM 76 will further improve the local economy and mobility for the workforce that is employed in El Paso. FM 76 must be included in the future transit routes.

Truck Transport

Currently, the truck volume along the FM 76 corridor does not exceed 500 trucks per day anywhere on the corridor. With the increase of commercial activity along FM 76, it is expected that truck movement along the FM 76 corridor would increase. An increase in truck traffic on the FM 76 under the No-Build conditions and access management will increase intersection delays and reduce corridor speeds. FM 76 widening to four lanes will support improved mobility for truck transport.

7. Quality Control

Quality control checks on the results from all the analyses were conducted on both the existing year (2019) and future year (2045) No-Build line diagrams. This ensured that the resulting line diagrams provide a reliable representation of the existing traffic conditions as well as a reasonable future traffic forecast along the study corridor.

APPENDIX D.1

Existing 2019 Straight Line Diagrams

APPENDIX D.2

Existing Vehicle Classification Data

APPENDIX D.3

Existing Year 2019 Synchro and HCS Outputs

APPENDIX D.4

Future No-Build 2045 Straight Line Diagrams

APPENDIX D.5

Future No-Build 2045 Synchro and HCS Outputs