Reimagine I-10 Corridor Study

Feasibility Report

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Table of Contents

List of Figures

List of Tables

List of Appendices

1. Executive Summary

The Reimagine I-10 Study looked at current and future transportation needs along the I-10 corridor in El Paso County from the New Mexico state line in the northwest to FM 3380 near Tornillo in the southeast. This 55-mile corridor was broken into four segments, which share unique characteristics and needs. The four segments are as follows:

- Segment 1: Northern Gateway (New Mexico State Line to Executive Center Boulevard – 16 miles)
- Segment 2: Downtown (Executive Center Boulevard to Raynolds Street – 7 miles)
- Segment 3: Airport (Raynolds Street to Eastlake Boulevard – 12 miles)
- Segment 4: Southern Gateway (Eastlake Boulevard to FM 3380 – 20 miles)

The following goals and objectives for the corridor were identified through collaboration with TxDOT, stakeholders, and the public:

1. Mobility & Circulation: Facilitate movement through and within the corridor
2. Environmental: Design to minimize impacts to the human and natural environment
3. Multimodal: Offer innovative transportation alternatives
4. Design: Comply with accepted design standards to improve safety along the corridor
5. Value: Ensure that improvements are sustainable and balanced with respect to costs and benefits

Five international ports of entry exist within the study area, including the third busiest truck port in the United States in 2017. Combined rail and truck traffic is expected to increase 50% between 2016 and 2025, and projections estimate 4,300 daily truck border crossings by 2045[1]. I-10 is a critical freight route for the United States, running over 2,400 miles from Los Angeles, CA to Jacksonville, FL. I-10 is used more intensely for freight movement during colder months, when other east-west routes like I-40 experience undesirable driving conditions due to winter weather.

I-10 between downtown and US 54 is the 86th most congested roadway in Texas (with an annual cost of delay of $11.93 million), and 75th most congested in terms of truck delay (with an annual cost of truck delay of $2.02 million)[2]. Traffic analysis concluded that if improvements are not implemented on I-10, delays and user costs will significantly increase over the next 20 years. As congestion on I-10 worsens, it will likely spread onto arterials and local streets as drivers seek alternative routes.

The most severe traffic congestion on I-10 occurs in the event of a crash or broken-down vehicle. Incident management tends to be more difficult and delays tend to be more pronounced where frontage roads are discontinuous or non-existent. Continuous frontage roads could provide additional

[1] Texas Centers for Border Economic and Enterprise Development, Bureau of Transportation Statistics, TransBorder Freight Data

[2] TxDOT Statewide Planning Map, Top 100 Congested Roadways (2018)

capacity when mainlanes are compromised and could make it easier for drivers to access alternative routes.

The I-10 corridor currently lacks bike and pedestrian friendly infrastructure along many cross streets and frontage roads. Transit vehicles traveling along the I-10 corridor are not separated from car traffic, making travel times unreliable and arrival/departure times difficult to predict. Improvements to bike and pedestrian infrastructure and transit service could lead to more transportation options for people traveling within the El Paso region.

Of the 202 bridge structures along I-10 within the study area, 31 bridges are classified as functionally obsolete (meaning they are no longer being used as originally intended because traffic exceeds design volumes) and 28 bridges do not meet minimum clearance. Compliance with clearance requirements is critical for freight movement, as failure to comply can lead to costly detours. The study area has a high percentage of bridges that are aging, with 64% of bridges older than 50 years (compared to 44% statewide). Infrastructure age also affects I-10 pavement. Geotechnical analysis indicates numerous areas with less than 10 years of remaining service life and areas with unacceptable ride quality along the corridor, primarily between the SH 20 (Mesa Street) interchange in Segment 1 and the Lomaland Drive interchange in Segment 3.

Bridge and pavement deficiencies are currently creating high maintenance costs. TxDOT El Paso District spent $4,944,816 in 2019 on non-contracted maintenance for I-10 within the study area for emergency repairs. This was 55% of the District's total non-contracted maintenance budget, and includes $1,804,000 on bridges and $762,000 on pavement. Maintenance will continue to become more costly if deficiencies are left unaddressed.

Estimated future traffic volumes were developed based on historic and projected travel demand in the El Paso region. These future traffic volumes were used to evaluate alternatives. Recommendations for operational improvements to better accommodate estimated future traffic volumes included ramp consolidation, X-ramp configuration, auxiliary/speed-change lanes, intersection improvements, and continuous frontage roads. New configurations were recommended at Artcraft Road, Thorn Avenue, SH 20 (Mesa Street), Schuster Avenue, downtown, Cotton Street, US 54, Buffalo Soldier Road, Airway Boulevard, Hawkins Boulevard, Yarbrough Drive, Zaragoza Road, Eastlake Boulevard, and Horizon Boulevard.

Four corridor-wide typical cross sections were developed with study goals and objectives in mind. These typical sections addressed anticipated corridor capacity needs. Alternative 1 added a lane of capacity in each direction. Alternative 2 added a lane of capacity and a 15-foot wide inside multi-use shoulder in each direction. Alternative 3 added a lane of capacity and a buffer separated adaptive lane for designated uses in each direction. Alternative 4 added a lane of capacity and a barrier separated adaptive lane for designated uses in each direction. Alternative 3 was ultimately chosen as the recommended concept due to the multimodal benefit it could offer and reduced right-of-way (ROW) footprint when compared with Alternative 4.

Additional recommendations related to technology included updates to existing corridor technology infrastructure and five potential pilot projects: truck parking and port of entry reservation, 5G, corridor electrification, unmanned aircraft (drone) system incident management, and truck platooning. These recommendations are expected to further alleviate traffic congestion and delay if applied. Bicycle and pedestrian recommendations, particularly in the downtown area, provide missing connections and are intended to improve the usefulness and user experience of the multimodal network in and around El Paso. The El Paso Bike Plan is accommodated between the I-10 frontage roads at each cross street.

Recommendations were compiled into a recommended concept called the “Build” scenario and evaluated against the “No Build” scenario. The recommended concept performed better from a traffic and safety standpoint, and addresses other corridor needs. This recommended concept will be further evaluated in future phases of design. The purpose of the Reimagine I-10 Study was to determine the feasibility of recommendations. The next phase will divide the recommended concept into projects and involve more in-depth analysis and design, including an environmental process. The final project phases are detailed design and construction.

Lastly, recommendations were grouped into projects and prioritized based on stakeholder feedback, needs, benefits, costs, and dependence on other projects. “Interim improvements” are relatively low cost projects that can address more pressing corridor needs until funding is obtained for larger, more costly projects. “Break Out Projects” are components of the recommended concept that can be built over time. “Interim Improvements” and “Break Out Projects” were categorized as short, mid, or long term, indicating their priority.

2. Introduction

2.1 Study Overview

Texas Department of Transportation (TxDOT), in coordination with El Paso Metropolitan Planning Organization (MPO), City of El Paso, and El Paso County, is conducting a study of the Interstate Highway 10 (I-10) Corridor from the New Mexico Stateline to FM 3380 (Aguilera International Highway) (**Figure 2-1**). The study's purpose is to analyze current and future transportation needs for the El Paso I-10 Corridor.

Figure 2-1. Reimagine I-10 Study Limits

2.2 Study Context

To better evaluate the elements of the corridor, the corridor was broken into four segments, or context areas, to identify unique characteristics and needs specific to that segment which may not be applicable to the entire project area. The four segments are as follows:

- Segment 1: Northern Gateway (New Mexico State Line to Executive Center Boulevard – 16 miles)
- Segment 2: Downtown (Executive Center Boulevard to Raynolds Street – 7 miles)
- Segment 3: Airport (Raynolds Street to Eastlake Boulevard – 12 miles)
- Segment 4: Southern Gateway (Eastlake Boulevard to FM 3380 – 20 miles)

Figure 2-2 shows the breakdown of each segment along I-10.

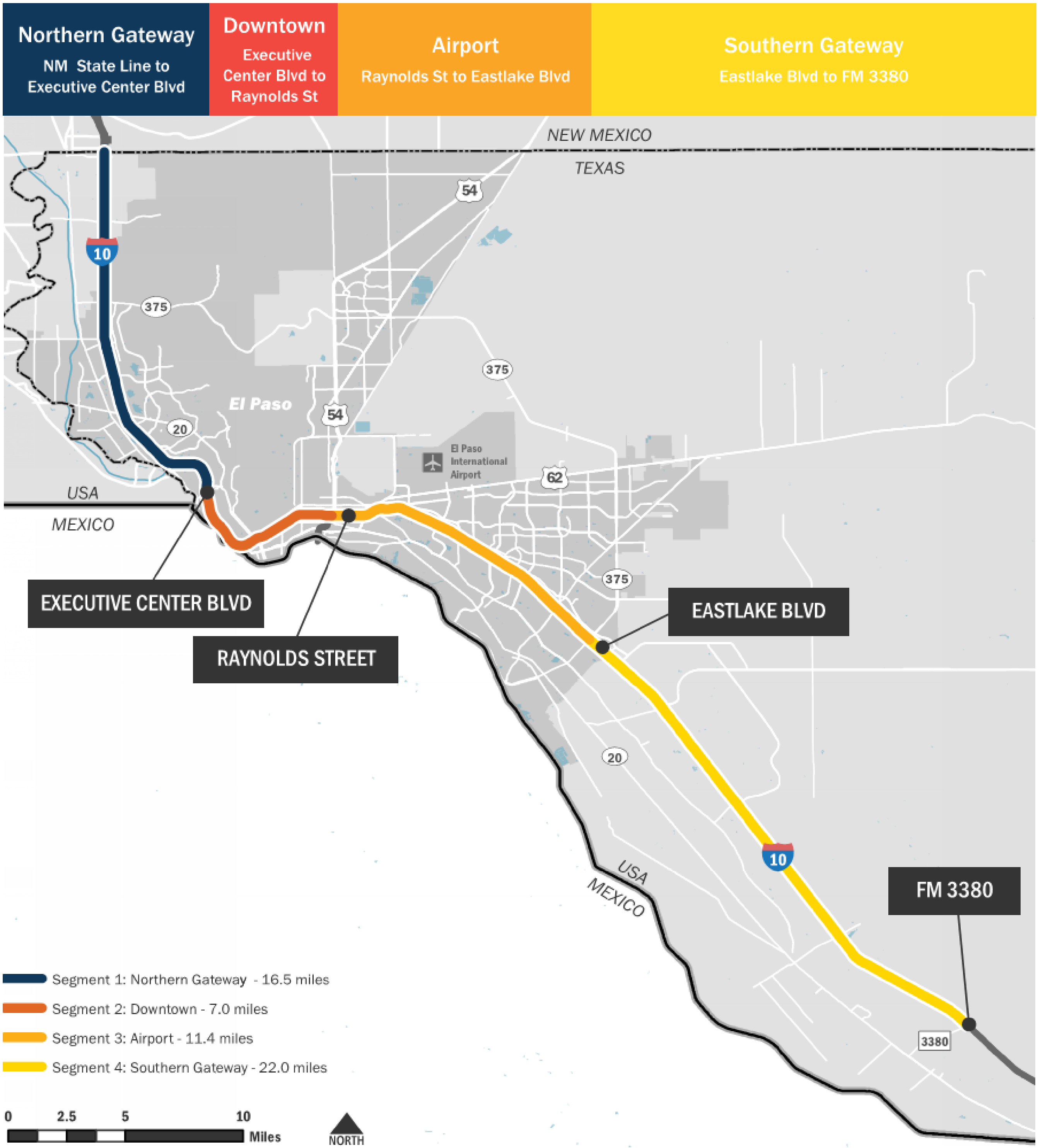

Figure 2-2. I-10 Segments

(a) Segment 1: Northern Gateway

In Segment 1, I-10 is a four-lane divided highway from the New Mexico state line to SH 20 (Mesa Street) and a six-lane separated highway from SH 20 (Mesa Street) to Executive Center Boulevard. This section has a posted speed limit of 75 miles per hour (mph) from Antonio Street to Redd Road where the speed limit decreases to 60 mph. This section has continuous frontage roads from Antonio Street to SH 20 (Mesa Street) with a posted speed limit of 55 mph.

Land use in this segment is primarily residential with several industrial sites and a few major entertainment and retail attractions. These attractions include Wet 'N' Wild Waterworld near the New Mexico state line, the Outlet Shoppes at El Paso just north of the Loop 375 interchange, and Sunland Park Mall between Sunland Park Drive and the US 85 interchange. Long stretches of undeveloped land border I-10 north of Loop 375, but some major development is taking place around the Loop 375 interchange. South of Artcraft Road/Paseo del Norte density increases and land use is primarily residential. The two-mile stretch along I-10 between the SH 85 interchange and Executive Center Boulevard is undeveloped with uneven terrain.

The north end of Segment 1 has a wide unpaved median, frontage roads, and two mainlanes in each direction. In the immediate vicinity of the Redd Road interchange, the median is paved. South of SH 20 (Mesa Street) there are no frontage roads and three mainlanes in each direction. The GO 10 project added mainlanes and collector-distributor (CD) roads to the corridor between SH 20 (Mesa Street) and Executive Center Boulevard.

(b) Segment 2: Downtown

In Segment 2, I-10 is primarily an eight-lane highway from Executive Center Drive to Prospect Street and is reduced to six lanes through downtown El Paso. East of downtown El Paso, I-10 increases to a ten-lane highway and then reduces to an eight-lane highway from Copia Street to Raynolds Street. The posted speed limit for this section is 60 mph. The westbound frontage road exists east of downtown, and the eastbound frontage road exists east of Piedras Street. The mainlanes are depressed through downtown with steep walls connecting the outside shoulder edges to ground level.

Land use in this segment is extremely varied but dominated by commercial, industrial, and residential uses. Major trip attractors include downtown, the Bridge of the Americas Port of Entry, and The University of Texas at El Paso (UTEP). Segment 2 is densely developed with the exception of the 1.5 mile stretch between Executive Center Boulevard and UTEP. Union Pacific Railroad (UPRR) rail lines run along the eastbound side of I-10 for the majority of Segment 2 and a UPRR rail yard exists between downtown and Piedras Street.

(c) Segment 3: Airport

In Segment 3, I-10 is an eight-lane highway from Raynolds Street to McRae Boulevard and a six-lane highway from Mc Rae Boulevard to Eastlake Boulevard with continuous frontage roads throughout the entire section. The posted speed limit for the mainlanes is 60 mph and the posted speed limit for the frontage roads is 45 mph. The median is paved and inside shoulders are narrow at spots. Several recent studies have been conducted in this segment regarding additional north-south connectivity and capacity.

Land use in this segment is dominated by commercial and residential with the exception of a very large industrial area on the eastbound side of I-10 between Marlow Road and Tony Lama Street. A few additional industrial sites are scattered throughout the remainder of Segment 3. Major attractions in this segment include the El Paso International Airport, Fort Bliss, the Fountains at Farah, Cielo Vista Mall, University Medical Center, the Zaragoza Port of Entry, and Bassett Place.

(d) Segment 4: Southern Gateway

In Segment 4, I-10 is a four-lane highway from Eastlake Boulevard to FM 3380 with a posted speed limit of 75 mph. There are continuous frontage roads from Eastlake Boulevard to FM 1110 (Darrington Road) that have a posted speed limit of 55 mph.

The Loop 375 interchange is surrounded by commercial, industrial and agricultural zones. The remainder of this segment is primarily residential with small businesses interspersed. Major trip attractors are Horizon area truck stops. There is very little development along I-10 in Segment 4 except at the Loop 375 and Horizon Boulevard interchanges.

2.3 Previous Studies

Several studies have been prepared for I-10 and its adjacent roadways. More information on these studies can be found in Appendix A. This section summarizes recommendations from these studies that were incorporated into the Reimagine I-10 Study.

(a) Analysis of Mitigation Strategies for I-10 Corridor Hot Spots (August 2007)

It is recommended that the westbound US 62 (Paisano Drive) entrance ramp to I-10 be permanently closed. Currently, the amount of vehicles traveling on the far right lane (destined for US 54/Mexico) interacting with vehicles entering the freeway creates a bottleneck location on the freeway which disrupts the balanced flow of traffic. Ramp closure would reduce weaving, improve freeway traffic congestion and increase mainlane speed at both upstream and downstream locations (creating a more balanced flow of traffic). *This recommendation was incorporated into the Reimagine I-10 Study.*

An additional lane is needed in both the eastbound and westbound directions on I-10 between Sunland Park Drive and Executive Center Boulevard to accommodate traffic volumes. *This recommendation was incorporated into the Reimagine I-10 Study.*

(b) I-10 and Loop 375 Corridor Simulation Study (August 25, 2009)

At the FM 1905/Mountain Pass Boulevard interchange with I-10, the westbound Mountain Pass Boulevard approach currently has one channelized right turn and one through lane. Adding one through lane would improve operations and reduce queuing. The eastbound FM 1905 approach experiences congestion due to the high right turning volume passing through the signalized intersection. Channelization of this movement and the addition of an acceleration lane would improve operation of the eastbound approach. The I-10 southbound entrance ramp is less than 200 feet from the FM 1905/S Desert Boulevard intersection. This is extremely close and relocating this ramp further south would increase the weaving distance available, thus improving traffic operations on this segment. *These recommendations were incorporated into the Reimagine I-10 Study.*

At the Vinton Road/Westway Boulevard interchange with I-10, traffic operation on the northbound approach is adversely affected by the proximity of the northbound exit ramp to Vinton Road/Westway Boulevard. This results in inadequate weaving distance, which could be increased by moving the ramp south. On the eastbound Vinton Road approach, high right turn demand and the existing unchannelized right turn results in extensive queuing. A channelized right turn will improve approach operation. *A right turn lane is recommended in the Reimagine I-10 Study, but it is not channelized.*

(c) Zaragoza Preliminary Improvement Concepts (September 11, 2009)

Tight diamond interchanges were proposed along I-10 at Pendale Road and at Don Haskins Drive/Alza Drive to offer alternate routes. *A Pendale Road interchange is recommended in the Reimagine I-10 Study.*

2.4 Goals and Objectives

The following goals and objectives were identified for the Reimagine I-10 Study:

1. Mobility & Circulation: Facilitate movement through and within the corridor
2. Environmental: Design to minimize impacts to the human and natural environment
3. Multimodal: Offer innovative transportation alternatives
4. Design: Comply with accepted design standards to improve safety along the corridor
5. Value: Ensure that improvements are sustainable and balanced with respect to costs and benefits
6. Technology: Leverage advancing technologies to address corridor issues

2.5 Study Development Process

The following sections of this report will discuss the process for this corridor study. The phases of the study process are outlined below.

Table 2-1. Study Development Process

Step 1	**Determine Existing Conditions**: An assessment of the general study area and roadway network was conducted to develop a project baseline to measure against in the alternative development and analysis steps of the study. This step included a traffic analysis that included traffic projections and an origin and destination (O&D) study.
Step 2	**Public Outreach Round I**: Meetings with the public and stakeholders were conducted to gain awareness of issues along the I-10 corridor.
Step 3	**Refine Goals and Objectives and Develop Preliminary Alternatives**: Public input was used to clarify and prioritize goals and objectives. Preliminary alternatives were developed and evaluated using qualitative constraints data and the baseline information that was established in determining the existing conditions.
Step 4	**Public Outreach Round II**: Preliminary alternatives and traffic analysis findings were presented to the public. These meetings provided the public and stakeholders an opportunity to ask questions and comment in detail about the preliminary alternatives and evaluation process.
Step 5	**Refine Alternatives and Identify Recommended Alternative**: Based on public comments and traffic analysis, refinements were made to the preliminary alternatives and a recommended alternative was established.
Step 6	**Public Outreach Round III**: The recommended alternative and traffic analysis findings were presented to the public, along with viable technology applications and bike/pedestrian improvements. The layout of a potential downtown deck plaza was also shown to gauge public interest*.
Step 7	**Refine Preferred Alternative and Develop Implementation Plan**: Coordination with stakeholders continued throughout this step, and several one-on-one meetings were held. Two internal workshops were held to prioritize break out projects and interim improvements. Geotechnical, economic and technology reports were created to accompany the overall feasibility report.

*Deck plaza construction, maintenance and amenities would require financial partnerships.

3. Public Involvement

Public feedback helped shape the goals and objectives for the Reimagine I-10 Study and contributed to many design decisions. The following section gives an overview of past opportunities for stakeholders and the public to learn more about the study and give input.

3.1 Summary of Outreach Efforts

The Reimagine I-10 Study began in early 2017. Throughout the study's progress, TxDOT and the study team (HDR and Blanton & Associates), have conducted several rounds of outreach efforts, including work group meetings, public meetings, one-on-one meetings, and community engagement efforts.

(a) Outreach Round I

Work Group Meetings:

- UTEP Physical Plant Complex #113, Building A	June 2, 2017
- TxDOT El Paso District Office	June 2, 2017

Public Meetings:

- Vinton City Hall	July 26, 2017
- UTEP	July 27, 2017
- El Paso Multipurpose Recreation Center	August 9, 2017
- Rio Vista Community Center	August 8, 2017

Additional Outreach:

- Published notices in El Paso Times and El Diario de El Paso newspapers
- Purchased banner advertisement on elpasoinc.com
- Mailed letters to 175 work group members
- Mailed postcards to 1,322 adjacent property owners
- Manned information booth at an El Paso Chihuahuas baseball game on July 25, 2017
- Posted meeting information on www.txdot.gov (Hearings, Meetings and Notices Schedule)
- Updated meetings pages with meeting materials
- Regularly updated Reimagine I-10 Study page on www.txdot.gov

General Outcome/Feedback from Outreach:

During this round of outreach, the team received input from the study work group that there may be push back from the public, that there needs to be an emphasis on incident management, and that mobility, congestion, and connectivity are top priorities for I-10. In response to public outreach efforts, 294 comments were received during this round. Comments at this stage included concerns about lighting, traffic congestion and chokepoints, ramp and exit/entrance locations, truck bypasses, incident management, multi-modal transportation options, adaptive lanes, and signage.

Figure 3-1. Fountains at Farah and El Paso Chihuahuas Game

(b) Outreach Round II

Work Group Meetings:

- TxDOT El Paso District Office	February 13, 2018
- UTEP Physical Plant Complex #113, Building A	February 14, 2018

Public Meetings:

- El Paso Community College Northwest Campus	March 6, 2018
- Mesita Elementary School Gymnasium	March 7, 2018
- El Paso Multipurpose Recreation Center	March 13, 2018
- Fabens High School	March 14, 2018

Additional Outreach:

- Published notice on TxDOT Website
- Sent emails to 142 work group members
- Mailed postcards to 1,043 adjacent property owners
- Distributed flyers to 10 libraries/community centers throughout study area, and high schools
- Aired movie trailer advertising study and meetings for four weeks at three local cinemas
- Included flyers in the El Paso Marathon runner's packets
- Manned informational booth at the El Paso Poppy Festival on March 31, 2018
- Utilized Twitter and Facebook to provide project information and advertise event dates
- Sent email broadcast via GovDelivery to 208 recipients (98.6 percent open rate)
- Posted meeting information on www.txdot.gov (Hearings, Meetings and Notices Schedule)
- Updated meetings pages with meeting materials
- Regularly updated Reimagine I-10 Study page on www.txdot.gov
- Posted MetroQuest survey on Reimagine I-10 Study page

General Outcome/Feedback from Outreach:

During this round of outreach, the workgroup asked and provided input about priority areas, deck plaza options, adaptive lanes, funding, and the use of technology. In response to public outreach efforts, 129 comments were received from the public during this round. These comments included concerns about exit/entrance ramp locations, lighting, the potential removal of the Porfirio Diaz exit, access and impacts to the Sunset Heights neighborhood, questions about deck plaza concept, multi-modal transportation including rapid transit, and comments about bicycle and pedestrian facilities.

Figure 3-2. Work Group Meeting and Public Meeting

(c) Outreach Round III

Work Group Meetings:

- TxDOT EL Paso District — January 9, 2019
- UTEP Physical Plant Complex #113, Building A — January 10, 2019

Public Meetings:

- El Paso Community Foundation — January 22, 2019
- Ysleta ISD Central Office — January 24, 2019

Additional Outreach:

- Advertised meetings online in *El Paso Times* and *El Diario de El Paso*
- Sent email to 499 work group members and interested parties
- Mailed postcard to 1,039 adjacent property owners
- Manned informational booths at
  - the El Paso Holiday Market on November 18, 2018
  - the El Paso WinterFest on December 15, 2018
- Utilized Twitter and Facebook to provide project information and advertise event dates
- Posted meeting information on www.txdot.gov (Hearings, Meetings and Notices Schedule)
- Updated meetings pages with meeting materials
- Regularly updated Reimagine I-10 Study page on www.txdot.gov
- Posted MetroQuest survey on Reimagine I-10 Study page

General Outcome/Feedback from Outreach:

During this round of outreach, the work group provided comments and suggestions primarily focused around the proposed adaptive lanes, the conceptual improvements in and around the downtown area, incident management, and truck traffic/port of entry considerations. In response to the public outreach efforts this round, approximately 113 comments were received. These comments included concerns about downtown bridge removals, access to and from the Sunset Heights neighborhood, the deck plaza concept, bicycle and pedestrian access and accommodations, ROW and displacements, traffic noise, and funding.

Figure 3-3. Public Meeting and Poppy Festival

(d) Additional Outreach Efforts and One-on-One Meetings

In addition to the work group and public outreach meetings, TxDOT and the study team also conducted several one-on-one meetings with local agencies and stakeholders to provide updates on the study and receive input.

02/13/2017: Meeting with HDR and TTI to discuss available datasets, statistics and previous and on-going border research for El Paso.

10/18/2017: Meeting with UPRR, HDR, and TxDOT to coordinate options for I-10 and adjacent rail lines east of the downtown area.

11/07/2017: Meeting with City of El Paso, HDR, and TxDOT to discuss goals and objectives of the study, existing problem areas, current/future traffic growth, and current/future projects.

11/07/2017: Meeting with SunMetro, HDR, and TxDOT to discuss goals and objectives of the study and identify future transit projects within the corridor.

11/08/2017: Meeting with City of Socorro, San Elizario, Town of Horizon City, Town of Clint, HDR, and TxDOT to discuss goals and objectives of the study, existing problem areas, current/future traffic growth, and current/future projects.

11/09/2017: Meeting with El Paso County, HDR, and TxDOT to discuss goals and objectives of the study, existing problem areas, current/future traffic growth, and current/future projects.

11/09/2017: Meeting with El Paso MPO, HDR, and TxDOT to discuss goals and objectives of the study, existing problem areas, current/future traffic growth, and current/future projects.

02/14/2018: Meeting with UPRR, HDR, and TxDOT to review and discuss options for I-10 and adjacent rail lines east of the downtown area.

04/19/2018: Presentation to Greater Chamber of Commerce by HDR and TxDOT to provide update on Reimagine I-10 Study.

04/20/2018: Presentation to El Paso MPO by HDR and TXDOT to provide update on Reimagine I-10 Study.

04/30/2018: Meeting with City of El Paso, HDR, and TxDOT to discuss downtown alternatives.

05/01/2018: Meeting with Medical Center of the Americas, HDR, and TxDOT to discuss ramping configurations east of US 54.

06/13/2018: Meeting with Sunset Heights HOA, HDR, and TxDOT to provide an update on the study and discuss options in the downtown area.

06/14/2018: Presentation to El Paso Hispanic Chamber of Commerce by TxDOT to provide update on Reimagine I-10 Study.

06/15/2018: Presentation to Central Business Association by HDR and TxDOT to provide update on Reimagine I-10 Study.

08/02/2018: Presentation to International Bridges Steering Committee by TxDOT to provide update on Reimagine I-10 Study.

09/06/2018: Follow-up Presentation to International Bridges Steering Committee by HDR and TxDOT to provide update on Reimagine I-10 Study.

09/25/2018: Meeting with UPRR, HDR, and TxDOT to review and discuss alternatives for I-10 and adjacent rail lines at Cotton St.

12/04/2018: Meeting with SunMetro, HDR and TxDOT to discuss recommended alternative and identify areas of potential concern.

12/05/2018: Meeting with City of El Paso, HDR and TxDOT to discuss recommended alternative and identify areas of potential concern.

1/9/19: Meeting with TxDOT, HDR, and representatives from St. Clements School regarding potential impacts to school property.

01/16/2019: Meeting with St Clements School, HDR, and TxDOT to discuss to discuss recommended alternative and identify areas of potential concern.

01/25/2019: Presentation to El Paso MPO by HDR and TXDOT to provide update on Reimagine I-10 Study.

03/14/19: Presentation to Central Business Association by TxDOT to provide update on Reimagine I-10 Study.

7/10/19: Presentation and question/answer session with the Sunset Heights Neighborhood Association.

4. Existing Conditions

4.1 Roadway

I-10 within the study area serves as the backbone of the El Paso region, responsible for 2.7% of total centerline miles and 6.2% of total lane miles but 32% of vehicle miles traveled. Due to natural and cultural constraints as well as the international border with Mexico, the El Paso region is limited in alternative routes. There are three major system interchanges which exist within the study area. State Loop (SL) 375 intersects I-10 in two locations, once in Segment 1 and second in Segment 3. The third system interchange is US 54 in Segment 2.

Segments 2 and 3 are located in urbanized and developed areas and have a relatively high ramp densities (2.21 and 2.25 ramps/mile respectively) when compared to the rural Segments 1 and 4 which are not as dense (1.16 and 0.47 ramps/mile respectively). These higher ramp densities, along with higher travel demand, lead to lower free flow speeds and reduce the traffic level of service (LOS) of the I-10 facility.

4.2 Right-of-Way

Along the I-10 El Paso Corridor, ROW width varies between 220 feet and 760 feet. ROW width increases near undeveloped plots of land and where frontage roads shift out away from the highway (often at interchanges). ROW is limited in other areas by developments along I-10, particularly in urban segments.

ROW width in Segment 2 is the most constrained, varying between 220 feet and 470 feet. There is little room for expansion within existing ROW in this segment due to development bordering I-10.

4.3 Bridges

There are approximately 202 bridge class structures along I-10 within the project limits. For analysis purposes, PonTex reports were utilized to determine any potential structural deficiencies. PonTex is a bridge inspection data management program intended to replace but not retire the Bridge Inventory, Inspection, and Appraisal Program (BRINSAP). Within the report, 31 bridges are classified as Functionally Obsolete. FHWA classifies bridges Functionally Obsolete if it fails to meet its design criteria either by its deck geometry, its load-carrying capacity, its vertical and horizontal clearances, or the approach roadway alignment to the bridge. Over half of the structures within the corridor were built before 1970, during the construction of the interstate system.

Even though over half of the structures were built before 1970, 85% of all of the structures have a sufficiency rating over 80.

4.4 International Economy

The El Paso Border Region is the most active for personally owned vehicle (POV) and pedestrian border crossings in Texas and is the second most active for truck border crossings in Texas according to 2018 data. The Santa Teresa, Bridge of the Americas, and Ysleta-Zaragoza Ports of Entry saw 114,996, 270,846, and 540,027 truck border crossings respectively in 2018. Freight from these ports uses I-10 to access the El Paso region and beyond. I-10 is a critical freight route for the United States, running over 2,400 miles from Los Angeles, CA to Jacksonville, FL. I-10 is used more intensely for freight movement during colder months, when other east-west routes like I-40 experience undesirable driving conditions due to winter weather.

The Borderplex Alliance (which includes El Paso, TX, Ciudad Juarez, MX, and Las Cruces, NM) makes up "the seventh largest manufacturing hub in North America and a globally competitive advanced manufacturing center, with over 340 significant manufacturing operations, employing over 275,000 individuals in the region."[3] The high numbers of POV (14,358,390) and pedestrian (7,657,974) border crossings in the El Paso Border Region in 2018 are indicative of the connected economies of El Paso and Ciudad Juárez.

See Appendix A for a detailed description of existing conditions. See Appendix B for maps showing environmental constraints.

[3] The Borderplex Alliance (https://borderplexalliance.org/)

5. Proposed Alternatives

For the purposes of this feasibility study, conceptual designs and recommendations are referred to as “alternatives”. Projects that move forward into the next phase of project development will go through a separate alternatives development and evaluation process that is part of the formal National Environmental Policy Act (NEPA) process.

5.1 Operational Improvements

(a) X-Ramp Configuration

Conversion from diamond to X-ramp configuration is desirable for urban areas such as El Paso. X-ramp configurations provide frontage road intersection bypasses if an auxiliary lane is built between entrance and exit ramps. This can add throughput capacity, reduce through traffic on frontage roads at frontage road intersections, and provide better routes for vehicles if incidents occur[4]. Additionally, X-ramp configurations increase storage area for queuing along frontage roads, improve access to frontage road development, and move weaving from the mainlanes to the frontage road[5].

(b) Ramp Safety Improvements

In order to determine the safety impact of various entrance ramp designs, predictive crash analysis was performed using the Interchange Safety Analysis Tool Enhanced (ISATe, a Highway Safety Manual based spreadsheet) for three scenarios: direct merge, merge lane, and auxiliary lane. The auxiliary lane scenario performed best, followed by the merge lane scenario. Detailed results and descriptions of how the predictive crash analysis was performed can be found in Appendix C.

Direct merges/diverges are not desirable and were eliminated from the corridor by adding auxiliary lanes or acceleration/deceleration lanes. Additional information regarding the locations and justification for the ramping improvements are discussed later in this report. These upgrades increase safety and reduce congestion by decreasing speed differentials at merge/diverge points and providing more space for merging/diverging.

(c) Other Operational Improvements

Highway Capacity Software (HCS) analysis of the 2042 No Build scenario (which includes improvements mentioned in the Amended El Paso MPO’s Horizon 2040 plan) shows almost all mainlane weaving segments as failing (LOS F). For this reason, ramp locations in high volume areas throughout the corridor were modified to avoid weaving segments by providing sufficient distance between entrance and exit ramps.

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[4] https://static.tti.tamu.edu/tti.tamu.edu/documents/0-5105-1.pdf

[5] Ibid.

(d) Adaptive Lanes

Adaptive lanes build in flexibility to the I-10 Corridor by allowing for a variety of potential future uses. Adaptive lanes would likely be restricted to certain vehicle types, such as truck and transit vehicles, high occupancy vehicles, or electric vehicles, allowing TxDOT to incentivize and facilitate certain modes of travel. Adaptive lane users would be removed from mainlane congestion and would have a more reliable trip (in terms of travel time) through the corridor. In the future, these adaptive lanes could be outfitted with technology (sensors, 5G, inductive charging) to maximize the benefits of connected, autonomous, and electric vehicles, thus increasing the capacity and sustainability of the corridor. Adaptive lanes (one in each direction) are recommended along a 23-mile segment of I-10 between Redd Road and Loop 375. Figure 5-1 shows a map of these limits.

Figure 5-1. Adaptive Lane Limits

Adaptive lanes allowing transit use could assist with proposed flexible bus routes in the northern and eastern parts of El Paso County. These routes are shown as dark blue lines in Figure 5-2[6]. Buses could use the adaptive lanes to more quickly travel to/from downtown El Paso, El Paso International Airport, and other destinations in El Paso.

[6] El Paso County Regional Transit Institutional Options Feasibility Study, 2019

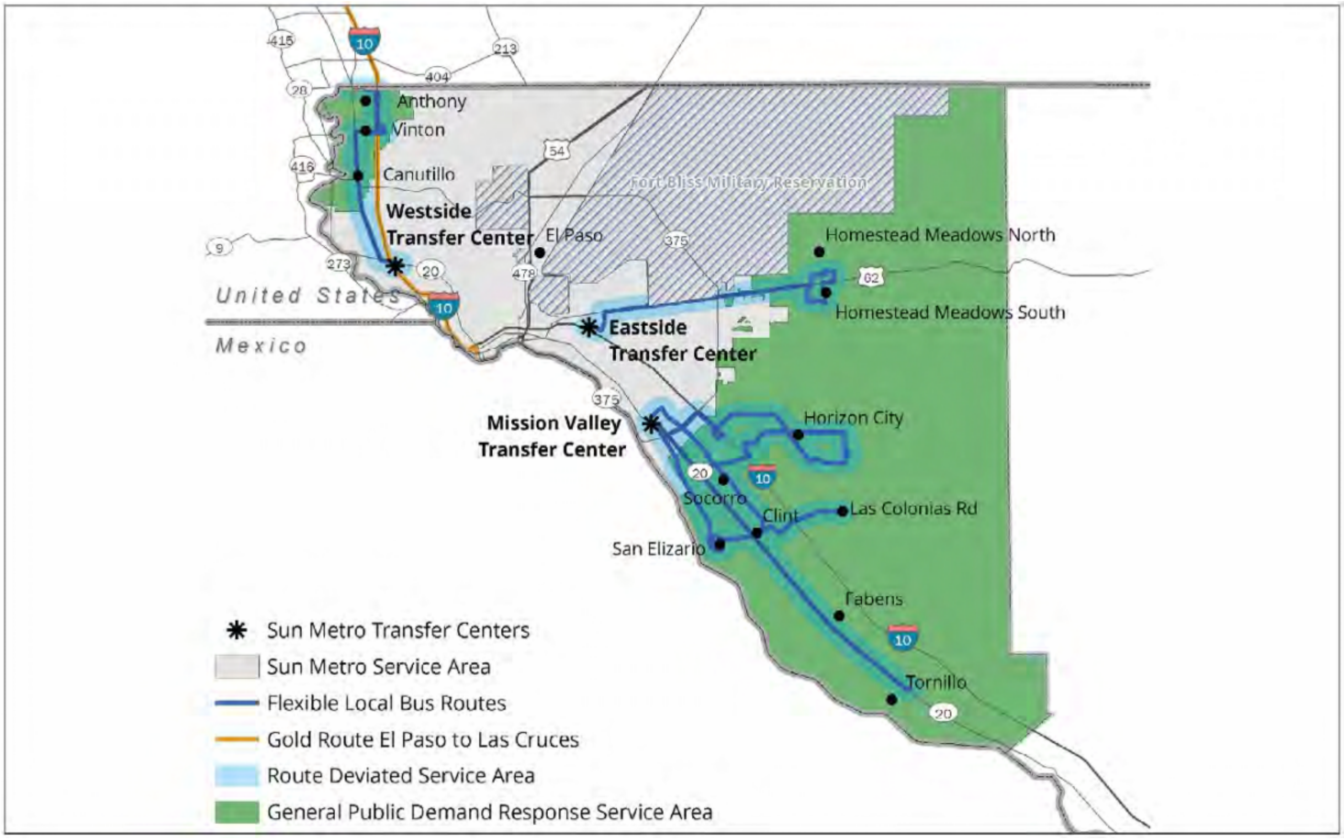


Figure 5-2. Proposed Transit Service Scenario

5.2 Corridor-Wide Alternatives

Four different cross section concepts were developed for corridor-wide alternatives.

Alternative 1 includes changes in ramping, auxiliary lanes, and additional capacity in some areas. Full lane widths (12 feet) and shoulder widths (10 feet) are provided along with continuous frontage roads and desirable border width (20 feet) for sidewalks and utilities. The main advantage of this alternative is more lanes available for all road users. Disadvantages include a wider ROW footprint and lack of lanes with designated uses that could provide a reliable trip through the corridor.

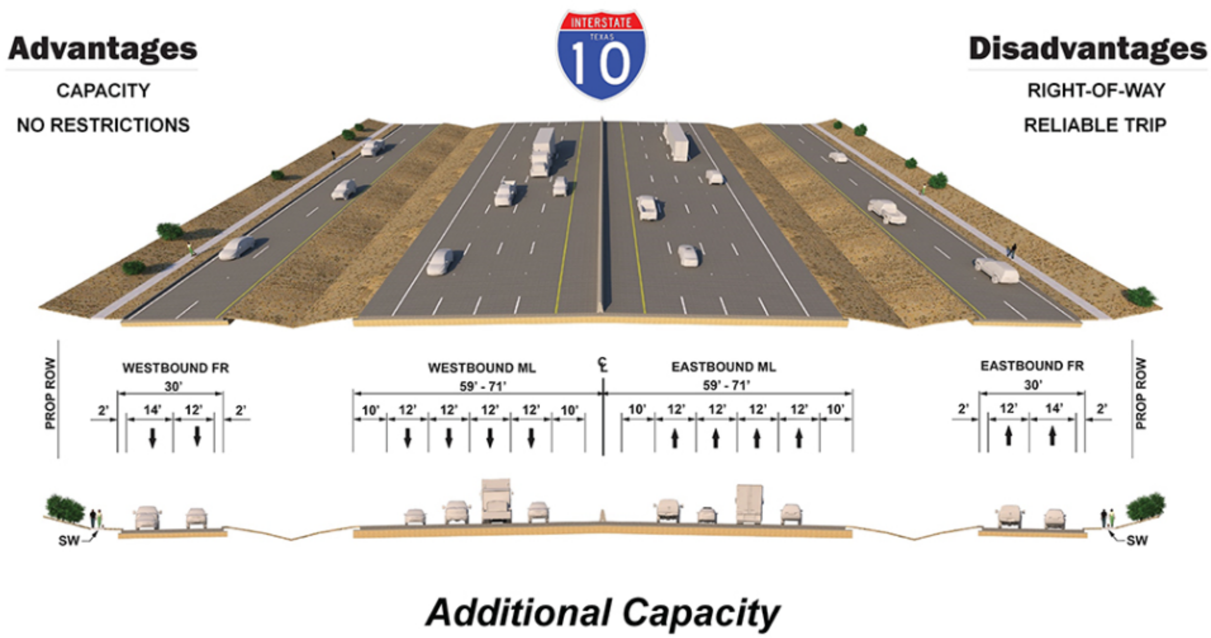


Figure 5-3. Corridor-Wide Alternative 1

Alternative 2 includes all of the improvements from Alternative 1 with a 15-foot wide inside multi-use shoulder. This alternative provides more lanes available for all road users. The wide inside shoulder improves safety, allows for more effective incident management, and could be used as a peak period or special purpose lane in the future. Disadvantages include a wider ROW footprint and lack of lanes with designated uses that could provide a reliable trip through the corridor. There is also the possibility that the wide inside shoulder could be used incorrectly by impatient or confused drivers.

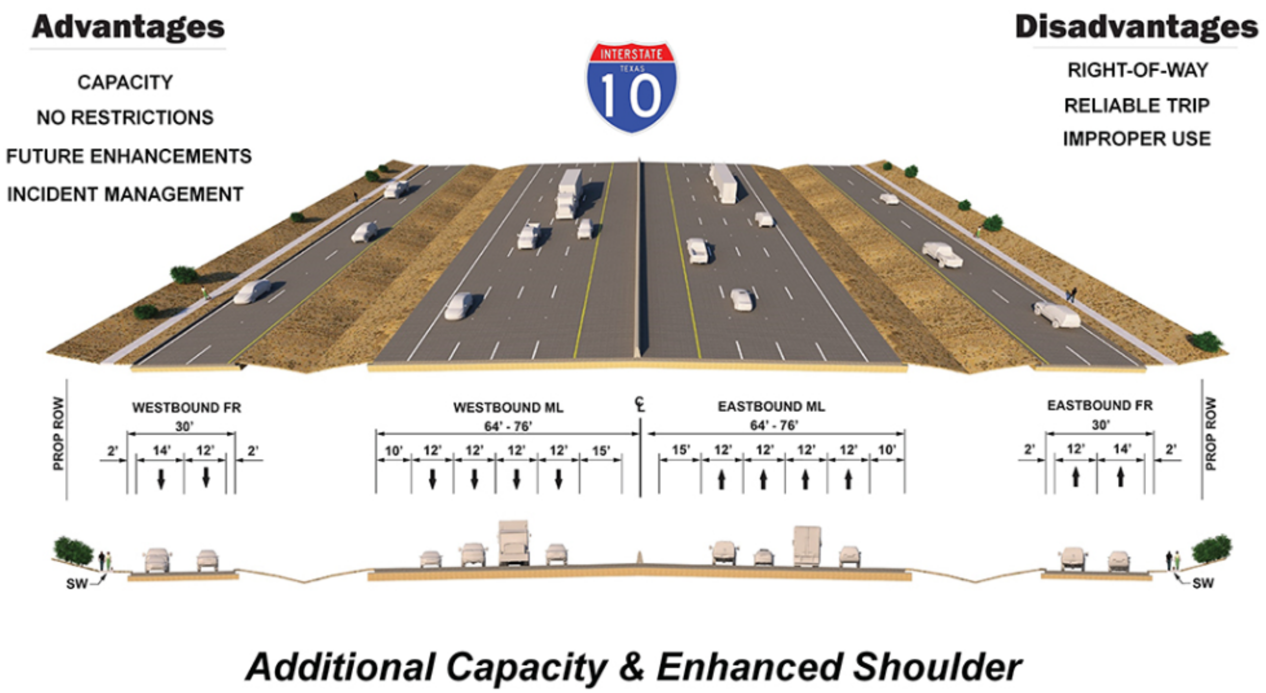


Figure 5-4. Corridor-Wide Alternative 2

Alternative 3 includes all of the improvements from Alternative 1, except the inside most lane is separated from the other lanes by a two-foot buffer. This adaptive lane could be designated for special uses to benefit trucks or transit and remove these larger vehicles from mainlane traffic. Examples of truck and transit lanes are I-394 in Minneapolis (where transit buses and light commercial vehicles are allowed to use the high-occupancy toll lanes), I-595 express lanes in Fort Lauderdale (where trucks are allowed on express lanes), and the TEXpress Lanes on I-820 and I-635 in DFW (where trucks can get discounted tolls if carrying multiple passengers, although tolls are still very high)[7]. The I-595, I-820, and I-635 lanes were built specifically to accommodate heavy trucks. Elevated T-ins or flyovers could be used to provide direct access for trucks and transit vehicles and prevent weaving across multiple lanes. The downside of buffer separation is that vehicles can access the adaptive lane at any point, which could lead to safety issues. However, buffer separation also makes these lanes more accessible for incident management and requires a narrower ROW footprint than barrier separation.

[7] https://static.tti.tamu.edu/tti.tamu.edu/documents/PRC-15-39-F.pdf

This alternative provides more lanes available for all road users and adaptive lanes that could provide a reliable trip. These lanes could accommodate specific uses in the future as technology advances. There may be opportunities to obtain funding from the private sector in exchange for use of adaptive lanes. Continuous access to adaptive lanes is less expensive than designated built in access points with physical separation elsewhere. Disadvantages include a wider ROW footprint and a chance that adaptive lanes are used incorrectly by impatient or confused drivers. Restricted use could be viewed negatively by drivers who aren't allowed to use the adaptive lanes.

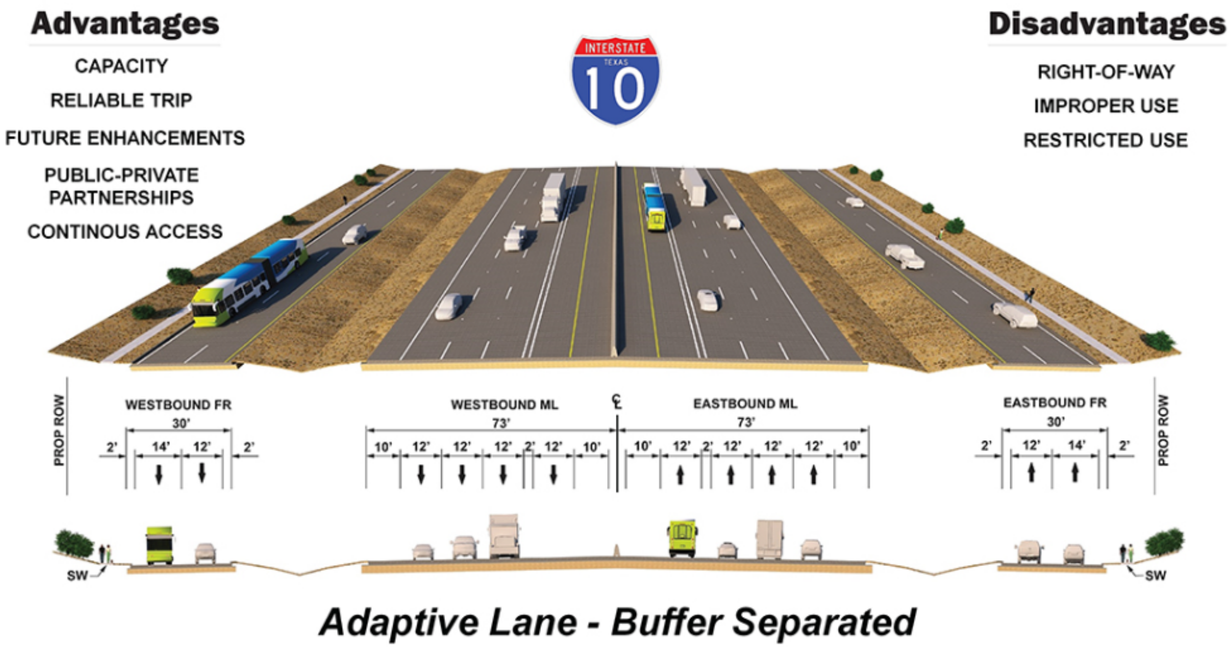


Figure 5-5. Corridor-Wide Alternative 3

Alternative 4 includes all of the improvements from Alternative 3, except the inside most lane is separated from the other lanes by a barrier. The barrier separated lane has a ten foot outside shoulder and a four foot inside shoulder. Similar to the buffer separated lane, T-ins or flyovers could be used to provide direct access for trucks and transit vehicles. One benefit of barrier separation is that access is limited to designated points (instead of continuous access). This provides more comfort for drivers, because they don't have to worry about vehicles merging from the mainlanes, but also makes the adaptive lane less useful for incident management.

This alternative provides more lanes available for all road users and adaptive lanes that could provide a reliable trip. These lanes could accommodate specific uses in the future as technology advances. There may be opportunities to obtain funding from the private sector in exchange for use of adaptive lanes. This alternative has the widest ROW footprint. Restricted access may decrease the number of potential users of the adaptive lanes, and restricted use could be viewed negatively by drivers who aren't allowed to use the adaptive lanes. The presence of a barrier between mainlanes and adaptive lanes could lead to more crashes.

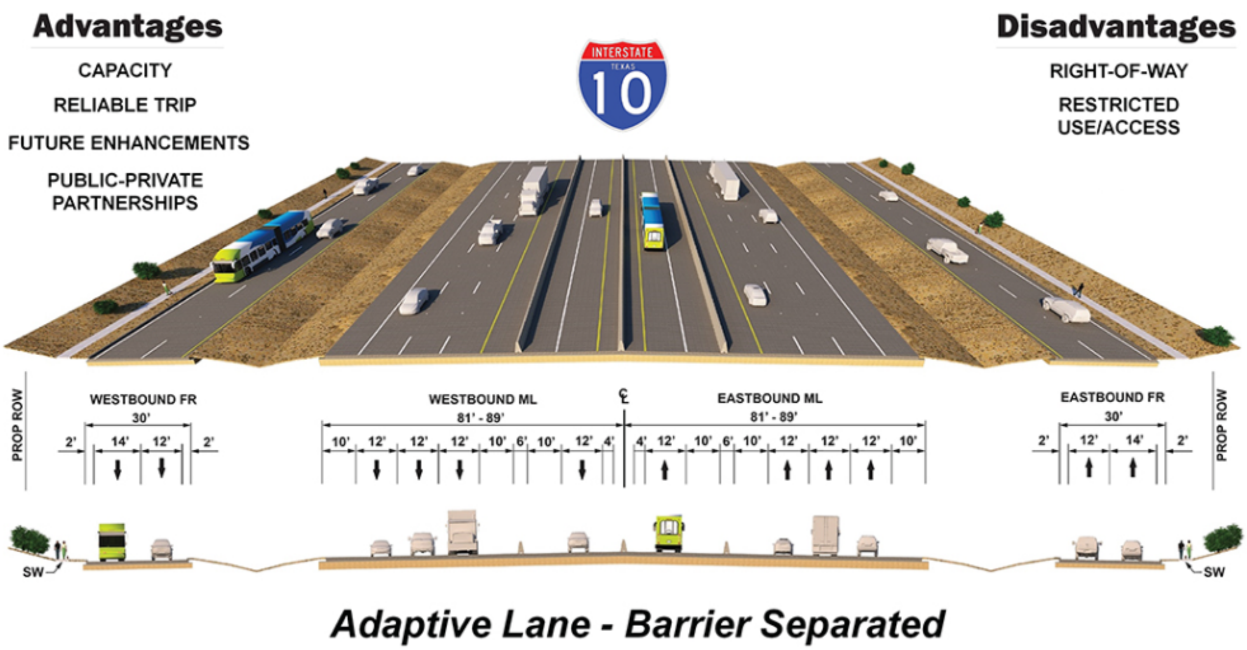


Figure 5-6. Corridor-Wide Alternative 4

Figure 5-7 shows the detailed typical section for each corridor-wide alternative. Alternative 3 was chosen as the recommended corridor wide alternative due to the potential benefits and flexibility available with an adaptive lane. Alternative 3 was preferred over Alternative 4 due to its smaller ROW footprint, especially in certain areas where impacts are narrowly avoided.

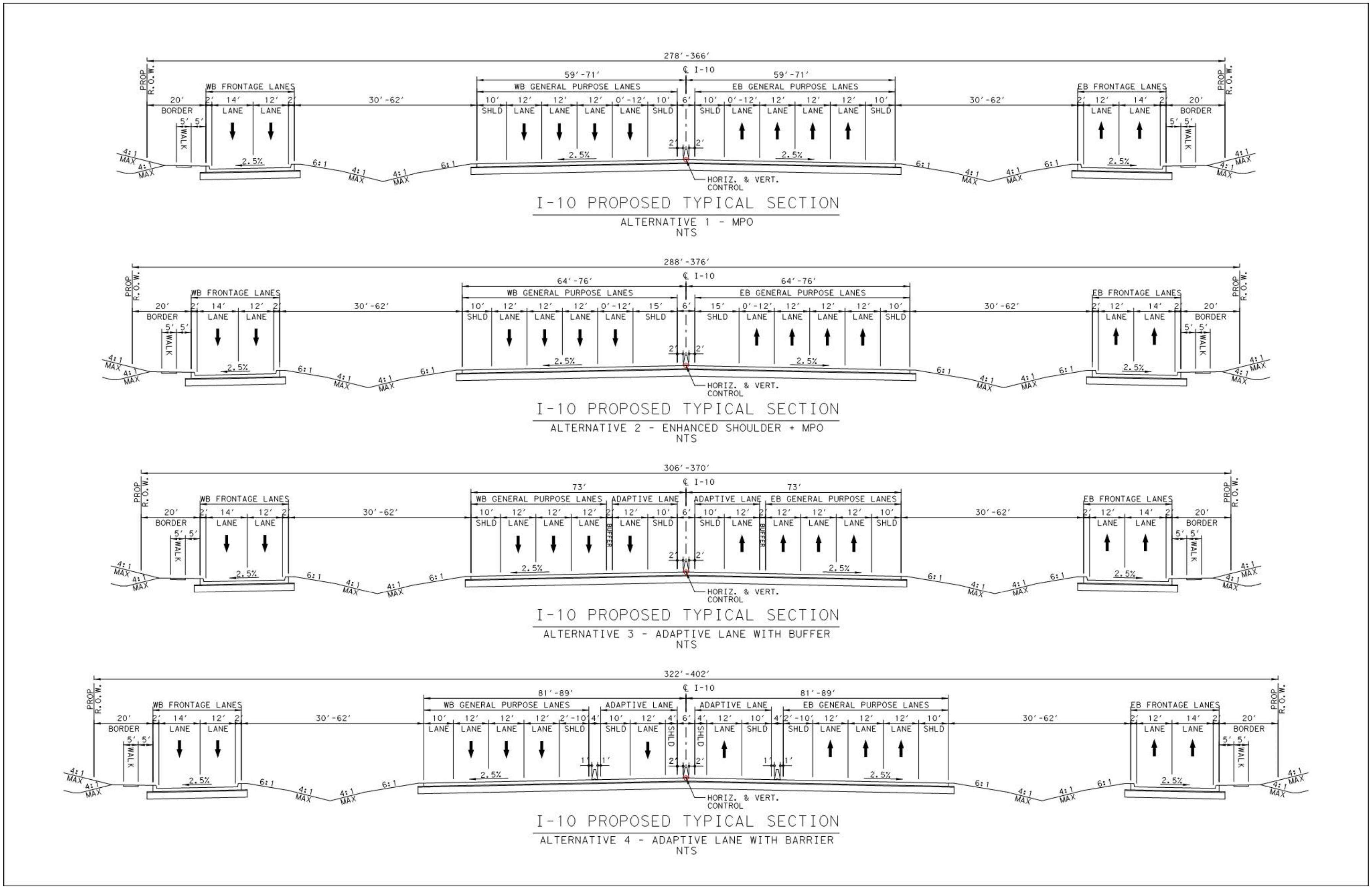


Figure 5-7. Corridor-Wide Detailed Alternative Typical Sections

5.3 Recommended Alternative

Alternative 3 was recommended between Redd Road and Loop 375 due to the benefits and flexibility that an adaptive lane provides. Alternative 2 was recommended in the remainder of the corridor, where traffic volumes are not projected to be high enough to justify an adaptive lane.

5.4 Additional Considerations

Additional options along the corridor were considered to reduce demand on I-10 and/or mitigate ROW impacts. To reduce demand on I-10, light rail was considered. This light rail line would run parallel to I-10, with stops in high demand areas such as downtown and The Fountains at Farah. Due to expense and concerns with projected ridership, this alternative was eliminated. To mitigate ROW impacts, a stacked (or double deck) freeway option was considered. This configuration made ramp design difficult and is not aesthetically pleasing. It is also expensive and further divides the two sides of the freeway.

Lastly, a tunnel option was considered which would provide a bypass of Segment 2 via a four-lane tunnel under the Franklin Mountains. Potential tunnel alignments are shown in Figure 5-8.

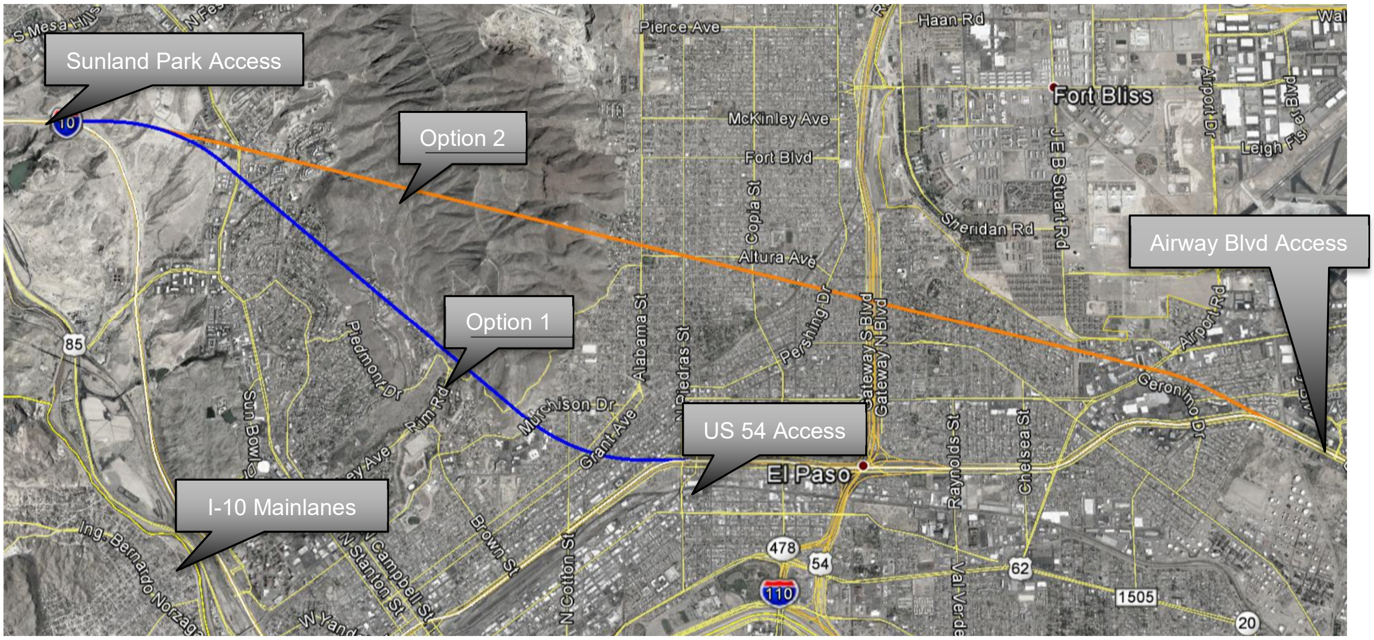


Figure 5-8. Potential Tunnel Alignments

This option would reduce traffic on Segment 2 and provide a more direct route through El Paso on I-10 by eliminating several curves but was eliminated due to high cost. More information about the two tunnel options, including the percentage of existing car and truck trips that could bypass the existing downtown segment, is shown in Table 5-1.

Table 5-1. Potential Tunnel Alignment Information

Option	Facility	Tunnel Distance (miles)	I-10 Distance (miles)	*EB/WB Average OD - Personal	*EB/WB Average OD - Trucks	**Cost (Approx. $100k/Foot)
1	4-Lane Tunnel	4.75	6.87	41%	73%	$ 2.5 Billion
2	4-Lane Tunnel	8.10	10.75	33%	66%	$ 4.3 Billion

*OD Data is for an all-day average of an average weekday defined as 12 am to 12am Tuesday to Thursday.

**These numbers are planning level numbers and should be considered as an order-of-magnitude representation of the potential cost.

5.5 Technology Improvements

Please see Section 9 for details on corridor technology recommendations.

5.6 Segment 1 Improvements

Segment 1 includes I-10 between the New Mexico state line and Executive Center Boulevard.

Alternatives 2 and 3 were proposed for Segment 1. Alternative 2 was proposed due to its potential safety benefits, and because the 15-foot inside shoulder could aid with incident management and provide opportunities for future use. Alternative 3 was proposed due to its adaptive lane and ability to provide road users a reliable trip through the segment. Alternative 4 would provide an even more reliable trip but was eliminated due to its wide footprint, which would require the reconstruction of GO 10 improvements. Alternative 3 differs from Alternative 2 in that buffer separated adaptive lanes are provided in both directions from SH 20 (Mesa Street) through Segment 2. Direct connectors to/from these adaptive lanes could be provided to make them more accessible for trucks. The proposed future left entrance and exit to/from US 85 that are part of the GO 10 project are removed in Alternative 3, as the buffer separated adaptive lanes continue along I-10.

Along this entire segment (from the New Mexico state line to Executive Center Boulevard) a minimum of three mainlanes are provided in each direction. In order to accommodate a wider mainlane footprint and recommended ramps, frontage roads were pushed out in many areas. A new interchange was added near Mile Marker (MM) 4.5, and frontage road intersection bypasses were provided at Loop 375, Thorn Avenue and SH 20 (Mesa Street). Frontage roads are continuous throughout Segment 1. Improvements from the I-10 third lane (CSJ 2121-01-094), SH 178 (CSJ 3592-01-009), Mesa Street - SH 20 Corridor Study (CSJ 0001-02-059), GO 10 (CSJ 2121-02-137), and Mesa Park (CSJ 2121-02-150) projects were incorporated to the greatest extent possible.

Table 5-2 lists recommended ramping changes, Table 5-3 lists recommended lane additions, and Table 5-4 lists recommended intersection improvements.

Table 5-2. Recommended Ramping Changes

Ramp	Direction	New Gore Station	Old Gore Station	Justification
Valley Chili Rd Exit	EB	1014+25	1036+00	Provide x-ramp configuration
Antonio St Entrance	EB	1082+75	1019+00	Provide x-ramp configuration
Vinton Rd Exit	EB	1105+00	1141+25	Provide x-ramp configuration
Valley Chili Rd Entrance	EB	1150+50	1108+25	Provide x-ramp configuration
New Interchange Exit	EB	1172+00	N/A	Needed for new interchange
Vinton Rd Entrance	EB	1225+50	1171+25	Provide x-ramp configuration
Loop 375 Exit	EB	1246+50	1310+00	Provide x-ramp configuration
New Interchange Entrance	EB	1310+50	N/A	Needed for new interchange
Loop 375 DC Entrance	EB	1366+75	1366+50	Matched SH 178 schematic
Artcraft Rd DC Exit	EB	1391+50	1401+75	Matched SH 178 schematic
Loop 375 Entrance	EB	1420+00	1355+25	Provide x-ramp configuration
Redd Rd Exit	EB	1434+50	1461+75	Provide x-ramp configuration
Artcraft Rd DC Entrance	EB	1457+00	N/A	Matched SH 178 schematic
Artcraft Rd Entrance	EB	1479+25	1448+25	Provide x-ramp configuration
Thorn Ave Exit	EB	1507+50	N/A	Provide x-ramp configuration and utilize Thorn Ave frontage road bypass
Redd Rd Entrance	EB	Removed	1532+50	Not needed due to Thorn Ave frontage road bypass
Thorn Ave Entrance	EB	1577+00	N/A	Provide x-ramp configuration and utilize Thorn Ave frontage road bypass

Ramp	Direction	New Gore Station	Old Gore Station	Justification
SH 20 Exit	EB	Removed	1573+50	Not needed due to Thorn Ave frontage road bypass
SH 20 Entrance	EB	1614+00	1618+00	Shifted to eliminate weave (3000' between ramps)
Sunland Park Dr Exit	EB	1643+75	1641+75	Shifted to eliminate weave (3000' between ramps)
Sunland Park Dr Entrance	EB	1762+75	1772+00	Shifted to eliminate weave (3000' between ramps)
Mesa Park Dr Exit	EB	1793+25	1802+25	Shifted to give more space before intersection
Executive Center Dr Entrance	EB	1859+50	1862+25	Ties in at different location due to wide inside shoulder
Executive Center Dr Exit	WB	1861+75	1859+00	Larger radius used on ramp
Mesa Park Dr Entrance	WB	1796+50	1802+00	Shifted to give more space from intersection to ramp
Sunland Park Dr Exit	WB	1752+50	1752+50	Ties in at different location due to wide inside shoulder
Sunland Park Dr Entrance	WB	1645+75	1641+75	Shifted to eliminate weave (3000' between ramps)
SH 20 Exit	WB	1615+25	1620+25	Shifted to eliminate weave (3000' between ramps)
Thorn Ave Exit	WB	1582+00	N/A	Provide x-ramp configuration and utilize Thorn Ave frontage road bypass
SH 20 Entrance	WB	Removed	1571+75	Not needed due to Thorn Ave frontage road bypass
Redd Rd Exit	WB	Removed	1542+75	Not needed due to Thorn Ave frontage road bypass
Thorn Ave Entrance	WB	1511+50	N/A	Provide x-ramp configuration and utilize Thorn Ave frontage road bypass
Paseo del Norte Exit	WB	1489+25	1448+00	Provide x-ramp configuration

Ramp	Direction	New Gore Station	Old Gore Station	Justification
Artcraft DC Exit	WB	1459+50	N/A	Matched SH 178 schematic
Redd Rd Entrance	WB	1437+00	1463+50	Provide x-ramp configuration
Loop 375 Exit	WB	1421+25	1354+00	Matched SH 178 schematic
Artcraft DC Entrance	WB	1400+50	1387+75	Matched SH 178 schematic
Loop 375 DC Exit	WB	1367+00	1365+75	Shifted due to wider mainlanes
New Interchange Exit	WB	1322+25	N/A	Needed for new interchange
Loop 375 Entrance	WB	1246+50	1308+50	Provide x-ramp configuration
Westway Blvd Exit	WB	1224+75	1181+75	Provide x-ramp configuration
New Interchange Entrance	WB	1175+00	N/A	Provide x-ramp configuration
Kingsway Dr Exit	WB	1151+00	N/A	Provide access to new development
Westway Blvd Entrance	WB	1104+50	1143+00	Provide x-ramp configuration
Antonio St Exit	WB	1084+50	1084+50	Ties in at different location due to wide inside shoulder
Colonia Vista Entrance	WB	1021+50	N/A	Provide access to new development

Table 5-3. Recommended Lane Additions

Lane Type	Direction	From	To	Length (ft)	Justification
Mainlane	EB	New Mexico State Line	SH 20	61700	Increase capacity
Mainlane	WB	SH 20	New Mexico State Line	62050	Increase capacity
Auxiliary	EB	FM 1905 (Antonio St)	SH 37 (Vinton Rd)	2225	Increase safety
Auxiliary	EB	SH 37 (Vinton Rd)	New Interchange	2150	Increase safety
Auxiliary	EB	SH 37 (Vinton Rd)	New Interchange	2100	Increase safety
Auxiliary	EB	Loop 375	SH 178 (Artcraft Rd)	2475	Increase safety
Auxiliary	EB	SH 178 (Artcraft Rd)	SH 178 (Artcraft Rd)	1450	Increase safety
Auxiliary	EB	SH 178 (Artcraft Rd)	Redd	5050	Increase safety
Auxiliary	EB	Executive Center Dr	Segment 2	1050	Additional capacity needed between ramps
Auxiliary	WB	Segment 2	Executive Center Dr	825	Additional capacity needed between ramps
Auxiliary	WB	Mesa Park Dr	Sunland Park Dr	4400	Additional capacity needed between ramps
Auxiliary	WB	SH 20	SH 20	3325	Additional capacity needed between ramps
Auxiliary	WB	Redd Rd	Redd Rd	2225	Increase safety
Auxiliary	WB	SH 178 (Artcraft Rd)	SH 178 (Artcraft Rd)	1575	Increase safety
Auxiliary	WB	SH 178 (Artcraft Rd)	Loop 375	3350	Increase safety
Auxiliary	WB	New Interchange	SH 37 (Vinton Rd)	2175	Increase safety

Lane Type	Direction	From	To	Length (ft)	Justification
Auxiliary	WB	SH 37 (Vinton Rd)	SH 37 (Vinton Rd)	2400	Increase safety
Auxiliary	WB	SH 37 (Vinton Rd)	FM 1905 (Antonio St)	2300	Increase safety
Frontage Road	EB	FM 1905 (Antonio St)	SH 37 (Vinton Rd)	4375	Provide auxiliary lane between ramps
Frontage Road	EB	FM 1905 (Antonio St)	SH 37 (Vinton Rd)	1500	Provide auxiliary lane between ramps
Frontage Road	EB	SH 37 (Vinton Rd)	New Interchange	2075	Provide auxiliary lane between ramps
Frontage Road	EB	New Interchange	Loop 375	3100	Provide auxiliary lane between ramps
Frontage Road	EB	Loop 375	SH 178 (Artcraft Rd)	2800	Provide auxiliary lane between ramps
Frontage Road	EB	SH 178 (Artcraft Rd)	Redd Rd	1925	Provide auxiliary lane between ramps
Frontage Road	EB	Redd Rd	Thorn Ave	1000	Provide auxiliary lane between ramps
Frontage Road	EB	Thorn Ave	SH 20	1200	Provide auxiliary lane between ramps
Frontage Road	EB	Sunland Park Dr	Mesa Park Dr	5550	Make frontage roads continuous
Frontage Road	WB	Mesa Park Dr	Sunland Park Dr	8775	Make frontage roads continuous
Frontage Road	WB	SH 20	Thorn Ave	1450	Provide auxiliary lane between ramps
Frontage Road	WB	Thorn Ave	Redd Rd	825	Provide auxiliary lane between ramps
Frontage Road	WB	Redd Rd	SH 178 (Artcraft Rd)	2650	Provide auxiliary lane between ramps
Frontage Road	WB	Loop 375	New Interchange	6150	Provide auxiliary lane between ramps

Lane Type	Direction	From	To	Length (ft)	Justification
Frontage Road	WB	New Interchange	SH 37 (Vinton Rd)	1675	Provide auxiliary lane between ramps
Frontage Road	WB	SH 37 (Vinton Rd)	FM 1905 (Antonio St)	1500	Provide auxiliary lane between ramps
Frontage Road	WB	SH 37 (Vinton Rd)	FM 1905 (Antonio St)	2950	Provide auxiliary lane between ramps

Table 5-4. Recommended Intersection Improvements

Cross Street	Side	Changes	Relative Cost of Improvement	2042 No Build PM LOS	2042 Build PM LOS
FM 1905 (Antonio St)	EB	Add thru lane to eastbound Antonio St Add U-turn	$$	D	C
	WB	Add thru lane to westbound Antonio St	$	E	C
SH 37 (Vinton Rd)	EB	Add U-turn	$$	B	B
New Interchange	EB	Add six lane cross street with U-turns	$$$$	N/A	N/A
	WB	Add six lane cross street with U-turns	$$$$	N/A	N/A
Loop 375	EB	Provide intersection bypass	$$	C	C
	WB	Provide intersection bypass	$$	C	C
SH 178 (Artcraft Rd)	EB	Channelize both right turns Add left turn lane to FR approach Add U-turn Add Direct Connectors	$$$$	F	C
	WB	Add thru lane to FR approach	$	F	C
Redd Rd	EB	Add thru lane and left turn lane to FR approach	$	F	D
	WB	Add thru lane and left turn lane to FR approach	$	F	D

Cross Street	Side	Changes	Relative Cost of Improvement	2042 No Build PM LOS	2042 Build PM LOS
Thorn Ave	EB	Provide intersection bypass Add right turn lane and thru lane to FR approach Add thru lane to eastbound Thorn Ave Add U-turn	$$$	C	C
	WB	Provide intersection bypass Add right turn lane and thru lane to FR approach Add thru lane to westbound Thorn Ave Add U-turn	$$$	B	B
SH 20	EB	Reconstruct to SPUI with bypasses	$$$$	B	B
	WB	Reconstruct to SPUI with bypasses	$$$$	C	C
Mesa Park Dr	EB	Add U-turn	$$	N/A	N/A
	WB	Add U-turn	$$	N/A	N/A
Executive Center Blvd	EB	Add two left turn lanes to FR approach Add thru lane to westbound Executive Center Blvd	$$	E	B
	WB	Add right turn lane and optional left turn lane to FR approach Add thru lane to westbound Executive Center Blvd	$$	F	C

5.7 Segment 2 Improvements

Segment 2 includes I-10 between Executive Center Boulevard and Raynolds Street.

Alternatives 2, 3 and 4 were proposed for Segment 2. Alternative 2 was proposed due to its potential safety benefits, and because the 15-foot inside shoulder could aid with incident management and provide opportunities for future use. Alternative 3 was proposed due to its adaptive lane and ability to provide road users a reliable trip through the segment. Alternative 4 was proposed because it eliminates frequent weaving between the mainlanes and adaptive lanes. Congestion in Segment 2 may incentivize people to cut into the adaptive lanes if these lanes are only buffer separated. Barrier separation prevents this unwanted behavior and provides a more reliable and safer trip through the segment. Modified typical sections can be used in certain areas to reduce ROW acquisitions if needed. These could include elevating the adaptive lanes, cantilevering the frontage roads, etc.

With the exception of the area beneath US 54, a minimum of four mainlanes are provided in each direction. In order to accommodate a wider mainlane footprint, recommended ramps, and CD roads, frontage roads were pushed out in most areas. Frontage roads are continuous throughout Segment 2. Improvements from the I-10 Connect project (CSJ 1067-01-113, etc.) were incorporated to the greatest extent possible. Table 5-5 lists recommended ramping changes, Table 5-6 lists recommended lane additions, and Table 5-7 lists recommended intersection improvements.

Table 5-5. Recommended Ramping Changes

Ramp	Direction	New Gore Station	Old Gore Station	Justification
Schuster Ave Exit	EB	1938+00	1945+25	Provide more storage for queues
University Ave Entrance	EB	1963+75	1962+25	Accommodate new configuration
Franklin Ave/Downtown Exit	EB	1986+25	1978+00	Consolidate ramps
Porfirio Diaz St Entrance	EB	Removed	1993+25	Porfirio Diaz St bridge removed
Downtown Exit	EB	Removed	2007+00	Consolidate ramps
Franklin Ave Entrance	EB	2009+75	N/A	Replace Porfirio Diaz St Entrance
Downtown Entrance	EB	Removed	2046+00	Consolidate ramps
Cotton St Exit	EB	2044+25	N/A	Provide access to Cotton St and new FR
Frankline Ave Entrance	EB	2066+75	2054+00	Consolidate ramps
Dallas St Exit	EB	Removed	2077+00	Replaced by Cotton St Exit
Cotton St Entrance	EB	2108+75	2099+50	Shifted to eliminate weave (3000' between ramps)
Piedras St Exit	EB	Removed	2112+00	Removed to eliminate weave (3000' between ramps)
Copia St Exit	EB	2138+25	2142+25	Shifted to give more space from ramp to intersection
US 54 DC Exit	EB	2154+75	2156+25	Shifted due to wider mainlanes
Raynolds St Exit	EB	2179+25	2198+25	Provide x-ramp configuration
Copia St Entrance	EB	2249+25	2183+75	Utilize CD road to consolidate ramps
US 54 DC Entrance	EB	2249+25	2222+00	Utilize CD road to consolidate ramps

Ramp	Direction	New Gore Station	Old Gore Station	Justification
Raynolds St Exit	WB	2255+50	2234+50	Utilize CD road to consolidate ramps
US 54 DC Exit	WB	2255+50	2219+00	Utilize CD road to consolidate ramps
Copia St Exit	WB	2255+50	2187+25	Utilize CD road to consolidate ramps
US 62 (Paisano Dr) Entrance	WB	2237+00	2245+75	Shifted to give more space from ramp to intersection
Raynolds St/US 54 NB Entrance	WB	2175+00	2201+50	Utilize new FR to consolidate ramps
US 54 NB Entrance	WB	Removed	2198+00	Utilize new FR to consolidate ramps
Piedras St Entrance	WB	2109+00	2108+00	Shifted due to wider mainlanes
Downtown Exit	WB	2067+00	2051+00	Shifted to eliminate weave (3000' between ramps)
Cotton St Entrance	WB	2046+00	2066+75	Shifted to eliminate weave (3000' between ramps)
N Kansas St Exit	WB	Removed	2045+25	Consolidate ramps
Downtown Entrance	WB	1999+75	2006+25	Shifted to follow ramp design standards
Porfirio Diaz St Exit	WB	Removed	1992+00	Removed to eliminate weave (3000' between ramps)
Schuster Ave Exit	WB	1966+75	1969+25	Shifted due to wider mainlanes
University Ave Entrance	WB	1917+50	1937+50	Shifted to provide space for frontage road weaving
US 54 SB DC Entrance	WB	2163+50	2171+50	Shifted due to wider mainlanes and Raynolds St Entrance ramp
Raynor St Exit	WB	Removed	2159+00	Removed to eliminate weave (3000' between ramps)
Copia St Entrance	WB	Removed	2141+00	Removed to eliminate weave (3000' between ramps)
Cotton St Exit	WB	2126+00	2132+25	Shifted to eliminate weave (3000' between ramps)

Table 5-6. Recommended Lane Additions

Lane Type	Direction	From	To	Length (ft)	Justification
Auxiliary	EB	Executive Center Blvd	Franklin Avenue	11625	Additional capacity needed between ramps
Auxiliary	EB	Franklin Avenue	Campbell St	3450	Additional capacity needed between ramps
Auxiliary	EB	Cotton St	Copia St	4600	Additional capacity needed between ramps
Auxiliary	EB	Cotton St	Raynor St	2950	Additional capacity needed between ramps
Auxiliary	WB	Copia St	Piedras St	3750	Additional capacity needed between ramps
Auxiliary	WB	Franklin Avenue	Schuster Avenue	3300	Additional capacity needed between ramps
Mainlane	EB	Campbell St	Copia St	11250	Increase capacity
Mainlane	EB	Campbell St	Copia St	8800	Increase capacity
Mainlane	WB	Copia St	Campbell St	10800	Increase capacity
Mainlane	WB	Copia St	Campbell St	9650	Increase capacity
Mainlane	WB	Campbell St	Executive Center Blvd	17600	Increase capacity
Frontage Road	EB	Executive Center Blvd	Prospect St	15425	Provide new frontage road
Frontage Road	EB	Campbell St	Piedras St	7525	Provide new frontage road
Frontage Road	EB	US 54	Raynolds St	2175	Provide auxiliary lane between ramps
Frontage Road	WB	Raynolds St	Copia St	4075	Provide new frontage road
Frontage Road	WB	Cotton St	Campbell St	2100	Provide auxiliary lane between ramps
Frontage Road	WB	Prospect St	Porfirio Diaz St	2450	Provide new frontage road

Lane Type	Direction	From	To	Length (ft)	Justification
Frontage Road	WB	University Ave	Executive Center Blvd	8325	Provide new frontage road

Table 5-7. Recommended Intersection Improvements

Cross Street	Side	Changes	Relative Cost of Improvement
Schuster Ave	EB	Reconfigure (See write up)	$$$$
	WB	Reconfigure (See write up)	$$$$
Porfirio Diaz St	EB	Remove cross street	$$
	WB	Remove cross street	$$
Franklin Ave	EB	Add Franklin entrance ramp	$$
Cotton St	EB	Reconfigure (See write up)	$$$$
	WB	Reconfigure (See write up)	$$$$
Piedras St	WB	Add two thru lanes and right turn lane to FR approach	$$
Raynor St	EB	Add thru lane to FR approach	$
	WB	Add thru lane and right turn lane to FR approach Add left turn lane to NB Raynor St	$$
Copia St	EB	Add right turn lane and U-turn lane to FR approach	$
	WB	Add right turn lane to FR approach Add U-turn	$$
Raynolds St	EB	Add right turn lane and left turn lane to FR approach Add U-turn Add right turn lane to NB Raynolds St Add thru lane to SB Raynolds St	$$
	WB	Add right turn lane and left turn lane to FR approach Add U-turn Add thru lane to SB Raynolds St	$$

There were numerous areas in Segment 2 that required additional considerations: where lane additions and changes to ramping alone did not sufficiently improve LOS or where constraints made unique solutions necessary. These areas are discussed in the following subsections.

(a) Frontage Roads

Frontage road addition in the segment of I-10 between Executive Center Boulevard and downtown proved to be a challenge. ROW in this segment is extremely tight, with a railroad, Border Highway West, potential historic buildings, and the Sunset Heights neighborhood all bordering I-10. There is a large area on the east side of I-10 between Executive Center Boulevard and University Avenue that is undeveloped and has steep natural terrain. A potential approach to maintain continuous frontage roads is to have the eastbound frontage road cross over to the east side of I-10, run parallel with the westbound frontage road, and cross back over to the west side near University Avenue. At that point, it would remain elevated on structure over the railroad and taper down to one lane before merging with an off-ramp lane and continuing on to downtown. On the east side, the westbound frontage road will have two segments, one from downtown to Schuster Avenue and the other from University Avenue to Executive Center Boulevard. Despite the increased structural costs and complexity, this option will help avoid much of the present ROW issues, with the exception of the Sunset Heights neighborhood. Column spacing and frontage road discontinuity are two potential issues with this design, and other alternatives will be considered. Additionally, vehicles on the eastbound frontage road don't have access to the UTEP area.

(b) Schuster Avenue

The intersection at Schuster Avenue and Sun Bowl Drive was failing in the No Build 2042 scenario, mainly due to heavy left turn movement onto eastbound I-10 causing a bottleneck at the intersection itself. Queues from this intersection were also backing up onto the eastbound Schuster Avenue exit ramp, resulting in congestion on I-10. Roundabouts installed on the campus have been well received and effective, therefore another roundabout was proposed for this intersection. A number of ramping layouts in this area were also considered as an attempt to further relieve congestion.

According to projected traffic volumes, there will be minimal traffic on nearby University Avenue. The first concept provides access from University Avenue to eastbound I-10. This addition also increases storage so that traffic at the Schuster intersection can be redistributed. Access to westbound I-10 from Schuster Avenue was eliminated to redirect traffic to University Avenue. An additional left turn was also added for the eastbound I-10 to Schuster Avenue movement to reduce queue lengths.

The second modification attempts to eliminate the signalized T-intersection on the west side of I-10 altogether. Access to eastbound I-10 would be provided by two direct connectors (DCs) that combine traffic from Sun Bowl Drive and Schuster Avenue, and the existing intersection would be used solely as the eastbound exit ramp from I-10. This option was seen as too disruptive and was eliminated.

Following the continuous flow concept, the third option attempted to reduce the number of signals on Schuster Avenue by making it a dedicated entrance ramp and redirecting all incoming traffic from eastbound I-10 to University Avenue. This concept seemed promising and was modified by switching access points. Access to I-10 was moved to University Avenue and access from I-10 flows to Schuster Avenue. This modified configuration provides more storage for vehicles and allows for a larger turn radius on the entrance ramp. This option was selected as the proposed solution and evaluated. Analysis shows severe congestion due to high left turn volumes at the proposed Schuster Avenue/Sun Bowl Drive roundabout. Adjustments to intersection design and ramping configuration are being considered to address this issue.

Ramping and intersection improvements alone were unable to provide the desired benefit for this area. The proposed solution is a reconfiguration of the Schuster Avenue interchange along with the addition of continuous frontage roads in the eastbound and westbound directions. This can be viewed on page 7 of the Roll Plots in Appendix D.

(c) Downtown

The downtown area is a hotspot for congestion. The 2042 No Build VISSIM model shows gridlock along Yandell Drive and Wyoming Avenue between N Santa Fe Street and N Campbell Street, with queues extending to the mainlanes and blocking traffic. Several layouts for the downtown area were considered to reduce congestion, connect the Uptown and downtown areas, and provide opportunities for development or improved aesthetics.

The first attempt at reducing congestion is a minimalistic approach. The westbound Yandell Drive exit is removed, forcing vehicles who previously used this exit to instead use the Missouri Avenue exit. By removing traffic from Yandell Drive, more green time is made available for cross streets. This design outperforms the No Build alternative, but significant congestion is still present. Another option involves removing the bridges across I-10 at Oregon Street and Stanton Street. In removing these connections, the number of traffic signals on Yandell Drive and Wyoming Avenue is reduced, but performance of the network is not improved substantially.

The second attempt combines Yandell Drive and Wyoming Avenue into a single parkway that runs on top of I-10. The parkway concept removes one of the two intersections along each cross street, and in doing so, significantly reduces congestion. The parkway concept also frees up land for development by relocating existing roads from alongside I-10 to above I-10. The city and public have shown interest in using newly available land to create an attractive public space.

The third attempt at reducing congestion is the creation of a “circuit”. All bridges across I-10 are removed and a U-turn is added at either end of downtown, essentially creating a large roundabout. Cross streets tie into the frontage roads, forming the legs of the roundabout. Volumes on U-turns and frontage roads in this layout are very high, requiring up to six lanes in one direction, so the SH 20 (Mesa Street) connection across I-10 was added (along with Texas U-turns at SH 20) to allow for narrower frontage roads. In this configuration, SH 20 (Mesa Street) is overloaded and has failing LOS. To better distribute traffic across I-10 and provide less circuitous routes, the N Santa Fe Street and N Campbell Street connections across I-10 were added (as two-way streets along with Texas U-turns at both crossings). This layout effectively handles traffic on frontage roads and cross streets, offers the most benefit in the form of congestion relief, and was chosen as the preferred layout. Additionally, this layout could accommodate a deck plaza, which the city and public have shown interest in.

The fourth attempt elevates SH 20 (Mesa Street) over Yandell Drive and Wyoming Avenue. An elevated intersection above I-10 provides access to/from I-10. Additional ramps to/from I-10 create lane balance issues and failing weaving segments on I-10. Additional structure would likely be expensive, unattractive, and cause vertical alignment issues.

The fifth attempt includes a number of changes. Southbound traffic on Kansas Street diverges from its current alignment north of I-10 and joins N Campbell Street until it reaches Missouri Avenue, where it is forced to turn right. The El Paso Street, Stanton Street, and Kansas Street bridges over I-10 are removed in this alternative, reducing the number of signals along Yandell Drive and Wyoming Avenue. An additional westbound ramp providing direct access to N Santa Fe Street was also added, along with a realignment of Prospect Street, which ties into Durango Street instead of N Santa Fe Street. Finally, a U-turn was added for westbound traffic prior to N Campbell Street. Components of this layout were used to improve the third layout.

The sixth attempt utilizes DCs to replace left turns from SH 20 (Mesa Street) and provides a new connection from southbound N Ochoa Street to eastbound I-10. Additional structure would likely be expensive, unattractive, and cause vertical alignment issues.

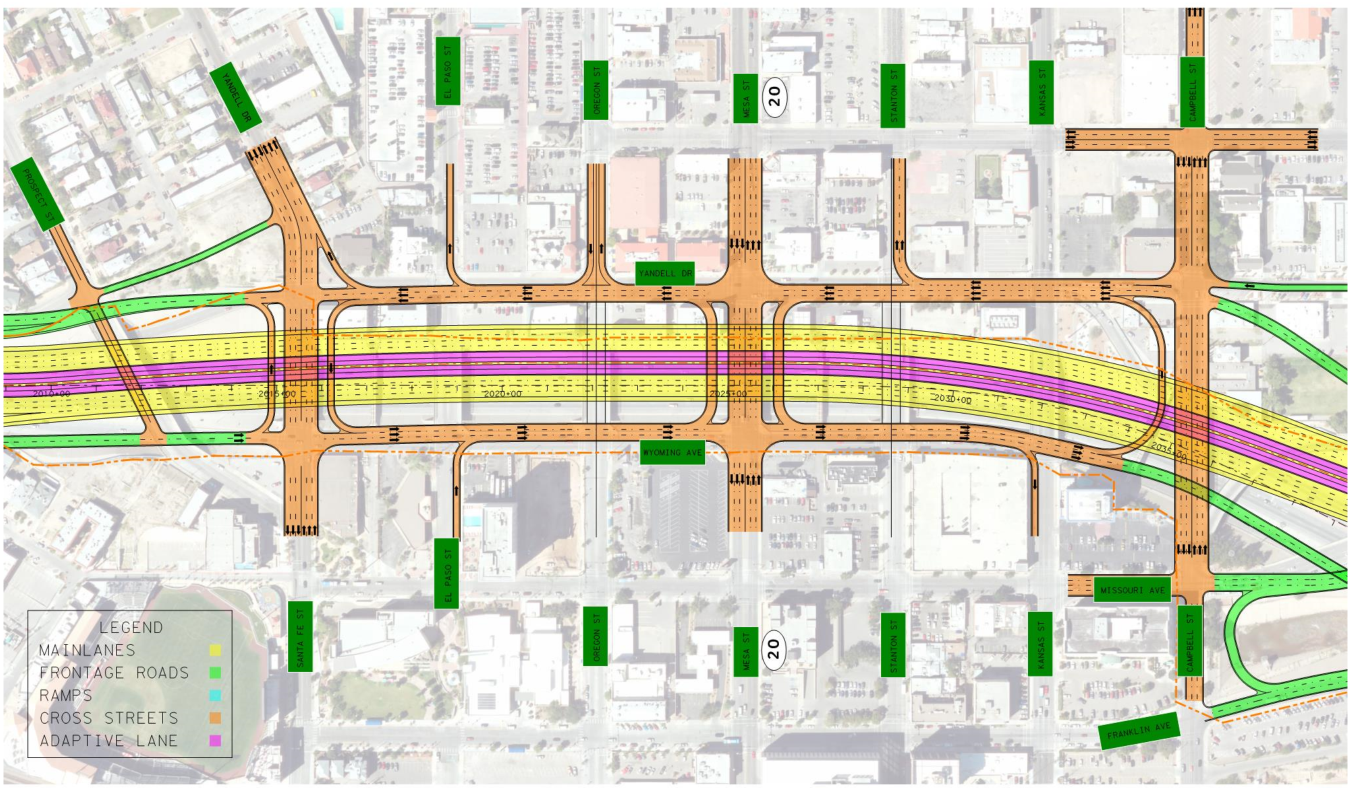


Figure 5-9. Proposed Downtown Layout

(d) Cotton Street

The existing Cotton Street interchange does not have a frontage road in the eastbound direction. Cotton Street passes over a UPRR line immediately south of I-10, and a spur of this rail line runs parallel to Cotton Street about 450 feet to the east. The existing Cotton Street Bridge is aging and in need of replacement, and only 15’8” clearance is provided for traffic underneath I-10. A brainstorming session took place to consider options for the Cotton Street interchange.

An eastbound frontage road between downtown and Piedras Street was added in order to provide continuous frontage roads. This offers an alternative route if needed for incident management. A traditional diamond interchange with U-turns is proposed. This eliminates the severe skew angle for traffic accessing the existing eastbound entrance ramp. An additional left turn lane can be added to southbound Cotton Street to improve LOS at the intersection with the eastbound frontage road. Two three level interchange configurations for this layout are being considered: one with rail at the first level, Cotton Street at the second level and I-10 at the third level; the other with a depressed I-10 at the first level, rail at the second level and Cotton Street at the third level. Both configurations will be challenging regarding vertical alignments and clearances. The first configuration requires a very high I-10 structure, while the second is likely more expensive and may have drainage issues. The second configuration would also result in a greater elevation difference between mainlanes and frontage roads. Alternatives at Cotton Street are still being considered.

(e) US 54

The I-10/US 54 interchange is currently a hotspot for congestion on I-10 due to high traffic volumes and ramp density.

In the eastbound direction, a CD road is proposed east of US 54. The eastbound Copia Street entrance ramp ties into the eastbound US 54 entrance ramp to form this CD, which continues until merging with eastbound I-10 beneath US 62 (Paisano Drive). This CD has an exit to Raynolds Street for vehicles coming from US 54 and eliminates the existing weave between the US 54 entrance and the Raynolds Street exit, which is proposed to pass underneath the CD. The Chelsea Street Bridge and intersections were removed to provide more storage length for frontage road intersections and reduce the number of signals for frontage road traffic.

A CD road was also created in the westbound direction. The CD begins as a three lane exit beneath US 62 (Paisano Drive) and offers exits to Raynolds Street, US 54, and Copia Street. This CD eliminates the existing weave between the US 62 (Paisano Drive) entrance and US 54 exit. The US 62 (Paisano Drive) entrance is proposed to pass underneath the CD and no longer has access to the US 54 direct connector. A westbound frontage road between Raynolds Street and Copia Street was added in order to provide continuous frontage roads. This offers an additional route if needed for incident management and is also used as a CD to consolidate ramps. The westbound Copia Street exit and the loop ramp from US 54 tie into the new frontage road, eliminating the existing weave between these existing ramps on the mainlanes.

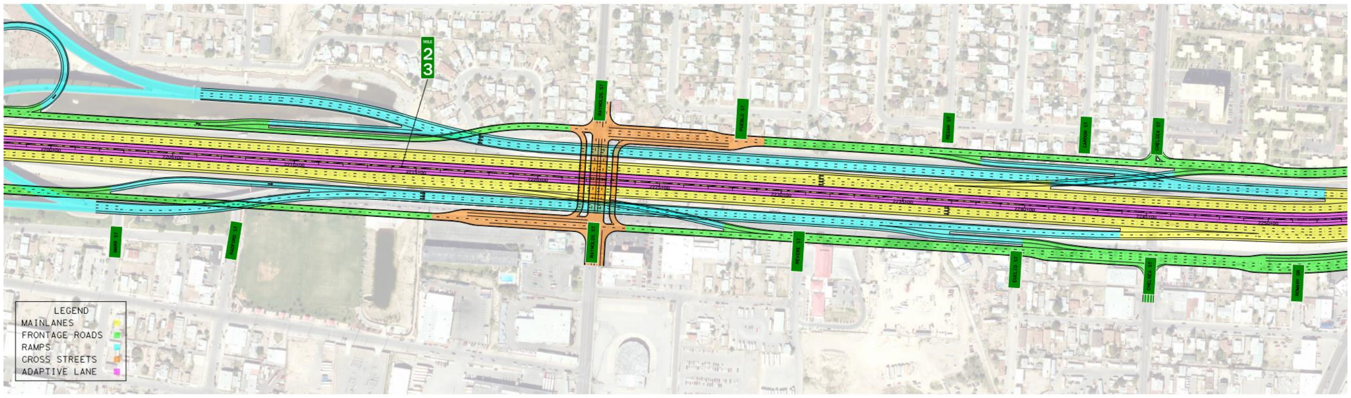


Figure 5-10. Proposed US 54 Area Layout

5.8 Segment 3 Improvements

Segment 3 includes I-10 between Raynolds Street and Eastlake Boulevard.

Alternatives 2, 3 and 4 were proposed for Segment 3. Alternative 2 was proposed due to its potential safety benefits, and because the 15-foot inside shoulder could aid with incident management and provide opportunities for future use. Alternative 3 was proposed due to its adaptive lane and ability to provide road users a reliable trip through the segment. Alternative 4 was proposed because it eliminates frequent weaving between the mainlanes and adaptive lanes. Congestion in Segment 3 may encourage people to cut into the adaptive lanes if they are only buffer separated. Barrier separation prevents this unwanted behavior and provides a more reliable and safer trip through the segment. Modified typical sections can be used in certain areas to reduce ROW acquisitions if needed. These could include elevating the adaptive lanes, cantilevering the frontage roads, etc. Direct connectors to/from adaptive lanes could be provided to make them more accessible for trucks or transit vehicles.

With the exception of the area immediately east of US 54 and the area beneath Loop 375, a minimum of four mainlanes are provided in each direction. In order to accommodate a wider mainlane footprint, recommended ramps, and CD roads, frontage roads were pushed out in most areas. Frontage roads are continuous throughout Segment 3.

Segment 3 ramping proved to be a challenge. Interchange and ramp density are very high along the majority of this segment, resulting in weaving issues on the mainlanes, queuing and congestion at frontage road intersections, and difficulty placing ramps. Development along Segment 3 frontage roads is substantial, resulting in limited available ROW without acquisitions. Holistic approaches were used to reduce congestion along the mainlanes and frontage roads in Segment 3 because changes to one ramp often impacted multiple other ramps and interchanges.

The initial attempt sought to maximize existing ramping. The operational improvement of adding auxiliary lanes between entrance and exit ramps actually decreased LOS due to short weaving distances. To increase weaving distance, ramps were consolidated or removed altogether in failing areas beginning with bottlenecks. Maintaining access to major intersections was a priority. Capacity was an issue in the eastbound direction near the US 54 interchange, so additional lanes were added. The mentioned changes significantly improved LOS, but still left five HCS segments failing in each direction.

A second concept utilized CD Roads to reduce ramp density and remove traffic volume from the mainlanes. It quickly became evident that the close spacing of cross streets in Segment 3 does not favor CD roads. Due to this spacing, vehicles had to enter the CD road well in advance of their cross street destination, which led to higher volumes on the CD roads, which led to more lanes on the CD roads, which led to more difficult weaving on the CD roads. Additionally, the width of the resulting facility was very large, so this concept was abandoned.

A third option was to have widened frontage roads with two lane bypasses at every intersection. The inside lanes of the new "Super Arterial" frontage roads acted as a CD road, but since no separate CD road facility was provided, facility width was much less. The frontage road bypasses were accessible to all vehicles on the frontage road instead of just those coming from I-10. In this manner, "Super Arterial" frontage roads served more uses than the CD roads. Few entrances and exits were provided, and HCS analysis showed LOS D or better on mainlanes in both directions.

The close spacing of cross streets in Segment 3 made providing intersection bypasses difficult. There was not enough distance for the bypass lanes to tie to the frontage road between many intersections, leave space for weaving and then diverge from the frontage road. For this reason, several bypasses had to span two intersections, and as a result, the "Super Arterial" frontage roads were less effective because more vehicles were forced through intersections. Additional capacity on the mainlanes was required even with the "Super Arterial" frontage roads, so the facility was wider than desired. This concept was deemed impractical because it congested frontage roads and frontage road intersections.

The fourth attempt began with an empty ramping layout. All Segment 3 ramps were removed and the following cross streets were identified as critical: US 62 (Paisano Drive), Airway Boulevard, Viscount Boulevard, Yarbrough Drive, Zaragoza Road, and Loop 375. The goal was to provide direct access between these cross streets and I-10 with X-ramp configuration. A minimum of 3,000 feet between consecutive entrance and exit gores was required to avoid weaving segments, which would fail due to high traffic volumes. Braided ramps were avoided when possible but needed in some areas to accomplish this. A minimal ramping layout was created following these criteria. Additional ramps were then added where they would not reduce mainlane LOS in order to reduce demand at overloaded intersections and provide more direct access to key areas. The Hawkins Boulevard and Loop 375 braided ramps were not incorporated because they create weaving issues and can't accommodate the proposed mainlane footprint.

This alternative increased traffic on the frontage roads and at many frontage road intersections. Modifications to many intersections were proposed to increase capacity, but several intersections were still failing, notably in the area between Viscount Boulevard and Lee Trevino Drive. Further adjustments to ramping and intersection layouts in these areas were made to mitigate these issues.

Table 5-8 lists recommended ramping changes, Table 5-9 lists recommended lane additions, and Table 5-10 lists recommended intersection improvements.

Table 5-8. Recommended Ramping Changes

Ramp	Direction	New Gore Station	Old Gore Station	Justification
US 62 (Paisano Dr) Entrance	EB	2269+75	N/A	Provide access for MCA development
Trowbridge Dr Exit	EB	Removed	2258+75	Removed to eliminate weave (3000' between ramps)
Geronimo Dr Exit	EB	Removed	2274+75	Removed to eliminate weave (3000' between ramps)
Trowbridge Dr Entrance	EB	Removed	2292+00	Removed to eliminate weave (3000' between ramps)
Airway Blvd Exit	EB	2303+75	2343+00	Provide x-ramp configuration
Geronimo Dr Entrance	EB	2346+00	2324+50	Provide x-ramp configuration
Hawkins Blvd Exit	EB	2375+50	2365+75	Shifted to eliminate weave (3000' between ramps)
Airway Blvd Entrance	EB	2395+00	2401+50	Shifted due to Hawkins Blvd Exit ramp
Hunter Dr Exit	EB	Removed	2414+00	Not needed due to Hawkins Blvd frontage road bypass
Hawkins Blvd Entrance	EB	2453+25	2450+75	Provide x-ramp configuration
Hunter Dr Entrance	EB	2476+50	N/A	Alleviate frontage road intersections
Giles Rd Exit	EB	Removed	2472+00	Removed to eliminate weave (3000' between ramps)
Giles Rd Entrance	EB	Removed	2502+00	Removed to eliminate weave (3000' between ramps)
N Yarbrough Dr Exit	EB	2507+75	2519+75	Shifted to give more space from ramp to intersection

Ramp	Direction	New Gore Station	Old Gore Station	Justification
N Yarbrough Dr Entrance	EB	2558+25	2545+75	Shifted to eliminate weave (3000' between ramps)
Lomaland Dr Exit	EB	2540+75	2569+50	Shifted to eliminate weave (3000' between ramps)
Lee Trevino Dr Exit	EB	2588+25	2590+50	Shifted due to wider mainlanes
Zaragoza Rd Exit	EB	2618+25	2666+50	Provide x-ramp configuration and access to Pendale Rd
Lee Trevino Dr Entrance	EB	2678+50	2625+75	Provide x-ramp configuration and access from Pendale Rd
Zaragoza Rd Entrance	EB	2736+50	2724+00	Shifted due to frontage road bypass
375 DC Exit	EB	2767+25	2758+25	Shifted due to wider mainlanes
Frontage Road Exit	EB	Removed	2771+50	Consolidate ramps
Eastlake Blvd Exit	EB	2815+50	2805+50	Shifted due to wider mainlanes
375 DC Entrance	EB	2839+00	2821+00	Shifted due to Eastlake Blvd Exit ramp
Frontage Road Entrance	EB	2859+75	2818+50	Provide x-ramp configuration
375 DC Exit	WB	2839+00	2835+25	Shifted due to wider mainlanes
Eastlake Blvd Entrance	WB	2821+50	2817+00	Shifted to eliminate weave (3000' between ramps)
Zaragoza Rd Exit	WB	2790+25	2787+00	Shifted due to wider mainlanes
Frontage Road Exit	WB	Removed	2741+50	Consolidate ramps
375 DC Entrance	WB	2757+50	2768+00	Reconfigured to provide exit to Zaragoza Rd
Frontage Road Entrance	WB	Removed	2720+50	Not needed due to Zaragoza Rd frontage road bypass

Ramp	Direction	New Gore Station	Old Gore Station	Justification
Zaragoza Road Entrance	WB	Removed	2689+25	Consolidate ramps
Pendale Exit	WB	2685+75	2667+75	Provide x-ramp configuration
Pendale Entrance	WB	2613+75	2622+50	Shifted due to wider mainlanes and wider ramp
Lee Trevino Dr Entrance	WB	2591+00	2598+00	Shifted to follow ramp design standards
Lomaland Dr Entrance	WB	2541+25	2572+50	Shifted to eliminate weave (3000' between ramps)
Yarbrough Dr Exit	WB	2559+25	2550+00	Shifted to eliminate weave (3000' between ramps)
Yarbrough Dr Entrance	WB	2514+50	2522+00	Shifted to follow ramp design standards
McRae Blvd Exit	WB	Removed	2506+50	Removed to eliminate weave (3000' between ramps)
McRae Blvd Entrance	WB	Removed	2473+25	Removed to eliminate weave (3000' between ramps)
Viscount Blvd Exit	WB	2484+50	N/A	Provide access to Viscount Blvd
Hawkins Blvd Exit	WB	2454+50	2443+50	Provide x-ramp configuration
Viscount Blvd Entrance 1	WB	Removed	2427+00	Removed to eliminate weave (3000' between ramps) Not needed due to Hawkins Blvd frontage road bypass
Viscount Blvd Entrance 2	WB	Removed	2424+25	Removed to eliminate weave (3000' between ramps) Not needed due to Hawkins Blvd frontage road bypass
Airway Blvd Exit	WB	2398+00	2402+00	Shifted due to wider mainlanes
Hawkins Blvd Entrance	WB	2374+50	2366+25	Shifted to eliminate weave (3000' between ramps)
Geronimo Dr Exit	WB	2348+25	2319+50	Provide x-ramp configuration

Ramp	Direction	New Gore Station	Old Gore Station	Justification
Airway Blvd Entrance	WB	2311+25	2342+75	Provide x-ramp configuration
Geronimo Entrance	WB	Removed	2284+00	Removed to eliminate weave (3000' between ramps)
US 62 (Paisano Dr) Exit	WB	Removed	2268+50	Removed due to spacing between intersections
Trowbridge Dr Entrance	WB	Removed	2258+50	Removed to eliminate weave (3000' between ramps)
US 62 (Paisano Dr) Entrance	WB	2237+00	2245+75	Shifted to give more space from intersection to ramp

Table 5-9. Recommended Lane Additions

Lane Type	Direction	From	To	Length (ft)	Justification
Auxiliary	EB	Trowbridge Dr	Geronimo Dr	3400	Additional capacity needed between ramps
Auxiliary	EB	Airway Blvd	Airway Blvd	2950	Additional capacity needed between ramps
Auxiliary	EB	Hunter Dr	Sumac Dr	3100	Additional capacity needed between ramps
Auxiliary	EB	Yarbrough Dr	Lomaland Dr	3000	Additional capacity needed between ramps
Auxiliary	EB	George Dieter Dr	Loop 375	3075	Increase safety
Auxiliary	WB	Loop 375	Loop 375	3125	Increase safety
Auxiliary	WB	Sumac Dr	McRae Dr	3000	Additional capacity needed between ramps
Auxiliary	WB	Hawkins Blvd	Airway Blvd	2625	Additional capacity needed between ramps
Mainlane	EB	US 62 (Paisano Dr)	Loop 375	56600	Increase capacity
Mainlane	EB	Loop 375	Segment 4	100	Increase capacity
Mainlane	EB	Loop 375	Segment 4	100	Increase capacity
Mainlane	WB	Segment 4	Loop 375	100	Increase capacity
Mainlane	WB	Segment 4	Loop 375	100	Increase capacity
Mainlane	WB	Loop 375	US 62 (Paisano Dr)	50200	Increase capacity
Mainlane	WB	Loop 375	George Dieter Dr	7175	Increase capacity
Mainlane	WB	Lee Trevino Dr	Yarbrough Dr	5450	Increase capacity
Mainlane	WB	Yarbrough Dr	Hawkins Blvd	14325	Increase capacity

Lane Type	Direction	From	To	Length (ft)	Justification
Mainlane	WB	Geronimo Dr	US 62 (Paisano Dr)	5575	Increase capacity
Frontage Road	EB	Geronimo Dr	Airway Blvd	1675	Provide auxiliary lane between ramps
Frontage Road	EB	Airway Blvd	Hawkins Blvd	1000	Provide auxiliary lane between ramps
Frontage Road	EB	Hawkins Blvd	Hunter Dr	2075	Provide auxiliary lane between ramps
Frontage Road	EB	George Dieter Dr	Loop 375	1075	Provide auxiliary lane between ramps
Frontage Road	EB	Loop 375	Segment 4	1450	Provide auxiliary lane between ramps
Frontage Road	WB	Segment 4	Loop 375	850	Provide auxiliary lane between ramps
Frontage Road	WB	Loop 375	George Dieter Dr	3325	Provide auxiliary lane between ramps
Frontage Road	WB	Hunter Dr	Hawkins Blvd	2150	Provide auxiliary lane between ramps
Frontage Road	WB	Hawkins Blvd	Airway Blvd	1200	Provide auxiliary lane between ramps
Frontage Road	WB	Airway Blvd	Geronimo Dr	1450	Provide auxiliary lane between ramps

Table 5-10. Recommended Intersection Improvements

Cross Street	Side	Changes	Relative Cost of Improvement
US 62 (Paisano Dr)	EB	Add U-turn Add through lane to FR approach Add right turn lane to NB US 62 (Paisano Dr)	$$
	WB	Add right turn lane, thru lane and U-turn lane to FR approach Add right turn lane to SB US 62 (Paisano Dr)	$$
Trowbridge Dr	EB	Add right turn lane to FR approach Add thru lane to NB Trowbridge Dr Add thru lane to SB Trowbridge Dr	$$
	WB	Add right turn lane, thru lane and left turn lane to FR approach Add thru lane to SB Trowbridge Dr	$$
Geronimo Dr	EB	Add right turn lane and thru lane to FR approach Add right turn lane to NB Geronimo Dr	$$
	WB	Add thru lane to FR approach	$
Airway Blvd	EB	Add right turn lane and left turn lane to FR approach Add thru lane to SB Airway Blvd	$$
	WB	Add right turn lane and thru lane to FR approach Add thru lane to SB Airway Blvd	$$
Hawkins Blvd	EB	Convert to SPUI with bypasses	$$$$
	WB	Convert to SPUI with bypasses	$$$$
Hunter Dr/Viscount Blvd	EB	Added thru lane to FR approach	$
	WB	Add right turn lane and two thru lanes to FR approach Add right turn lane to SB Hunter Dr	$$

Cross Street	Side	Changes	Relative Cost of Improvement
Giles Rd/McRae Blvd	EB	Add thru lane and left turn lane to FR approach Add right turn lane to NB Giles Rd	$$
	WB	Add thru lane to FR approach Add right turn lane to SB McRae Blvd	$
Corral Dr/Sumac Dr	EB	Add right turn lane and thru lane to FR approach	$
	WB	Add right turn lane and thru lane to FR approach	$
Yarbrough Dr	EB	Add right turn lane and left turn lane to FR approach Add thru lane to NB Yarbrough Dr Add left turn lane to SB Yarbrough Dr	$$
	WB	Add dedicated thru lane and left turn lane to FR approach Add thru lane to SB Yarbrough Dr Add left turn lane to NB Yarbrough Dr	$$
Lomaland Dr	EB	Add thru lane and left turn lane to FR approach	$
	WB	Add right turn lane to SB Lomaland Dr Add thru lane to FR approach	$
Lee Trevino Dr	EB	Add thru lane and left turn lane to FR approach Add right turn lane to NB Lee Trevino Dr Add thru lane to SB Lee Trevino Dr	$$
	WB	Add thru lane to FR approach	$
Pendale Rd	EB	Add four lane cross street with a U-turn	$$$$
	WB	Add four lane cross street with a U-turn	$$$$
George Dieter Dr/Zaragoza Rd	EB	Convert to SPUI with bypasses	$$$$
	WB	Convert to SPUI with bypasses	$$$$

Additional consideration was given to areas of high congestion in Segment 3 and to adaptive lane access, which are discussed in the following subsections.

(a) Airway Boulevard

Heavy left turning movement from the eastbound frontage road to Airway Boulevard and from Airway Boulevard to the eastbound frontage road is causing severe congestion. A potential solution is the continuous flow intersection (CFI). This innovative intersection design requires drivers to turn left before they reach the intersection and cross over to the right side further down the road. Increased storage bays make this configuration ideal for high volumes of left-turning traffic. Although uncommon, this configuration would significantly improve LOS at the Airway Boulevard interchange. The proposed phasing and layout of the Airway Boulevard CFI is shown in Figure 5-11.

Figure 5-11. Airway Boulevard Continuous Flow Intersection (CFI)

(b) Yarbrough Drive

Frontage road intersections in the area between Viscount Boulevard and Lee Trevino Drive are experiencing significant congestion in the 2042 Build scenario. Minimal ramping and high demand from large nearby residential communities are leading to high demand at these intersections. Eight direct connectors are proposed at the Yarbrough Drive to provide all movements between Yarbrough Drive and I-10. Yarbrough Drive falls in the center of the congested area between Viscount Boulevard and Lee Trevino Drive and nearly halfway between US 54 and Loop 375. Yarbrough Drive also connects to Loop 375 along the US-Mexico border and to Montana Avenue, before turning into Global Reach Drive, which continues to Spur 601. Upgrades along Yarbrough Drive could turn it into a major arterial or even a highway. This would hopefully pull traffic off of nearby arterials and alleviate traffic at frontage road intersections. Yarbrough Drive DCs were evaluated in a travel demand model to see if they produce the desired reduction in traffic at nearby frontage road intersections. The DCs did not pull a significant amount of traffic off of parallel arterials, and the placement of DCs created undesirable weaving issues. Instead, a three-level interchange is proposed at Yarbrough Drive and I-10, with the Yarbrough Drive through lanes bypassing frontage road intersections.

(c) Adaptive Lane Access

With heavy industrial activity along the corridor, it would be very beneficial to remove truck traffic from the general-purpose lanes and redirect them to adaptive lanes. Many studies have been done on truck-only lanes, but there are few applications across the United States. Removing trucks from the mainlanes can relieve congestion during peak hour, increase safety for general vehicles, and improve efficiency and reliability for trucks that are carrying time-sensitive goods.

It is critical to plan for truck use of adaptive lanes early, as trucking facilities have different design standards and requirements. Access points need to be provided near truck trip origins and destinations. Currently, adaptive lanes are proposed between Redd Road and Loop 375, with an intermediate access point at Buffalo Soldier Road. At Buffalo Soldier Road, ramps to/from the eastbound and westbound adaptive lanes would meet at an elevated intersection above I-10. From this elevated intersection, trucks would have access to a bidirectional facility extending north to the Airport and south to Industrial Ave. The facility will also be analyzed for passenger vehicles, transit vehicles and mixed-flow scenarios for comparison of LOS and usage. The proposed layout of the Buffalo Soldier Road elevated access points is shown in Figure 5-12.

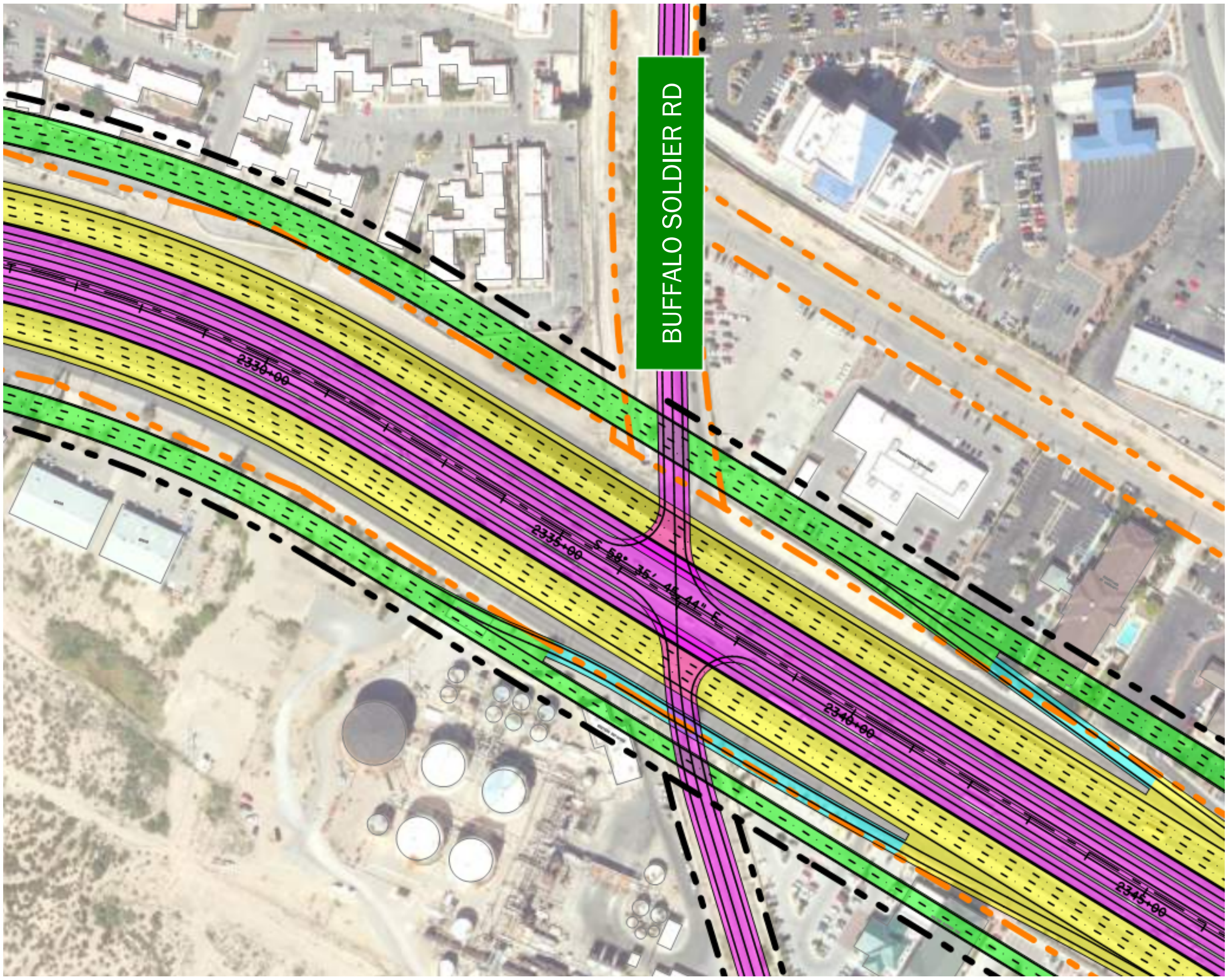


Figure 5-12. Buffalo Soldier Road Adaptive Lane Access

5.9 Segment 4 Improvements

Segment 4 includes I-10 between Eastlake Boulevard and FM 3380.

Alternatives 2 and 3 were proposed for Segment 4. Alternative 2 was proposed due to its potential safety benefits, and because the 15-foot inside shoulder could aid with incident management and provide opportunities for future use. Alternative 3 was proposed due to its adaptive lane and ability to provide road users a reliable trip through the segment. Alternative 4 would provide an even more reliable trip but was considered excessive due to relatively low traffic volumes in this segment. Alternative 3 differs from Alternative 2 in that buffer separated adaptive lanes are provided in both directions from Segment 3 to east of Horizon Boulevard.

Along this entire segment (from the Loop 375 to FM 3380) a minimum of three mainlanes are provided in each direction. In order to accommodate a wider mainlane footprint and recommended ramps, frontage roads were pushed out in many areas. A new interchange was added near MM 40.5. Frontage roads are continuous throughout Segment 4.

Table 5-11 lists recommended ramping changes, **Table 5-12** lists recommended lane additions, and **Table 5-13** lists recommended intersection improvements.

Table 5-11. Recommended Ramping Changes

Ramp	Direction	New Gore Station	Old Gore Station	Justification
Horizon Blvd Exit	EB	2896+50	2952+00	Provide x-ramp configuration
Eastlake Blvd Entrance	EB	2992+25	2896+25	Provide x-ramp configuration
New Interchange Exit	EB	3021+25	N/A	Provide access to new interchange
Horizon Blvd Entrance	EB	3121+50	3041+50	Provide x-ramp configuration
FM 1110 Exit	EB	3153+00	3244+25	Provide x-ramp configuration
New Interchange Entrance	EB	3230+75	N/A	Provide access from new interchange
FM 1110 Entrance	EB	3291+25	3279+25	Shifted to give more space from intersection to ramp
FM 793 Exit	EB	3570+50	3603+75	Shifted to give more space from ramp to intersection
FM 793 Entrance	EB	3641+50	3627+00	Shifted to give more space from intersection to ramp
FM 3380 Exit	EB	3898+50	3923+00	Shifted to give more space from ramp to intersection
FM 3380 Entrance	EB	3947+25	3945+50	Shifted to give more space from intersection to ramp
FM 3380 Exit	WB	3944+00	3944+25	Shifted to give more space from ramp to intersection
FM 3380 Entrance	WB	3911+75	3923+25	Shifted to give more space from intersection to ramp
FM 793 Exit	WB	3644+00	3624+25	Shifted to give more space from ramp to intersection

Ramp	Direction	New Gore Station	Old Gore Station	Justification
FM 793 Entrance	WB	3571+75	3606+25	Shifted to give more space from intersection to ramp
FM 1110 Exit	WB	3293+75	3281+25	Shifted to give more space from ramp to intersection
New Interchange Exit	WB	3230+75	N/A	Provide access to new interchange
FM 1110 Entrance	WB	3152+50	3247+50	Provide x-ramp configuration
Horizon Blvd Exit	WB	3121+25	3035+25	Provide x-ramp configuration
New Interchange Entrance	WB	3030+50	N/A	Provide access from new interchange
Eastlake Blvd Exit	WB	2990+00	2896+25	Provide x-ramp configuration
Horizon Blvd Entrance	WB	2896+50	2933+50	Provide x-ramp configuration
Frontage Road Exit	WB	2864+00	N/A	Provide access to Joe Battle Blvd

Table 5-12. Recommended Lane Additions

Lane Type	Direction	From	To	Length (ft)	Justification
Auxiliary	EB	New Interchange	New Interchange	3150	Increase safety
Auxiliary	WB	New Interchange	New Interchange	3125	Increase safety
Mainlane	EB	Segment 3	Horizon Blvd	18125	Increase capacity
Mainlane	EB	Segment 3	Eastlake Blvd	5650	Increase capacity
Mainlane	EB	FM 1110	FM 793	27925	Increase capacity
Mainlane	EB	FM 793	FM 3380	25700	Increase capacity
Mainlane	WB	FM 3380	FM 793	26755	Increase capacity
Mainlane	WB	FM 793	FM 1110	27800	Increase capacity
Mainlane	WB	Horizon Blvd	Segment 3	19050	Increase capacity
Mainlane	WB	Eastlake Blvd	Segment 3	5650	Increase capacity
Frontage Road	EB	Segment 3	Eastlake Blvd	750	Provide auxiliary lane between ramps
Frontage Road	EB	Eastlake Blvd	Horizon Blvd	7200	Provide additional lane between ramps
Frontage Road	EB	Horizon Blvd	New Interchange	7725	Provide new frontage road
Frontage Road	EB	New Interchange	FM 1110	5500	Provide new frontage road
Frontage Road	EB	FM 1110	FM 793	33950	Provide new frontage road
Frontage Road	EB	FM 793	FM 3380	30525	Provide new frontage road
Frontage Road	WB	FM 3380	FM 793	30750	Provide new frontage road
Frontage Road	WB	FM 793	FM 1110	33700	Provide new frontage road

Lane Type	Direction	From	To	Length (ft)	Justification
Frontage Road	WB	FM 1110	New Interchange	5500	Provide new frontage road
Frontage Road	WB	New Interchange	Horizon Blvd	6775	Provide new frontage road
Frontage Road	WB	Horizon Blvd	Eastlake Blvd	7000	Provide additional lane between ramps
Frontage Road	WB	Eastlake Blvd	Segment 3	1100	Provide auxiliary lane between ramps

Table 5-13. Recommended Intersection Improvements

Cross Street	Side	Changes	Relative Cost of Improvement	No Build PM LOS	Build PM LOS
Eastlake Blvd	EB	Convert to CFI, SPUI or DDI (see write up)	$$$$	F	?
	WB	Convert to CFI, SPUI or DDI (see write up)	$$$$	F	?
Horizon Blvd	EB	Convert to SPUI or DDI (see write up)	$$$$	F	?
	WB	Convert to SPUI or DDI (see write up)	$$$$	F	?
New Interchange	EB	Add six lane cross street with a U-turn	$$$$	N/A	N/A
	WB	Add six lane cross street with a U-turn	$$$$	N/A	N/A
FM 793	EB	Add right turn lane to FR approach Add right turn lane to NB FM 793	$	D	F
	WB	Add thru lane to FR approach	$	B	B
FM 3380	EB	Add thru lane to FR approach	$	A	A
	WB	Add thru lane to FR approach	$	A	A

There were two intersections in Segment 4 that required additional considerations due to high turning volumes. The design of these intersections is discussed in the following subsection.

(a) Eastlake Boulevard and Horizon Boulevard

Heavy left turning traffic from the eastbound frontage road and heavy right turning traffic from southbound Eastlake Boulevard and Horizon Boulevard has produced unacceptable LOS at these interchanges. Initially, additional left turn lanes were added at each intersection to alleviate congestion, but three left-turning lanes were necessary to meet demand. This was undesirable, so additional options were explored.

Research identified intersections designed specifically to target high left turning volumes, which include the CFI, the single point urban interchange (SPUI), and the diverging diamond interchange (DDI). The main differences between these interchanges and a traditional diamond interchange include reduced number of signal phases (CFI, DDI, and SPUI) and increased storage bays (CFI). These interchanges were analyzed with volumes from the Eastlake Boulevard and Horizon Boulevard interchanges and operated effectively with the provision of two free flowing right turn lanes for the southbound to westbound movement.

A CFI, DDI, or SPUI is proposed at Eastlake Boulevard, and a DDI or SPUI is proposed at Horizon Boulevard. Two free flowing right turns are provided for the southbound to westbound movements at these interchanges to accommodate high right turn volumes. Impacts and access to adjacent properties will determine which of the mentioned interchange layouts is chosen.

6. Traffic

6.1 Traffic Projections and Analysis Methodology

Details on traffic projections and analysis methodology are shown in Appendix E. Projects that move forward into the next phase of project development will go through a separate traffic projections and analysis process specific to the new project limits identified.

6.2 Existing vs Proposed

The Segment 1 alternative comparison clearly shows that LOS improves in both directions of travel and in both peak hours in the Build alternative when compared with the No Build alternative, as shown in Table 6-1. The PM peak hour showed the most improvement, with the eastbound percent of segments at LOS E or worse going from 33 percent to 11 percent and the westbound percent of segments at LOS E or worse going from 32 percent to 18 percent.

Table 6-1. Segment 1 Percent Passing Comparison – From the HCS Analysis

Direction	Time Period	Existing		2042 No-Build		2042 Build	
		% LOS D or better	% LOS E or worse	% LOS D or better	% LOS E or worse	% LOS D or better	% LOS E or worse
EB	AM	87%	13%	80%	20%	93%	7%
	PM	95%	5%	67%	33%	89%	11%
WB	AM	91%	9%	82%	18%	94%	6%
	PM	82%	18%	68%	32%	82%	18%

The Segment 2 alternative comparison clearly shows that LOS improves in both the directions of travel and in both peak hours in the Build alternative when compared with the No Build alternative, as shown in Table 6-2. The PM peak hour showed the most improvement, with the eastbound percent of segments at LOS E or worse going from 76 percent to six percent and the westbound percent of segments at LOS E or worse going from 53 percent to 10 percent LOS E or worse. The eastbound AM peak hour also improved significantly, with the number segments at LOS E or worse reducing from 52 percent to nine percent.

Table 6-2. Segment 2 Percent Passing Comparison - From the HCS Analysis

Direction	Time Period	Existing		2042 No-Build		2042 Build	
		% LOS D or better	% LOS E or worse	% LOS D or better	% LOS E or worse	% LOS D or better	% LOS E or worse
EB	AM	88%	12%	48%	52%	91%	9%
	PM	85%	15%	24%	76%	94%	6%
WB	AM	89%	11%	56%	44%	58%	42%
	PM	95%	5%	47%	53%	90%	10%

The Segment 2 No Build and Build 2042 alternative comparison was further analyzed using VISSIM 7, a traffic simulation software. The analysis shows improved driving conditions along the entire segment in the Build alternative when compared with the No Build alternative. Vehicle miles traveled (VMT) increases in the Build alternative when compared with the No Build alternative, while annual delays in both hour and cost decrease, as shown in Table 6-3 and Table 6-4.

Table 6-3. Segment 2 AM Peak Hour Measures of Effectiveness Comparison

MOE	AM Peak Hour		
	Existing AM	No-Build 2042 AM	Build 2042 AM
Total travel time (veh-hr)	2,652.27	5,499.36	5,499.34
Total Delay time (veh-hr)	699	3,161	2,663
Calculated Total Delay time (veh-hr)	639	2,647	2,247
Average Delay time per vehicle (sec/veh)	81	275	210
Average speed (mph)	41	23	27
Number of vehicles served	28,330	34,703	38,549
Travel Time (min/veh)	5.62	9.51	8.56
Annual Delay Hours	524,000	2,371,000	1,998,000
Annual Delay ($)	$ 9,520,000	$43,060,000	$36,280,000
VMT	107,154	127,001	147,836

Notes: Annual delay dollars based on 250 Working days/ 3 hours of peak traffic in each AM & PM peak / $18.19 per hour based on TTI's 2015 Urban Mobility Scorecard

Table 6-4. Segment 2 PM Peak Hour Measures of Effectiveness Comparison

MOE	PM Peak Hour		
	Existing PM	No-Build 2042 PM	Build 2042 PM
Total travel time (veh-hr)	2,982	7,875	4,901
Total Delay time (veh-hr)	974	6,103	1,785
Calculated Total Delay time (veh-hr)	872	4,319	1,574
Average Delay time per vehicle (sec/veh)	107	570	135
Average speed (mph)	37	12	33
Number of vehicles served	29,307	27,282	42,008
Travel Time (min/veh)	6.11	17.32	7.00
Annual Delay Hours	731,000	4,578,000	1,339,000
Annual Delay ($)	$13,270,000	$83,140,000	$24,320,000
VMT	109,308	95,023	160,464

Notes: Annual delay dollars based on 250 Working days/ 3 hours of peak traffic in each AM & PM peak / $18.19 per hour based on TTI's 2015 Urban Mobility Scorecard

The Segment 3 alternative comparison clearly shows that LOS improves in both the directions of travel and in both peak hours in the Build alternative when compared with the No Build alternative, as shown in Table 6-5. Both the AM and PM peak hours showed significant improvements over the No Build. The largest improvement was in the AM peak hour in the westbound direction, with the number of segments at LOS E or worse reducing from 53 percent to zero percent.

Table 6-5. Segment 3 Percent Passing Comparison

Directio n	Time Period	Existing		2042 No-Build		2042 Build	
		% LOS E or worse	% LOS D or better	% LOS E or worse	% LOS E or worse	% LOS D or better	% LOS E or worse
EB	AM	100%	0%	64%	36%	91%	9%
	PM	87%	13%	36%	64%	79%	21%
WB	AM	93%	7%	47%	53%	100%	0%
	PM	98%	2%	55%	45%	96%	4%

The Segment 3 No Build and Build 2042 alternative comparison was further analyzed using VISSIM 7. The analysis shows improved driving conditions along the entire segment in the Build alternative when compared with the No Build alternative. VMT increases in the Build alternative when compared with the No Build alternative, while annual delays in both hour and cost decrease, as shown in Table 6-6 and Table 6-7.

Table 6-6. Segment 3 AM Peak Hour Measures of Effectiveness Comparison

MOE	AM Peak Hour		
	Existing AM	No-Build 2042 AM	Build 2042 AM
Total travel time (veh-hr)	4,098	8,447	5,167
Total Delay time (veh-hr)	825	4,522	1,453
Calculated Total Delay time (veh-hr)	744	3,674	1,296
Average Delay time per vehicle (sec/veh)	69	285	97
Average speed (mph)	42	24	35
Number of vehicles served	38,687	46,403	48,326
Travel Time (min/veh)	6.36	10.92	6.42
Annual Delay Hours	619,000	3,391,000	1,090,000
Annual Delay ($)	$11,240,000	$61,580,000	$19,790,000
VMT	170,592	204,005	181,142

Notes: Annual delay dollars based on 250 Working days/ 3 hours of peak traffic in each AM & PM peak / $18.19 per hour based on TTI's 2015 Urban Mobility Scorecard

Table 6-7. Segment 3 PM Peak Hour Measures of Effectiveness Comparison

MOE	PM Peak Hour		
	Existing PM	No-Build 2042 PM	Build 2042 PM
Total travel time (veh-hr)	4,613	9,644	6,878
Total Delay time (veh-hr)	1,078	5,788	2,584
Calculated Total Delay time (veh-hr)	961	4,554	2,217
Average Delay time per vehicle (sec/veh)	85	357	153
Average speed (mph)	40	21	30
Number of vehicles served	40,895	45,986	52,229
Travel Time (min/veh)	6.77	12.58	7.90
Annual Delay Hours	809,000	4,341,000	1,938,000
Annual Delay ($)	$14,690,000	$78,830,000	$35,190,000
VMT	183,865	198,318	209,537

Notes: Annual delay dollars based on 250 Working days/ 3 hours of peak traffic in each AM & PM peak / $18.19 per hour based on TTI's 2015 Urban Mobility Scorecard

The Segment 4 alternative comparison clearly shows that LOS improves in both directions of travel and in both peak hours in the Build alternative when compared with the No Build alternative, as shown in Table 6-8. There are no segments in Segment 4 that operate at LOS E or worse in the Build alternative.

Table 6-8. Segment 4 Percent Passing Comparison

Direction	Time Period	Existing		2042 No-Build		2042 Build	
		% LOS D or better	% LOS E or worse	% LOS D or better	% LOS E or worse	% LOS D or better	% LOS E or worse
EB	AM	100%	0%	89%	11%	100%	0%
	PM	89%	11%	79%	21%	100%	0%
WB	AM	100%	0%	79%	21%	100%	0%
	PM	100%	0%	100%	0%	100%	0%

6.3 Conclusion

Based on available data from TxDOT, cities in the El Paso Metropolitan area, and El Paso MPO, and on supplemental data provided by GRV, the traffic analysis concluded that if improvements are not implemented on I-10, delays and user costs will significantly increase over the next 20 years. Potential negative impacts to the economy (from large delays and increased incidences due to substandard design) can be mitigated if the improvements recommended in this report are implemented.

More details related to traffic analyses can be found in Appendix E.

7. Safety

I-10 in El Paso has had a recent increase in crashes, and TxDOT is placing high importance on reversing this trend. The public also put an emphasis on safety, rating it in the top three areas of concern for all four segments along the corridor, as shown in Figure 7-1.

Figure 7-1. Public Involvement

7.1 Existing Crash Analysis

To analyze the current safety impacts along I-10, crash data from years 2011 through 2015 was obtained from TxDOT and reviewed for crash patterns, trends, and types. Figure 7-2 shows crash density along I-10, Table 7-1 shows a crash rate analysis summary, and Table 7-2 shows the top crash contributing factors by segment.

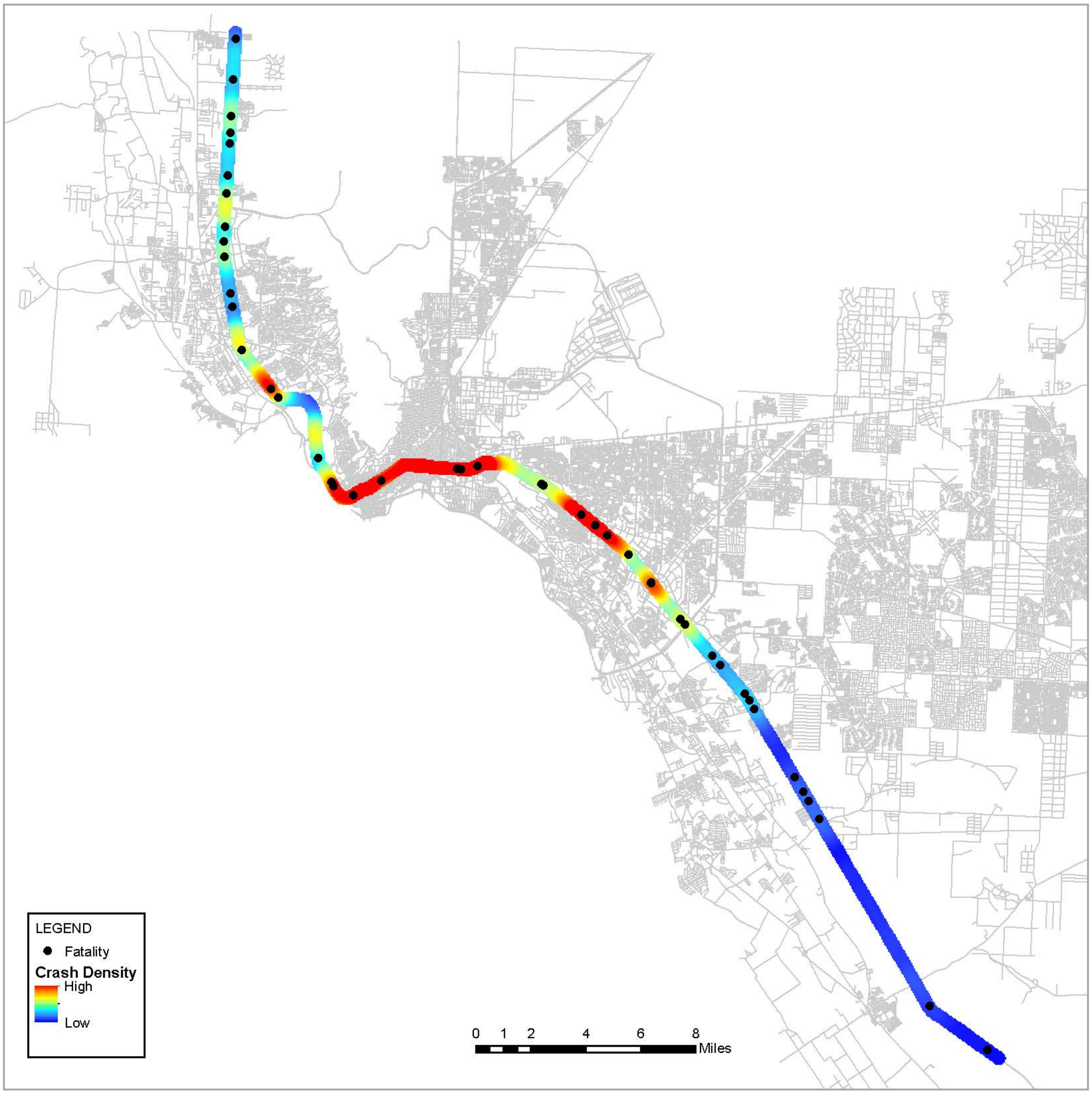


Figure 7-2. I-10 Crash Density (2011-2015)

Table 7-1. I-10 Crash Rate Analysis Summary (2011-2015)

	Year				
	2011	2012	2013	2014	2015
Yearly Total	410	658	411	607	1705
Average Daily Traffic Volume*	115,467	115,901	121,025	102,827	106,710
I-10 Corridor Crash Rate	17.50	27.98	16.73	29.09	78.73
Statewide Average Crash Rate**	70.21	94.14	99.44	108.82	142.21
Corridor Safety Ratio	0.25	0.30	0.17	0.27	0.55
Five-Year Annual Average Safety Ratio	0.31 or 69% less crashes than other urban interstate facilities				

*TxDOT Transportation Data Management System
**TxDOT Statewide Traffic Crash Rates for an Urban Interstate facility.

Table 7-2. Top Crash Contributing Factors by Segment (2011-2015)

	Segment 1	Segment 2	Segment 3	Segment 4
Speeding	267	338	600	101
Driver Inattention/Distraction	96	102	134	32
Unsafe Lane Change	85	93	134	15
Followed Too Closely	13	27	60	5
Fatigued or Asleep	16	5	4	4
Faulty Evasive Action	23	15	25	8
Failed to Drive in Single Lane	19	9	8	11
Alcohol Related	29	27	25	23
Other	167	101	127	88
Information Not Reported	199	215	389	62
Total Crashes	914	932	1506	349

7.2 Predictive Crash Analysis

A predictive crash analysis for each corridor-wide alternative was performed using ISATe to determine the relative safety of corridor-wide alternatives. Table 7-3 summarizes the results of this analysis. Each alternative is ranked from 1-5, with 5 being the worst. More detailed results and descriptions of how the predictive crash analysis was performed can be found in Appendix C.

Table 7-3. Predictive Crash Analysis Comparison

Alternative	Total	Fatal	Injury	Property Damage Only
No Build	5	4	4	5
1	2	2	2	2
2	1	1	1	1
3	3	3	3	3
4	4	5	5	4

Results of the predictive crash analysis show Alternative 4 producing the most fatal and injury crashes. These results do not take into account the potential removal of truck traffic from the mainlanes. The barrier separated adaptive lanes were modeled as a four-lane facility with twice the expected traffic volume (instead of a two lane facility) due to software limitations, and the results were divided in half before being added to the mainlane crashes for Alternative 4. It is likely that crashes on the barrier separated adaptive lanes are overestimated since the potential for lane changes in the model (on a four-lane facility) created more opportunity for crashes.

Alternative 2, with its enhanced shoulder, had the best results in regards to safety, which was its intended purpose.

A predictive crash analysis was also conducted for the No Build and Build scenarios using the Interactive Highway Safety Design Model (IHSDM) to assess the potential safety benefits of recommended freeway capacity and ramp improvements compared to the current No Build condition. The analysis is “comparative” because it is based on the national safety performance functions (SPFs) published in the Highway Safety Manual (HSM). There are no approved and published calibration factors for predicting interstate and ramp crashes in Texas, therefore the analysis results do not represent the actual expected number of crashes but rather provide an indication of whether crashes and crash rates will increase or decrease.

The current and proposed geometry and projected traffic volume data was entered into IHSDM for the freeway segments and ramps. The software predicted the number of crashes on the 57.5 miles of freeway for the 21-year period from 2022 to 2042 (inclusive). The IHSDM model outputs for the No Build and Build mainlane conditions are presented in Appendix F.

The results of the freeway analysis are presented in Table 7-4 and Table 7-5. The predicted No Build crashes total 21,806 for the 21 years or 1,038 crashes per year, with 21.5 fatal and incapacitating injury crashes per year. The Build crashes total 15,916 for the 21 years or 758 crashes per year with 17.5 fatal and incapacitating injury crashes per year. The total crashes in the Build scenario is predicted to decrease by 27.0 percent. The fatal and serious injury crashes on the freeway are predicted to decrease by 18.5%.

Table 7-4. Predicted Freeway Crashes by Severity (2022 – 2042)

	Severity					Total Crashes	
	Fatal	Incapacitating Injury	Non-Incapacitating Injury	Possible Injury	PDO	Total	% Change
No Build	126	325	2221	3968	15167	21806	
Build	103	265	1808	3225	10515	15916	-27.0%

Table 7-5. Average Annual Predicted Freeway Crashes by Severity (2022 – 2042)

	Severity					Total Crashes	
	Fatal	Incapacitating Injury	Non-Incapacitating Injury	Possible Injury	PDO	Total	% Change
No Build	6.0	15.5	105.7	188.9	122.2	1038.4	
Build	4.9	12.6	86.1	153.6	500.7	757.9	-27.0%

Figures 7-3 through 7-6 show a breakdown of predicted crashes by segment.

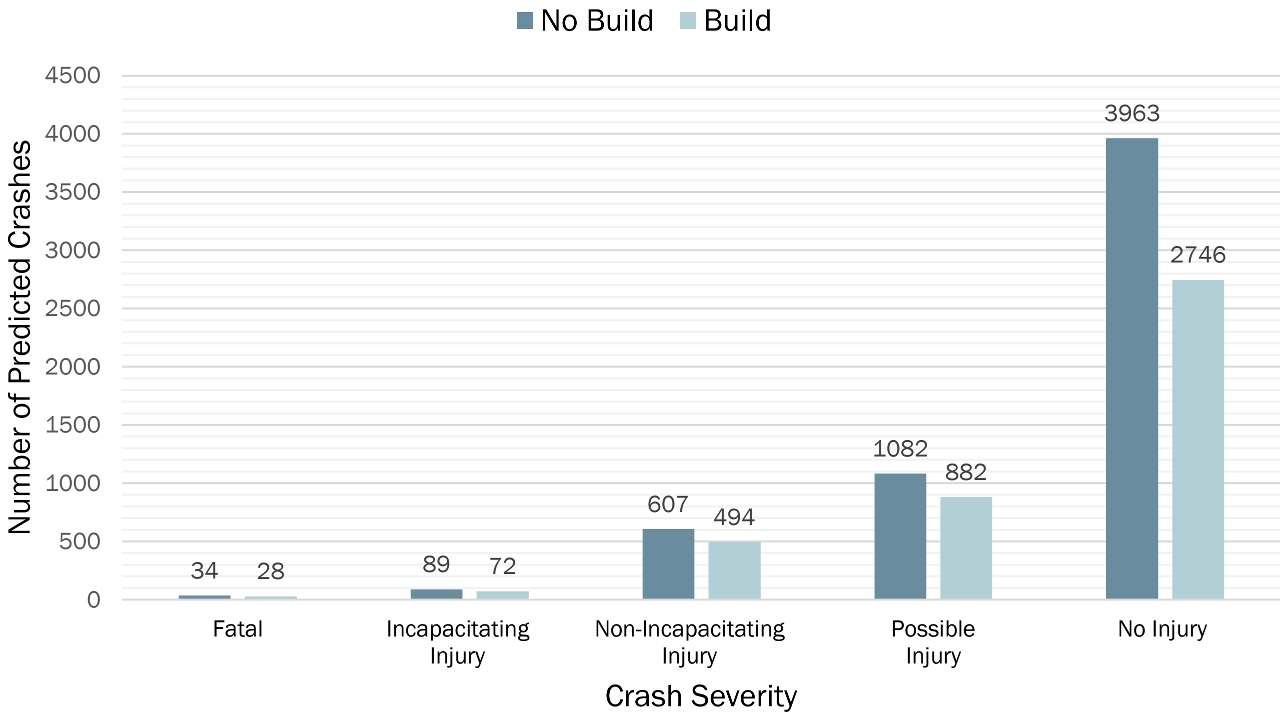


Figure 7-3. Segment 1 Predicted Freeway Crashes by Severity (2022-2042)

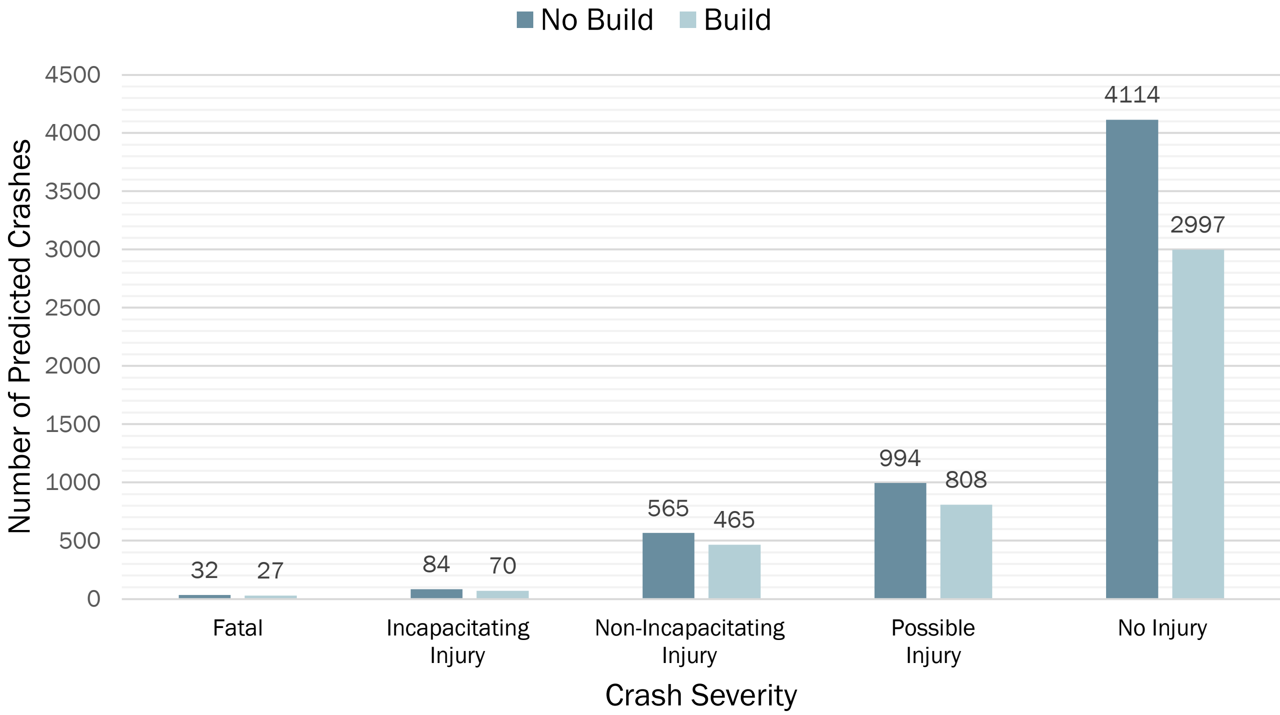


Figure 7-4. Segment 2 Predicted Freeway Crashes by Severity (2022-2042)

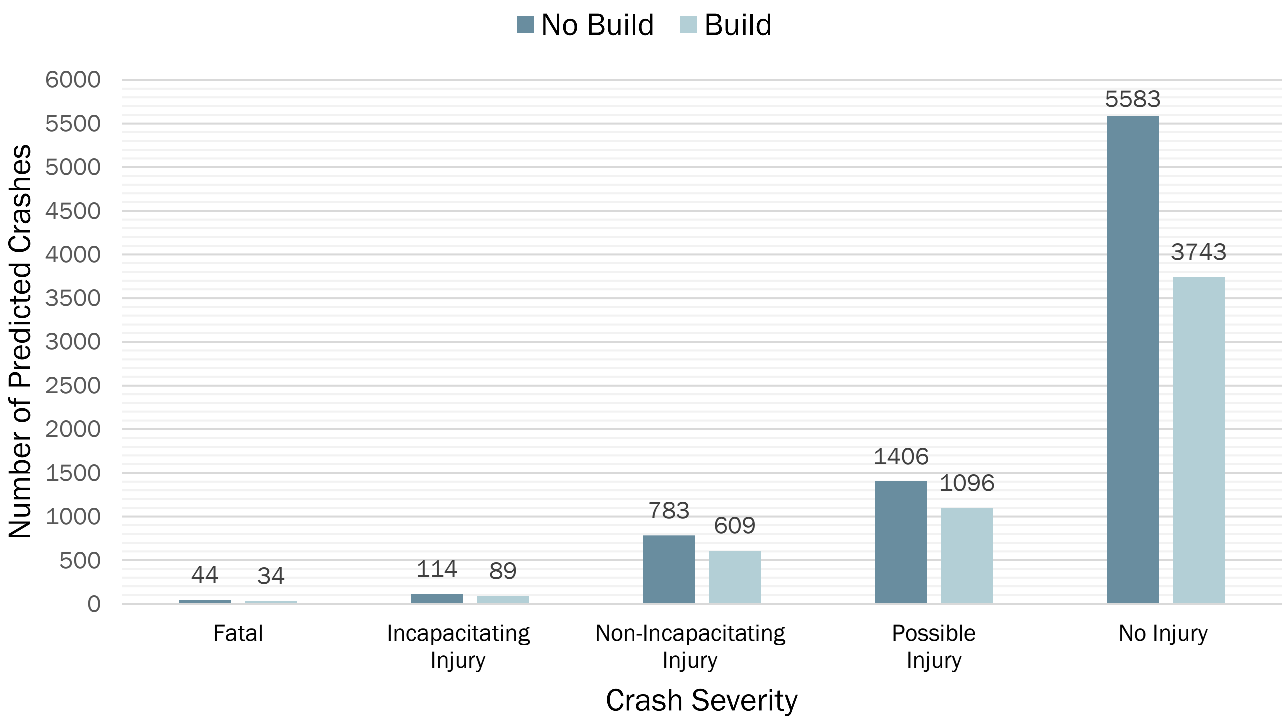


Figure 7-5. Segment 3 Predicted Freeway Crashes by Severity (2022-2042)

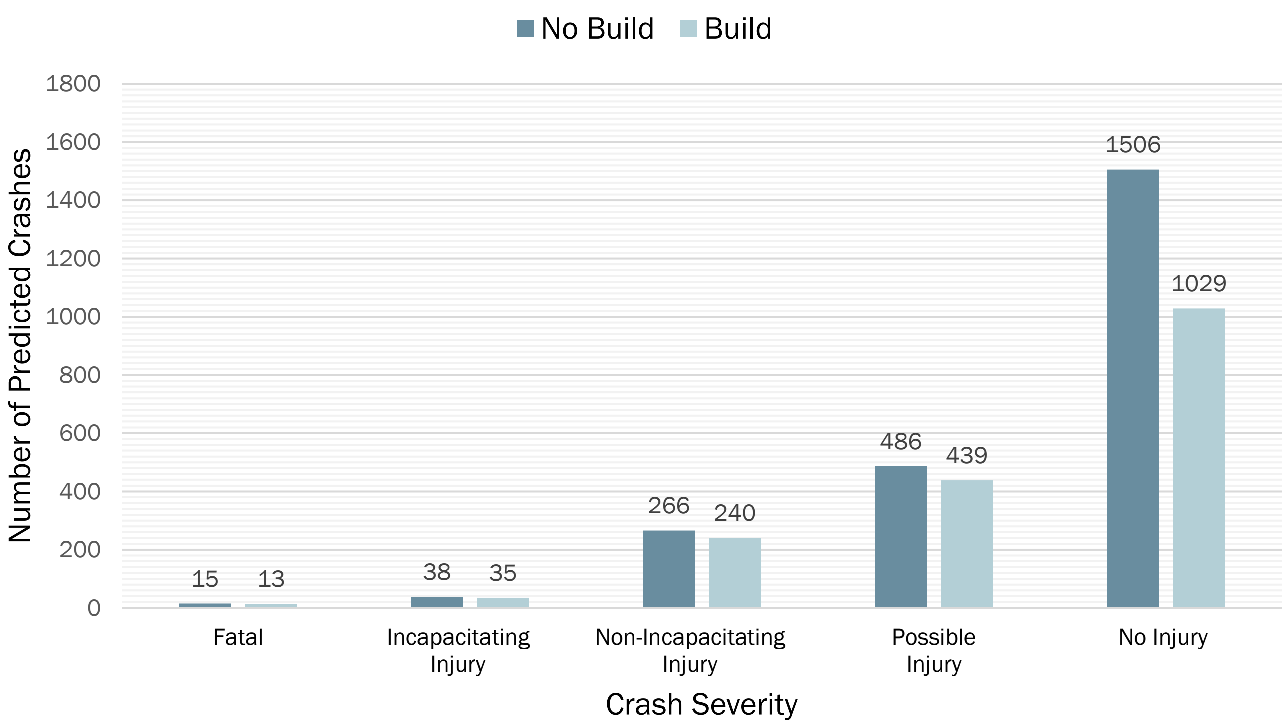


Figure 7-6. Segment 4 Predicted Freeway Crashes by Severity (2022-2042)

7.3 Crash Cost Comparison

As part of the predictive crash analysis, a crash cost comparison between the No Build and Build scenarios was produced. Crash cost is the monetary value of the impact of a crash based on crash severity. The purpose of the crash cost comparison was to determine whether or not the Build scenario would be cost efficient in terms of safety. The comparison was done using 2042 dollars. Crash cost was calculated by using the recommended national KABCO comprehensive crash unit costs in 2016 dollars as the base values for all crash severity types. A two percent yearly growth rate was used to obtain unit costs in 2042 dollars, as shown in Table 7-6.

Table 7-6. Unit Costs by Crash Type

Crash Severity	2018 Comprehensive Crash Unit Costs	2042 Comprehensive Crash Unit Costs
K	$11,295,400	$18,901,927
A	$655,000	$1,096,089
B	$198,500	$332,173
C	$125,600	$210,181
O	$11,900	$19,914

Crash data from the IHSDM model outputs for the No Build and Build scenarios was divided into quarter-mile segments along the I-10 corridor. The calculated unit costs in 2042 dollars were then applied to the crash data, and the difference in crash cost between the No Build and Build scenarios was calculated per quarter-mile segment. Figures 7-7 through 7-10 show crash cost difference for each of the four context areas.

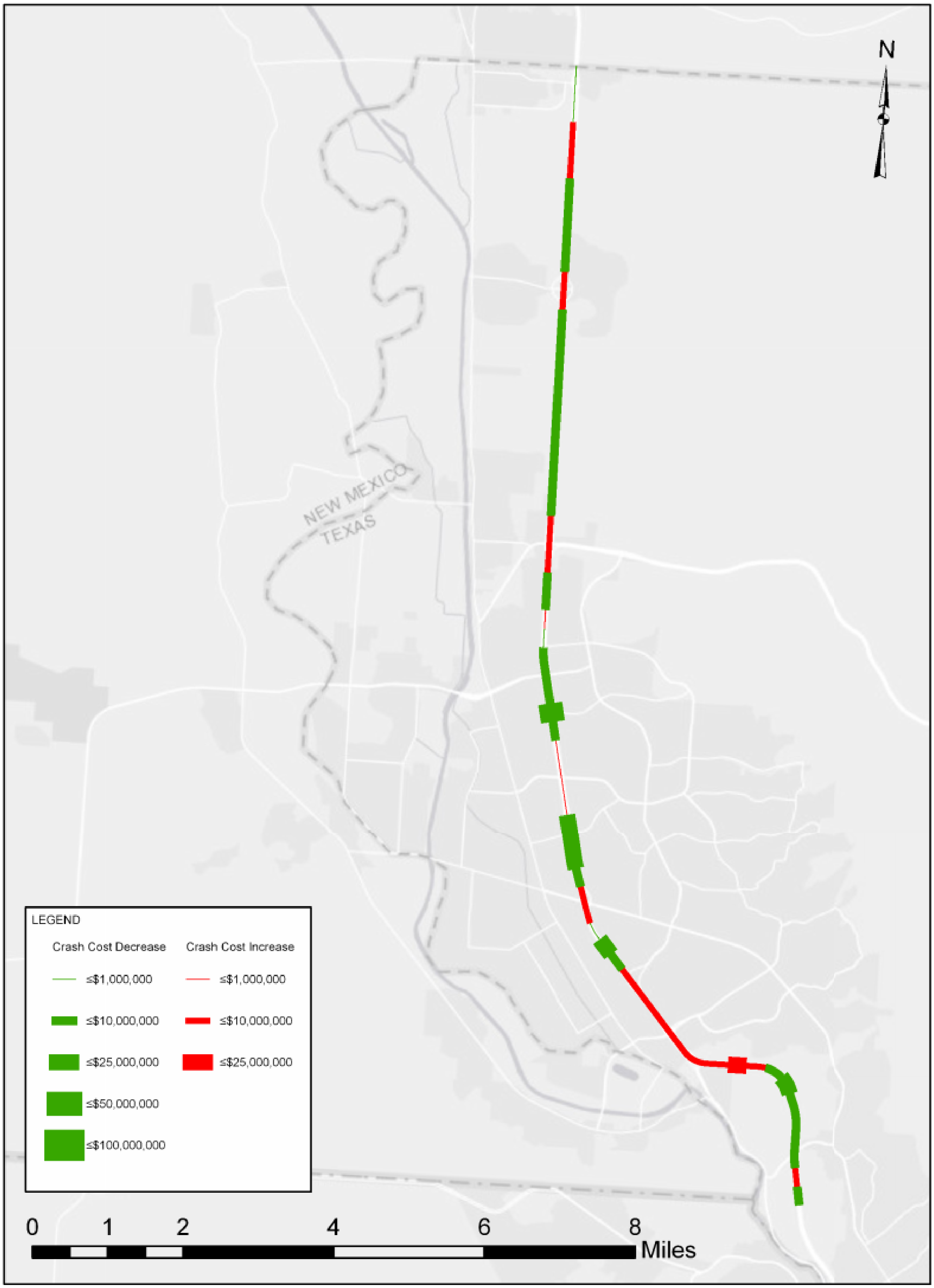


Figure 7-7. Segment 1 Crash Cost Differential (2042 Dollars)

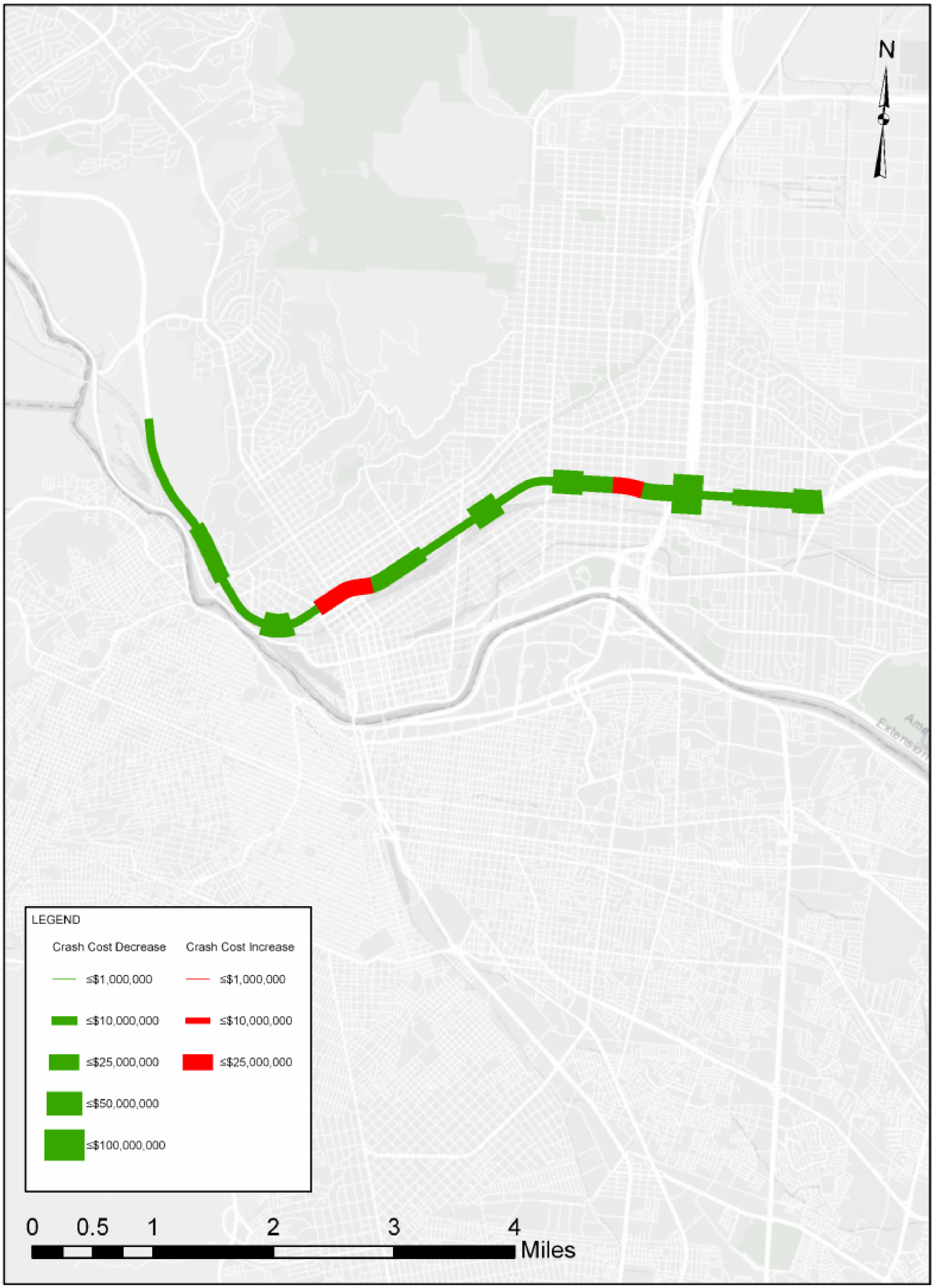


Figure 7-8. Segment 2 Crash Cost Differential (2042 Dollars)

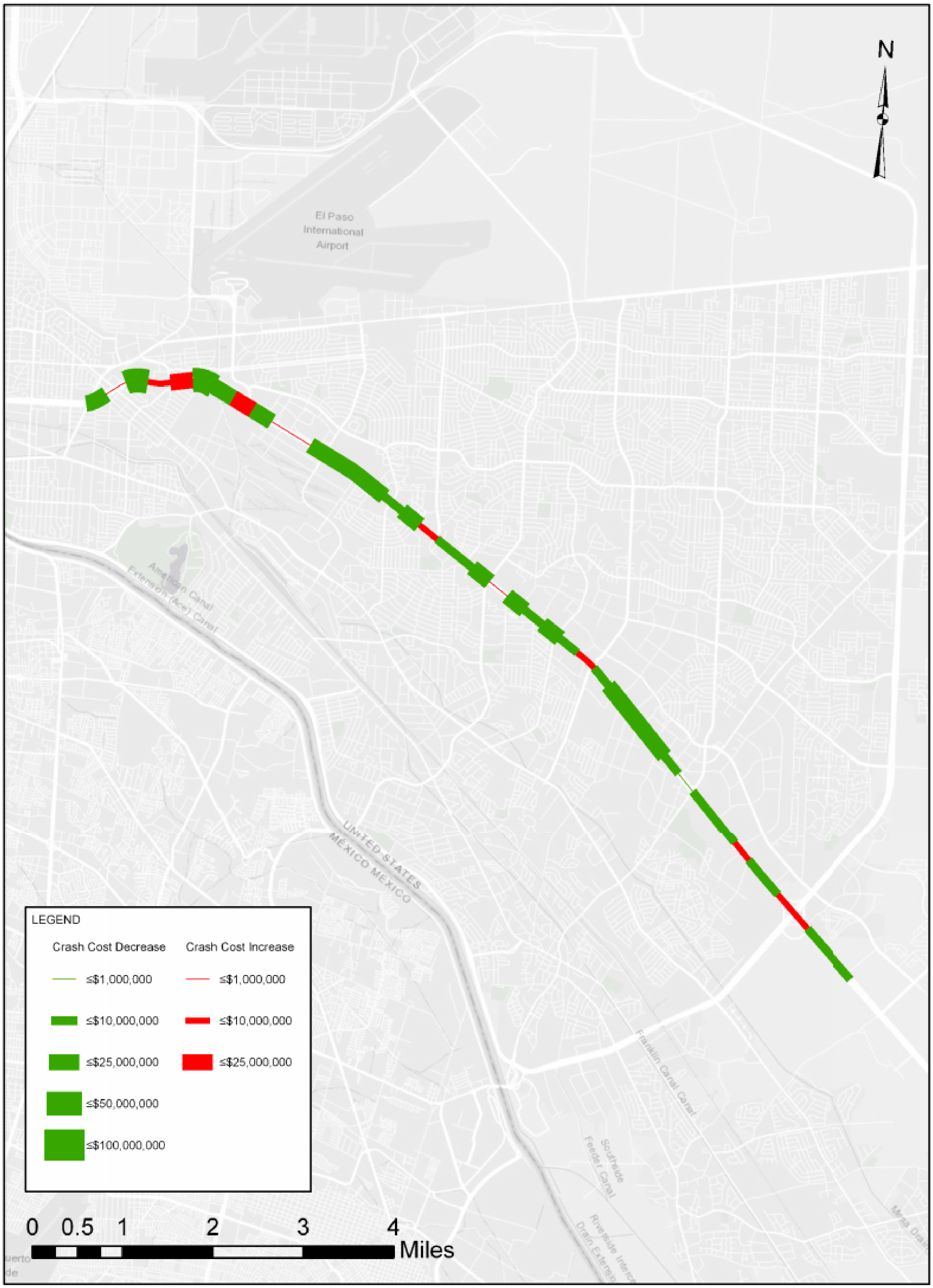


Figure 7-9. Segment 3 Crash Cost Differential (2042 Dollars)

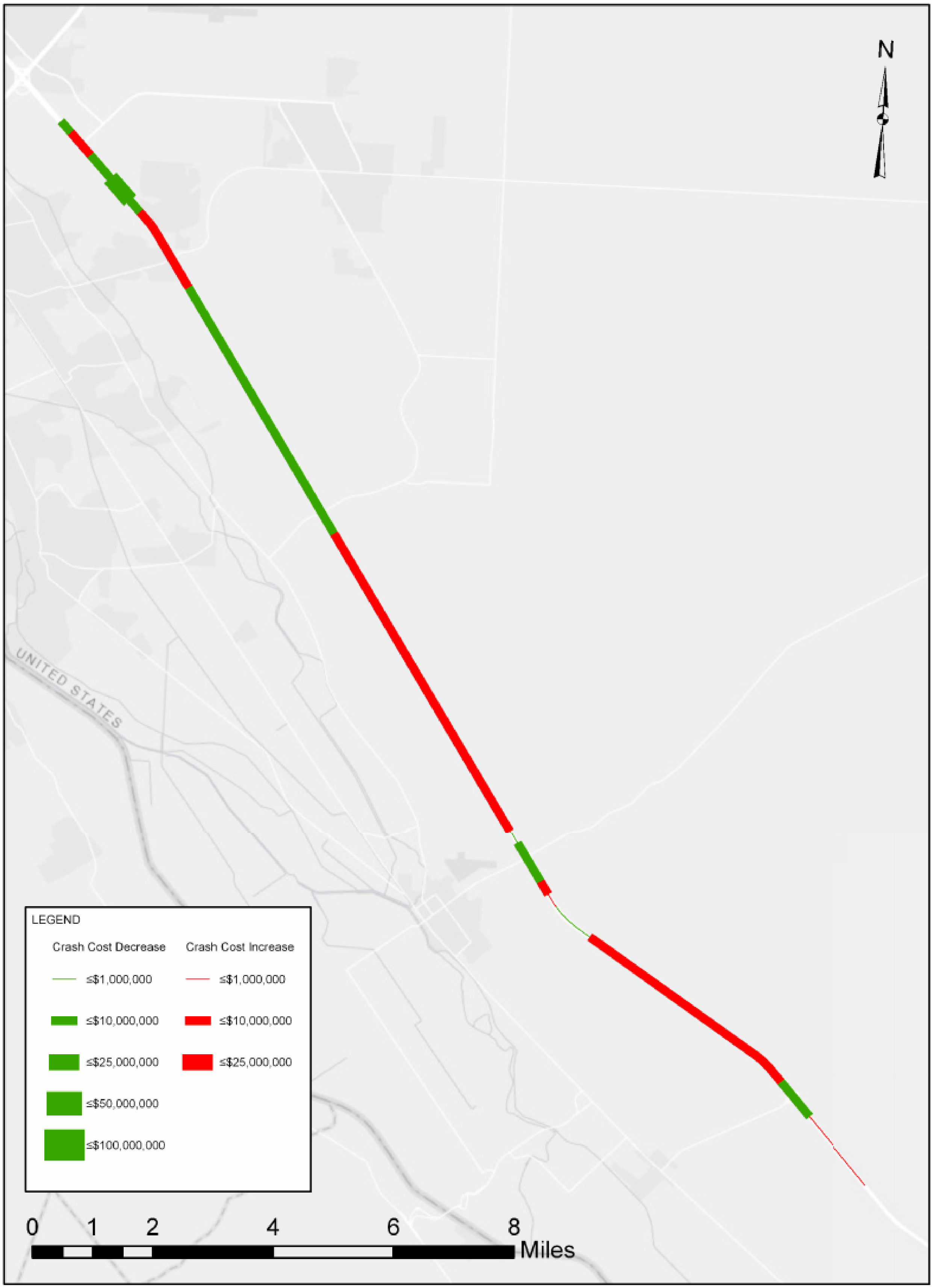


Figure 7-10. Segment 4 Crash Cost Differential (2042 Dollars)

The overall crash cost for the Build scenario is approximately $891 million (2042 dollars) less than the overall crash cost for the No Build scenario. Quarter mile segments with a decrease in crash cost are a result of an increased number of lanes, improved mainlane and ramp geometry, or a reduced number of ramp connections within or near those segments. Quarter mile segments with an increase in crash cost are a result of added ramp connections that did not exist in the No Build scenario or increased traffic volume. It is expected that some of the quarter mile segments would have greater crash cost in the Build scenario due to relocation of existing ramp connections.

7.4 Safety Analysis Conclusion

Over the five-year period (2011-2015), 3,701 crashes were reported within the project limits. The TxDOT five-year average crash rate for urban interstate facilities reported 102.96 crashes per 100 million VMT. The entire length of I-10 within the project limits had a five-year average crash rate of 34.00 crashes per 100 million VMT, which is 69 percent lower than the five-year statewide average crash rate.

The results of the predictive crash analysis show that freeway crashes are predicted to decrease by 27.0 percent (5,890 crashes) between the No Build and Build scenario. This equates to an estimated $891 million (2042 dollars) in overall crash cost savings.

The proposed improvements provide safety benefits, meet current design standards and meet desirable operational goals.

8. Bike and Pedestrian Recommendations

8.1 Corridor-Wide

The City of El Paso Bike Plan is accommodated between the frontage roads at each cross street.

8.2 Downtown

Bicycle level of traffic stress is a metric used to assess the comfort and connectivity of bicycle networks. Protected bike lanes provide a low level of traffic stress while sharrows (or no lane markings at all) provide a high level of traffic stress. Potential bicycle ridership increases exponentially as level of traffic stress decreases. Only experienced and confident riders are comfortable using facilities with a high level of traffic stress. These riders make up a small portion of the population. Unexperienced but interested riders, which make up a much larger portion of the population, are willing to use facilities that provide greater comfort. For this reason, the downtown bike layout is designed to provide low stress facilities (in the form of protected bike lanes) that connect existing low stress facilities. Sidewalks are provided along these protected bike lanes to accommodate pedestrians and improve their experience. An example of the potential bike and pedestrian facilities is illustrated in Figure 8-1.

Figure 8-1. Potential Bike and Pedestrian Facilities

Figure 8-2 shows how the proposed bicycle improvements connect existing low stress areas around downtown El Paso. Existing low stress facilities are indicated by solid green lines and proposed low stress facilities are indicated by dashed green lines.

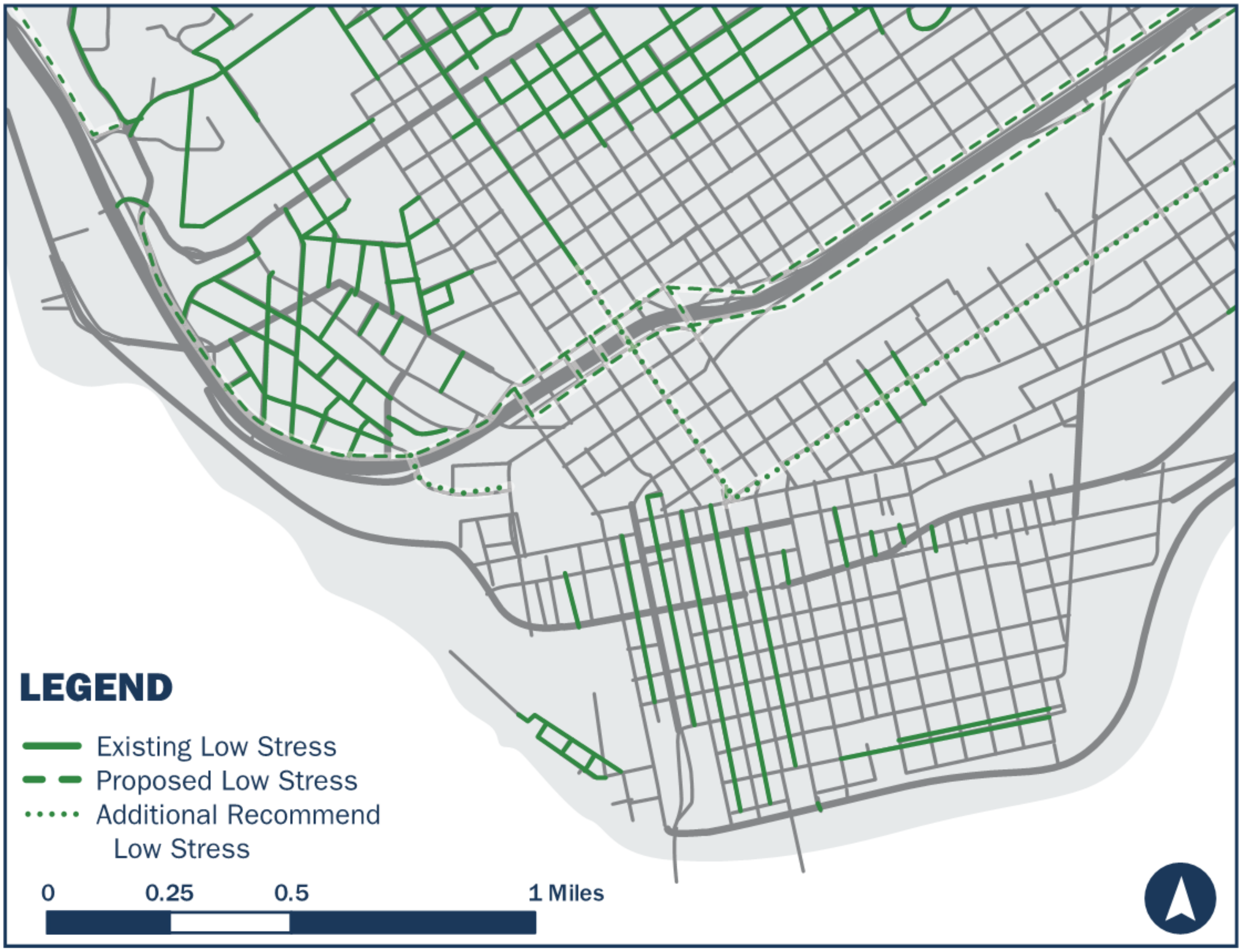


Figure 8-2. Existing and Proposed Low Stress Facilities

The additional recommended low stress facility indicated by the dotted green lines would facilitate a connection between UTEP, downtown, and Medical Center of the Americas along SH 20. Linking these three high density activity centers could result in a highly utilized multimodal network but would require some improvements away from the Interstate facility.

8.3 Other Recommendations

Numerous comments were received during the public involvement process regarding potential bike and pedestrian facilities along the I-10 corridor. The following bike and pedestrian facilities are recommended in response to many of these comments:

- 12-foot two-way shared use paths along the eastbound and westbound frontage roads between Antonio Street and Vinton Road/Westway Boulevard
- 12-foot two-way shared use paths along the eastbound and westbound frontage roads between Vinton Road/Westway Boulevard and Loop 375
- Pedestrian bridge over I-10 at Trade Center Avenue near Canutillo High School
- 10-foot shared use path along the westbound frontage road between Executive Center Boulevard and UTEP
- 12-foot two-way cycle track along the westbound frontage road between UTEP and downtown
- 10-foot shared use paths along the eastbound and westbound frontage roads between downtown and Piedras Street

9. Technology Inventory and Recommendations

9.1 Current Corridor Technologies

TxDOT El Paso District has been implementing numerous intelligent transportation system (ITS) technologies and solutions on the I-10 corridor. The current deployment includes fiber optic communication, video surveillance, speed monitoring and data sharing with other agencies. The current breakdown of ITS technology deployed throughout the I-10 corridor is as follows:

- Closed-Circuit Television (CCTV) Cameras: 38 cameras currently monitor 37 miles of the corridor starting at the New Mexico state line and end at Horizon Boulevard.
- Dynamic Message Signs (DMS): 25 signs provide information to the traveling public beginning at Westway Boulevard and ending at Horizon Boulevard.
- Vehicle Detectors: 141 detectors are stationed on 37 miles of the corridor starting at the New Mexico state line and end at Horizon Boulevard.
- Lane Control Signals: 34 LCS stations from Country Club Road. to Horizon Boulevard.
- Highway Advisory Radio: 9 controllers and 8 beacons provide information to tune into a preset station on the travelers radio.

The data received from these devices is transmitted to the TxDOT TransVista traffic management center (TMC) and shared with the City of El Paso's TMC and 911 emergency center which includes police, fire and emergency medical services (EMS).

The utilization of traditional ITS technologies can facilitate a smoother transition to autonomous and connected vehicles. The existing ITS infrastructure can support autonomous and connected hardware by mounting to the camera/detector poles and utilizing the same sources for power and communications backhaul as the existing ITS systems. This coordination is key to providing seamless implementation of future advancements in connected vehicles.

With expanding technology and ITS infrastructures, being able to provide a system that can adjust with additional networked devices is critical. To facilitate new technologies, TxDOT should ensure that legacy ITS technology is upgraded to include Ethernet based IP networking, has dedicated power, and has expansion capabilities. This will allow new technologies that require Power-over-Ethernet (POE) and a communications backhaul such as Dedicated Short Range Communications (DSRC) or 5G microcells to be readily added.

A full summary of current corridor technologies can be found in Appendix G.

9.2 Enhancements to Existing ITS Technologies

The I-10 Corridor already has a significant deployment of ITS equipment including CCTV, DMS, radar and Bluetooth vehicle detection equipment throughout the corridor. Travelers on the corridor have access to cellular communications as well as trip planning applications and information dissemination mechanisms that allow for travelers to select alternative routes, modes, and time-of-day for their travel. At the same time, there are potential enhancements that could be made to the traditional ITS components that would strengthen their impact on reducing congestion and improving mobility. This section provides recommendations for potential near-term enhancements that could be made by TxDOT to increase the impact of existing ITS infrastructure on reducing congestion and improving mobility.

(a) Power and Communications Upgrades

Dedicated power and a communications backhaul are the cornerstones of ITS deployments and are even more critical for emerging technologies. In preparation for emerging technologies, TxDOT should consider enhancing the existing power and communications links to include the following:

- Dedicated power with secondary power backup for ITS components.
- Inclusion of Power-over-Ethernet (PoE) as a power source at ITS deployment locations.
- Upgrades or installation of fiber-optic strands for ITS components linked to a Traffic Management Center. These fiber-optic strands should be at least 144 strands with 10 gigabits per second (Gbps) capabilities.

(b) Improvements to Closed Circuit Television Cameras

TxDOT has coverage of the I-10 freeway in this corridor. However, this coverage is not universal throughout the corridor even on I-10. Additional camera coverage could be added to include more segments of I-10 as well as additional coverage of arterials and alternative routes such as SR 62 and SR 375. The coverage of additional road segments will enable TxDOT to more quickly identify and clear incidents as well as monitoring traffic on I-10 and alternative arterials.

The existing CCTV cameras as well as any additional cameras should be digital, IP based cameras that avoid the need for direct linkages to a TMS. Moving to a digital camera platform will enable TxDOT to deploy software-based technologies that can automatically process the digital images using advanced computer analytics to identify traffic incidents, perform vehicle classification and counts, and to provide information on traffic speeds.

(c) Improvements to Dynamic Message Signs

There is coverage of I-10 and SR 62 with respect to DMS but other potential alternative routes such as SR 375 are lacking DMS components. Understanding that DMS as a technology will be rendered obsolete by vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications within the next two decades, there is still a role for DMS in the next 10-15 years to provide information to drivers of manually operated vehicles. TxDOT could consider replacing DMS components as they reach the end of their service life with high resolution full color LED instead of the existing monochrome displays.

(d) Integrated Trip Planning Applications

Travelers along the I-10 Corridor have a number of trip planning applications and information sources as previously described. However, these are not integrated into a single, comprehensive mobile application that combines traffic information on I-10 and arterials with real-time transit information. TxDOT should consider developing or supporting the development of such an integrated trip planning and real-time traffic reporting application. As an alternative, TxDOT could consider entering into agreements with large aggregators of traffic and trip information such as Waze™ and others.

(e) Streetlight Improvements

Streetlights are not typically considered to be ITS components. However, advances in streetlights include conversion to LED as well as dynamically controlled lighting based upon motion and the amount of ambient light. New streetlights also include the ability for additional sensors, such as weather sensors, to be added. When performing routine replacement of existing streetlights in the I-10 corridor, TxDOT should ensure that the replacements have the ability to add sensors (e.g., inclusion of 5-pin or 7-pin ports on the top of the light for plug in modules).

9.3 Investments for Emerging Technologies

Not all emerging technologies will have an immediate impact on congestion, mobility, and travel time reliability. However, these technologies will emerge rapidly and it is important for TxDOT to be in a position to capitalize upon these technologies when the market saturation is such that they will have a significant impact.

(a) Truck Parking and Port of Entry (POE) Reservation System

TxDOT could implement a truck parking and port of entry (POE) reservation pilot system along the I-10 corridor. This system would utilize smart truck parking signs which would display available parking spaces at designated truck parking lots near the I-10 corridor between the Anthony Travel Center and Fabens rest areas. This system would need to be developed in coordination with local area businesses such as private operated travel centers and plazas, large big-box retailers and other area businesses to ensure that there is capacity to handle the truck parking spots and to install technology to automatically determine parking availability. Currently, there are a number of technology solutions on the market that can be installed to track the number of available parking spots. The trucks could use these parking spaces as a way to make local deliveries more efficient and reduce the driving time and emissions emitted by trucks trying to find available overnight parking.

Truck parking spaces could be used as a staging area for border crossing. Trucks that are parked at these locations could wait until they receive their reserved border inspection time and then travel to the POE at that time. Allowing for trucks to be parked before moving through their POE could reduce driver time in the truck, reduce fuel consumption, reduce idling time at the border and reduce truck emissions.

If this system were to be contemplated, a baseline of data would need to be gathered (if not already known) to determine the additional driving time, costs and emissions looking for a parking spot as well as the time, costs and emissions generated waiting to pass through the POE. This data would then need to be compared to the pilot generated data to determine if there has been any measurable decrease in time, cost, and emissions. If there is a positive effect on time, cost and emissions, the pilot could potentially be expanded.

A 2020 study on truck parking for TxDOT found that around urban centers and major freight corridors throughout the state, authorized truck parking locations are at or overcapacity most weekday nights, and many for most of the day. There are approximately 27,000 authorized truck parking spaces statewide, publicly and privately owned, and on an average weekday night at the peak hour there are:

- 32,000 trucks needing a safe and authorized place to park.
- 21,000 trucks parked at authorized locations.
- 5,000 trucks that have no access to authorized locations.
- 6,000 trucks parking in unauthorized locations because the authorized parking is not located where drivers need it, or missing the necessary amenities, or is lacking in some other way.

The Reimagine I-10 Study identified a total of 959 existing truck parking spaces along the I-10 corridor within the study area using findfuelstops.com supplemented with aerial imagery. This included 373 spaces in Segment 1, zero spaces in Segment 2, 17 spaces in Segment 3, and 569 spaces in Segment 4.

Based on capacity needs, safety needs, and freight network significance, the TxDOT truck parking study identified one truck parking location with “High Capacity Need”, one truck parking location with “Medium Capacity Need”, and one truck parking location with “Low Capacity Need” in Segment 1. Two truck parking locations with “High Capacity Need” and one truck parking location with “Medium Capacity Need” were identified in Segment 4. Additionally, I-10 from Artcraft Road to FM 793 was identified as a corridor with high truck parking needs, which includes all of Segment 2 and Segment 3.

The TxDOT truck parking study recommends expanded and upgraded facilities with more spaces and amenities in Anthony and Fabens. The study also identifies the need for a new truck staging/parking facility near the Zaragoza Road interchange. These locations would be good candidates for the technology pilots mentioned in this report to test the effectiveness of smart truck parking signs and staging with POE reservations.

(b) 5G

Globally, there have been over 20 trials testing cellular vehical-to-everything (C-V2X) technology with three in the United States. These trials have been utilizing the C-V2X process control module 5 (PCM5) protocol while using a 4GLTE network. C-V2X 5G new radio (NR) has been evaluated in China and one is in the process of being trialed in Ann Arbor, Michigan in the fall of 2019. The goal of the 5G project would be to determine whether the use of C-V2X through a 5G network can reduce congestion, increase speed and traffic throughput and reduce traffic incidents, accidents and fatalities on the pilot project corridor. A portion of the I-10 corridor in El Paso has been identified as having the potential for a deployment of 5G C-V2X technology to test the various V2X technologies. The corridor, which stretches from Schuster Avenue to Copia Street is approximately 4 miles. A 5G cell network covering the span of I-10 from Schuster Avenue to Copia Street utilizing different types of cells, Picocells or Microcells, is being proposed for the pilot project.

Based on past deployments of cellular technology, the City of El Paso and the I-10 corridor is not expected to have 5G cellular service deployed until 2021. The almost 2 year timeframe should allow for a project plan to be put together and stakeholders engaged and committed. In addition, grant funding that could pay for some of the cost of the pilot project could be applied for. Launching a pilot project in the spring or summer of 2021 should not be out of the realm of possibilities. TxDOT will want to determine, in conjunction with the project partners, the length of the pilot, which could run for months in order to properly assess the technology in all type of driving conditions. Performance measurements to accurately assess the impacts of the pilot would include:

- Number of vehicles connected and participating in the pilot.
- Measuring the signal speed, both sending and receiving data, from the 5G cells.
- Speed of traffic along the I-10 corridor to determine whether there has been an increase/decrease in overall throughput and travel times.
- Capturing other traffic data including measuring traffic incidents (near misses that may be determined by analyzing driving data), traffic accidents and fatalities.

(c) Electrification Corridor

TxDOT will want to consider deploying an electric vehicle electrification pilot project along the I-10 corridor. The goal of the pilot would be to gather data to determine:

- Whether the addition of charging stations will lead to an increase in the number of electric vehicles that are owned and operated in El Paso.
- Whether public installation of charging stations will spur additional investment from private electric vehicle charging station operators.
- Whether the increase in electric vehicles has a measurable impact on lowering emissions in the I-10 corridor area.

Three different use cases for deploying electric vehicle charging stations have been developed including installing charging stations at rest stops on I-10, converting an I-10 lane to an HOV EV lane and installing charging stations at major area employers along the I-10 corridor.

(i) I-10 Rest Area Electric Vehicle Charging Station Pilot

Rest stops on I-10 at the Anthony Travel Center and Fabens rest areas were recommended for installing electric vehicle charging stations over others because they are owned and operated by TxDOT, have a high enough volume of vehicles due to easy access to I-10, and are at a location that encourages vehicles to remain idle for a period of time. Constructing charging infrastructure in facilities where travelers are already stopping and potentially dwelling for a substantial amount of time provides an opportunity to offer both consumer facing and commercial facing charging facilities.

(ii) I-10 HOV EV Lanes Pilot

The concept of managed lanes is growing in El Paso, and there is an opportunity to combine the use of HOV lanes with electric vehicles (EV) as a way to incentivize the increased purchase and use of electric vehicles along the I-10 corridor. Along a 4-mile corridor on I-10, from Schuster Avenue to Copia Street, TxDOT should dedicate one lane in either direction as a dedicated HOV EV lane. The use of HOV EV lanes would reduce current and future traffic congestions for drivers of electric vehicles that drive in the HOV EV lane. If successful, the length of the HOV EV lanes could be expanded beyond Schuster Avenue and Copia Street to further encourage adoption of electric vehicles.

(iii) Install Charging Stations at Major Area Employers along the I-10 Corridor Pilot

In addition to installing charging stations at rest areas along the I-10 corridor, TxDOT should consider partnering with major local area employers near the I-10 corridor to deploy electric vehicle charging stations. TxDOT, in conjunction with major employers, both public and private, should deploy electric vehicle charging stations at work locations throughout El Paso near the I-10 corridor. Considerations for TxDOT to determine the right employer partners would include:

- Number of employees.
- Proximity to I-10.
- Number of visitors/customers.
- Other attributes.

Major industries to consider are healthcare organizations, education and Fort Bliss. Other companies in the electric industry may also be good employer partners for this pilot.

(d) UAS Incident Management

TxDOT may want to consider developing a pilot for the use of Unmanned Aerial Systems (UAS) to aid in the event of a traffic incident or accident along the I-10 corridor. Significant regulatory requirements, both from a federal and state level, limit the type of pilot project that can be recommended. Regulations from a federal standpoint are governed under the Federal Aviation Administration (FAA) which controls how a vehicle operates within the airspace. At the state level, Texas regulations and laws control who can use Unmanned Aerial Vehicles (UAVs) and for what specific activities or purposes they can be used with privacy being a significant concern. While these rules and regulations are being updated based on technology development and feedback from industry and learnings from approved pilots, the suggested pilots should be able to comply with both federal and state regulatory requirements as they exist today.

While regulatory considerations are important when considering an UAS pilot project, current technology constraints also act as a limiting factor. Current mobile UASs allow for aerial drones to operate up to 1 hour in a range of up to 6 miles with sustained winds of less than 40 miles per hour. These mobile systems are intended to be used by people at an incident scene. In addition to mobile systems, stationary systems allow for drones to be deployed from a fixed point, which can reduce the time it take so deploy a drone from a mobile location. These stationary systems can come with a tethered which allows for the drone to remain in a fixed position but allows for a longer use based on a battery management system remaining on the ground. In addition, stationary systems also have the flexibility to release a drone to fly, similar to a mobile drone system, but allows for the drone to be housed in a weather-protected port while it is being stored and charged.

There are a number of UASs being tested in a variety of different use cases around North America. In Canada, the Ontario Provincial Police (OPP) Traffic Safety and Operational Support Command has been using UAS since 2012 to enhance search and rescue operations and map collision scenes for the Highway Safety Division (HSD). North Carolina is utilizing UAS to support construction inspections and reconstruct accident scenes in order to open travel lanes more quickly. The Texas Department of Public Safety has developed a UAS program with systems in operation across Texas. The Texas program has provided support to local law-enforcement to develop UAS programs and has developed a policy for how those operations should take place.

The first pilot project would involve the use of a mobile UAS along the I-10 corridor when there is a traffic incident or accident. The UAS is operated by a pilot on-scene and is used to gain a higher vantage point of the incident, allowing a better view of the on-ground details. These systems have been successful in this use, as they can give the first responders a better situational awareness of the area, better understand the extent of the accident, better detect the extent of spilled fluids and accident debris, and give a clearer picture of the position and location of evidence available for reconstruction.

The second pilot project would involve the deployment of stationary UASs along the I-10 corridor where they can be deployed in the event of a traffic incident or accident. The second pilot is a system of stationary UASs located along the corridor that could deploy quickly in response to an accident to give a better understanding of an incident scene. In this scenario, the vehicle would only operate vertically from the base station and would rely on the high resolution of the camera to capture the imagery from an incident. This system could cut the time required to get a camera on an incident, but it would also come at the expense of the greater detail that would come from a first responder operating the UAV.

A Concept of Operations or Operational Deployment Protocol will need to be developed specifically for use along the El Paso I-10 corridor. This will inform the basic operation of the program, who is responsible for what, how communications and coordination between agencies will be managed, and different operational protocols for different scenarios. Additionally, it should define how the UAS program is integrated with the existing Traffic Management Center and operations. Finally, performance measures such as vehicle control and operation, communication, image quality, response time and maintenance should all be analyzed during the pilot.

(e) Platooning

TxDOT has an opportunity to develop a truck platooning pilot to improve safety, reduce environmental impacts, and alleviate congestion along the I-10 corridor. The El Paso area is home to the third busiest truck border port in the United States and serves as a commercial freight, truck and air hub for the region. Truck freight uses the I-10 corridor and surrounding street network and is distributed throughout El Paso in one of four ways: 1) through trips; 2) POE destinations; 3) local destinations; and 4) intermodal destinations such as rail yards and the airport.

Many states prohibit truck platooning through following-too-closely (FTC) statutes but over 20 states, including Texas, have enacted FTC exemptions to allow for truck platooning. While the regulatory environment is open for piloting, testing and innovation, the technology component which will allow for the safe usage of truck platooning technology is just being developed. Platooning technology allows multiple vehicles to virtually couple such that vehicles can accelerate and brake simultaneously based on the steering, acceleration, and braking inputs of the lead vehicle. The connection between vehicles can be done via dedicated short-range communications or 5G connected vehicle technology, with the vehicle controls for platooning vehicles being automated. In addition, Vehicle-to-Vehicle (V2V) safety applications utilize communication between vehicles to prevent crashes while Vehicle-to-Infrastructure (V2I) safety applications integrate roadside communication infrastructure and vehicle data to enhance safety to drivers. Truck platooning is expected to improve capacity through reduced headways, decrease collisions, and increase fuel economy due to increased connectivity and automating among vehicles. Platooning technology requires trucks that are of similar size, that are new models and include required technology, and by similar manufacturers that allow shared use of proprietary technology.

There are a number of truck platooning pilot project that have either been completed or are currently underway. Several companies have completed demonstrations in Texas, Michigan, North Carolina, Florida, and other locations. Volvo Trucks North America and FedEx are running truck platoons in North Carolina and report fuel savings when operating along long distances on interstate environments. In addition, Peloton Technology recently unveiled technology for truck platooning that allows a single driver to drive a pair of vehicles. Peloton's proprietary technologies link pairs of heavy trucks for connected driving that improves aerodynamics, fuel economy and safety, using V2V communications and radar-based active braking systems, combined with vehicle control algorithms. While still in development, truck platooning technology may be ready for a pilot project in the I-10 corridor in the near term.

I-10 is uniquely located across a major metropolitan area, along a regional and national east-west corridor, and adjacent to the U.S.-Mexico border. These characteristics provide opportunities for truck platooning use cases that will improve efficiency for truckers, commercial companies, and the local economy.

(i) Drayage Operations

There are over two dozen drayage operations, freight that is shipped over relatively short distances, along I-10 in El Paso. Truck platooning will provide coordinated travel reliability that enhances efficiency. Through the use of a dynamic freight staging application, vehicles within a specified area will communicate their origins and destinations. The system will analyze the information provided and coordinate Dynamic Freight Staging. Dynamic freight staging will introduce the capability to group trucks at their origin or destination for a short period of time before, during or after a delivery. Drivers and shippers will be incentivized to use this service by the time and fuel savings afforded through signal priority. The application could be designed with the capability to build in reservation of delivery windows at El Paso International Airport and other area freight facilities.

(ii) Border Operations

Cross-border truck volumes continue to increase with hundreds of thousands of trucks passing through the El Paso border each year. Through enhanced coordination of multiple trucks traveling similar paths and distances, truck platoons can improve cross-border travel reliability and efficiency. With an eye towards future port of entry (POE) reservation, truck platoons could reduce queuing at border crossings. This deployment will build off of the improvements in drayage operations with signals along Airway Boulevard and Montana Avenue to be upgraded to include new controllers and DSRC. Trucks will be organized into non-autonomous “guided platoons” or road trains of three to five vehicles with similar routes through dynamic matching based on origin and destination. This use case will showcase many of the benefits of semi-autonomous platooning without the need for cooperative adaptive cruise control, a technology that has yet to become adopted widespread. The establishment of platoons will also serve as a basis for enacting signal priority, which will be requested through cellular technology.

(iii) Long Haul Trucking

Approximately 55 miles of the 880-mile Texas I-10 corridor are located in the study area. Trucks equipped with proper technology and of suitable size and condition will be able to form platoons at the eastern and western ends of the study area through the use of cooperative adaptive cruise control. At the western end of the study area, Exit 0 in Anthony, Texas provides Flying J Travel Plaza, Pilot Travel Center, and Love's Travel Stop suitable for truck staging. At this location, trucks coming from the west can stop, rest, and connect in a platoon for the travel east through the study area. At the eastern end of the study area, Exit 49 in Fabens, Texas provides Fast Trak travel center with amenities for truckers. At this location, trucks from the east can stop, rest, and connect in a platoon for the travel west through El Paso. Long haul trucking will benefit from fuel savings during platooning across this approximately 55 mile stretch of interstate. The associated benefit to El Paso will be improved air quality from fewer emissions from trucks passing through the region.

Truck platooning deployments will rely on a combination of public and private partnerships. Traffic signal improvements along Airway Boulevard and Montana Avenue to include new controllers and

DSRC will be a public sector responsibility while implementation of 5G technology will require investments from the private sector. Performance measures identified for the proposed truck platooning pilot would analyze the following data before and after the pilot to determine whether there has been a measurable change:

- Number of crashes.
- Fuel usage.
- Delivery time.
- Emissions.

10. Implementation Plan

Break out projects and interim improvements were identified for the Reimagine I-10 corridor. More details on break out projects can be found in Appendix H, and more details on interim improvements can be found in Appendix I.

10.1 Break Out Projects

Break out projects are projects that can be constructed independently and make up part of the recommended improvements for the whole corridor. Since they typically involve only a small fraction of the project limits, break out projects are useful as they can be done with much less funding and can target areas with the most significant issues. Break out projects differ from interim improvements in that they do not have to be completely reconstructed to match the ultimate design for the corridor.

(a) Segment 1

Ongoing and upcoming projects in Segment 1 include the new Los Mochis Drive underpass, direct connectors and ramping changes near the Artcraft Road interchange, roundabouts and frontage road bypasses at the Thorn Avenue interchange, the Go10 project, and the new Mesa Park Drive interchange. A study for improvements to the SH 20 (Mesa Street) interchange is also underway. In addition to these ongoing and upcoming projects, the Reimagine I-10 Study proposes corridor reconstruction between the New Mexico state line and Loop 375, shared use paths between Antonio Street and Vinton Road, a pedestrian bridge across I-10 at Canutillo High School, adaptive lanes between Thorn Avenue and Executive Center Boulevard, new frontage roads and ramping improvements between US 85 and Executive Center Boulevard, and truck parking as break out projects. Segment 1 break out projects along with estimated cost and timeframe are shown in Figure 10-1.

(b) Segment 2

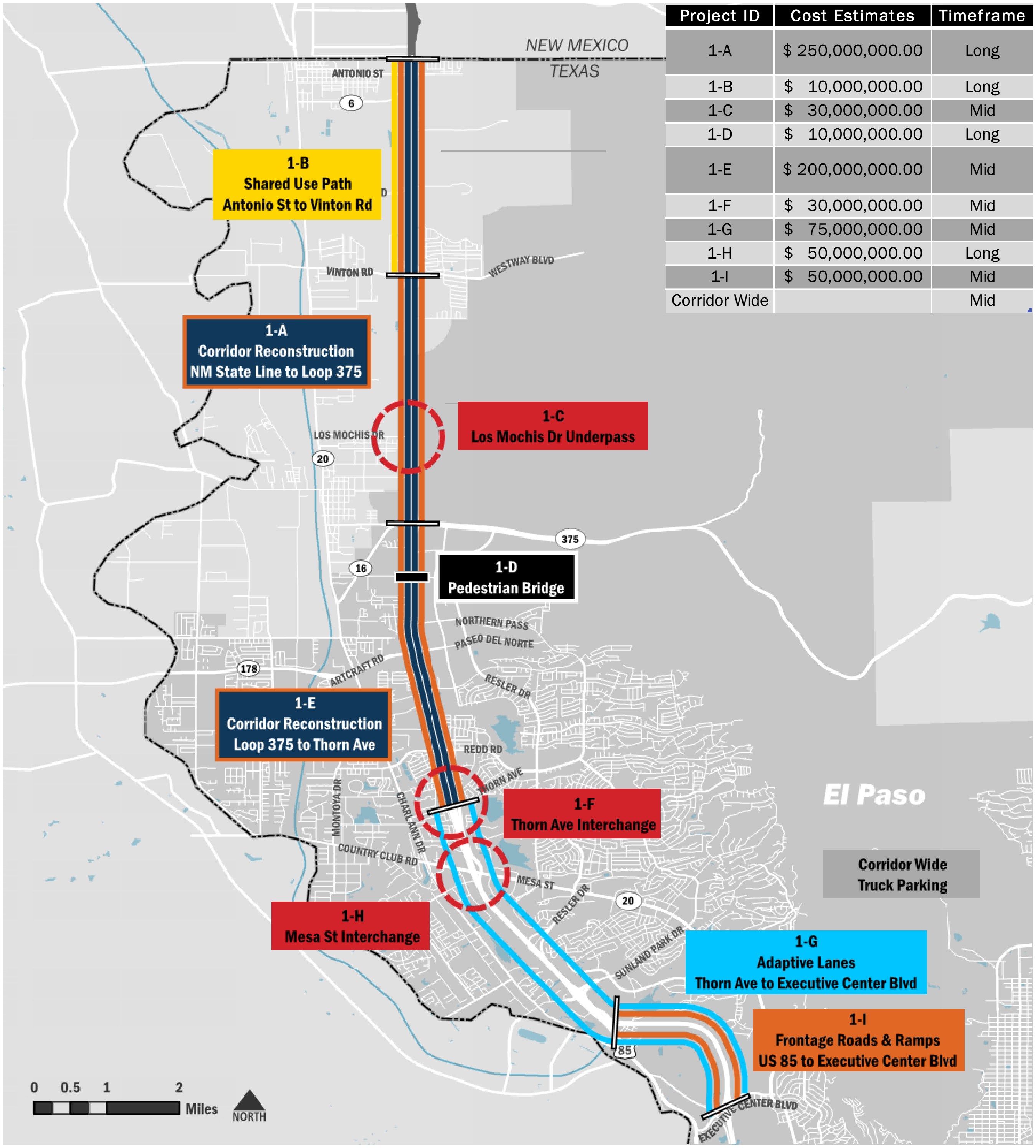
This area of I-10 contains two of El Paso's major trip attractors: downtown and UTEP. The worst mainlane congestion and pavement quality also exist in this segment. Recommended break out projects include corridor reconstruction between Executive Center Boulevard and Schuster Avenue, and corridor reconstruction between Schuster Avenue and Copia Street. Segment 2 break out projects along with estimated cost and timeframe are shown in Figure 10-2.

(c) Segment 3

Recommended break out projects in Segment 3 include corridor reconstruction between Copia Street and US 62 (Paisano Drive), corridor reconstruction between US 62 (Paisano Drive) and Airway Boulevard, corridor reconstruction between Airway Boulevard and Yarbrough Drive, and corridor reconstruction between Yarbrough Drive and Eastlake Boulevard. Segment 3 break out projects along with estimated cost and timeframe are shown in Figure 10-3.

(d) Segment 4

Recommended break out projects in Segment 4 include the Eastlake Boulevard interchange, corridor reconstruction between Eastlake Boulevard and Horizon Boulevard, the Horizon Boulevard interchange, corridor reconstruction between Horizon Boulevard and FM 1110, a new interchange near MM 40-41, the FM 1110 interchange, frontage roads between FM 1110 and FM 3380, mainlane reconstruction between FM 1110 and FM 3380, the FM 793 interchange, the FM 3380 interchange, and truck parking. Segment 4 break out projects along with estimated cost and timeframe are shown in Figure 10-4.

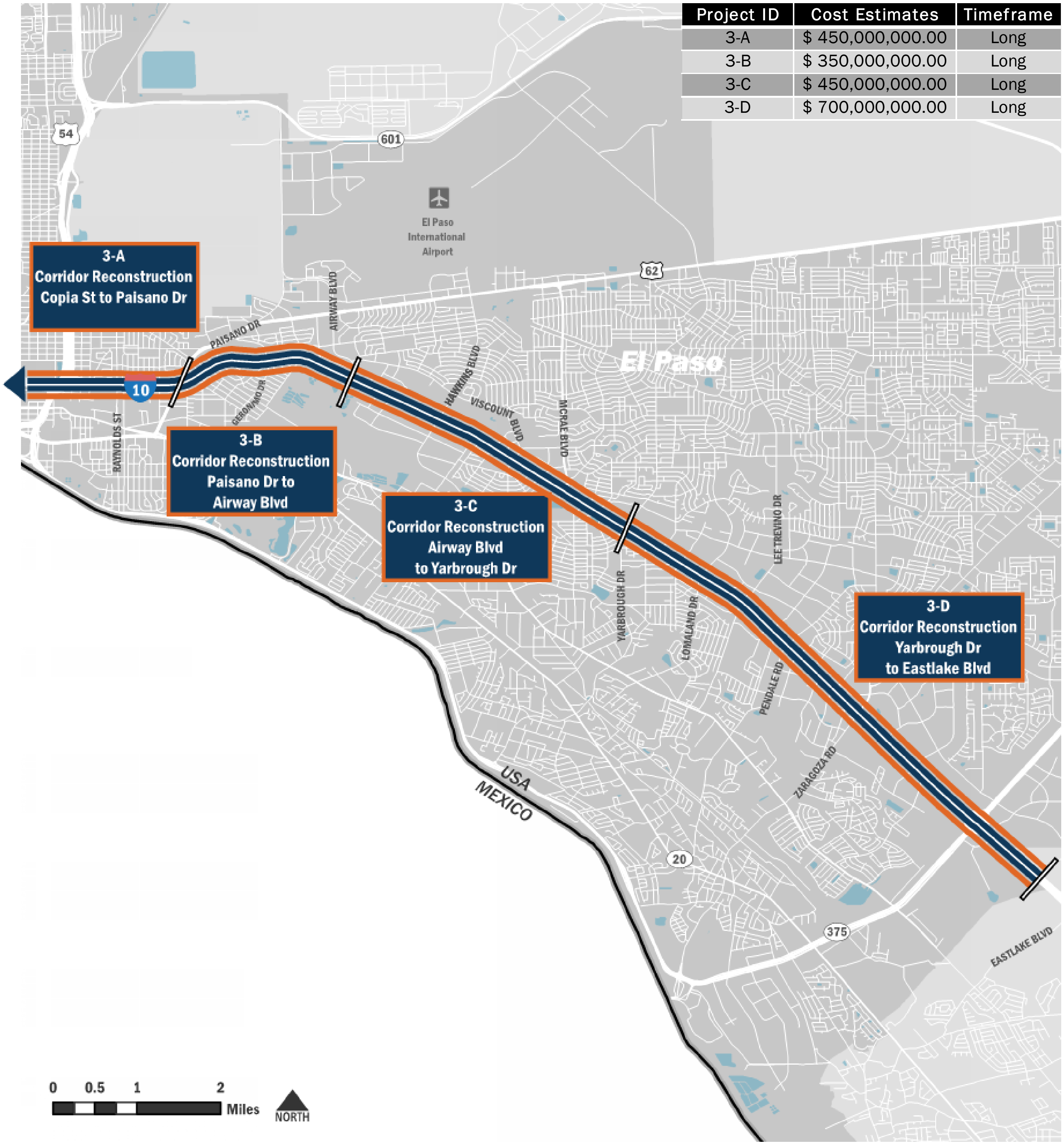


Project ID	Cost Estimates	Timeframe
1-A	$ 250,000,000.00	Long
1-B	$ 10,000,000.00	Long
1-C	$ 30,000,000.00	Mid
1-D	$ 10,000,000.00	Long
1-E	$ 200,000,000.00	Mid
1-F	$ 30,000,000.00	Mid
1-G	$ 75,000,000.00	Mid
1-H	$ 50,000,000.00	Long
1-I	$ 50,000,000.00	Mid
Corridor Wide		Mid

Figure 10-1. Segment 1 Break Out Projects

Project ID	Cost Estimates	Timeframe
2-A	$ 250,000,000.00	Long
2-B	$ 700,000,000.00	Mid

Figure 10-2. Segment 2 Break Out Projects



Project ID	Cost Estimates	Timeframe
3-A	$ 450,000,000.00	Long
3-B	$ 350,000,000.00	Long
3-C	$ 450,000,000.00	Long
3-D	$ 700,000,000.00	Long

Figure 10-3. Segment 3 Break Out Projects

Project ID	Cost Estimates	Timeframe
4-A	$ 50,000,000.00	Long
4-B	$ 100,000,000.00	Long
4-C	$ 50,000,000.00	Long
4-D	$ 100,000,000.00	Long
4-E	$ 30,000,000.00	Mid
4-F	$ 30,000,000.00	Long
4-G	$ 150,000,000.00	Long
4-H	$ 150,000,000.00	Long
4-I	$ 30,000,000.00	Long
4-J	$ 30,000,000.00	Long
Corridor Wide		Mid

Figure 10-4. Segment 5 Break Out Projects

10.2 Interim Improvements

Interim improvements are short- to mid-term improvements to address more immediate needs for the corridor until funding can be obtained for larger-scale projects. Unlike break out projects, interim improvements do not match the ultimate design for the corridor.

(a) Segment 1

Pavement rehabilitation is recommended as an interim improvement to increase the remaining life of mainlane pavement between Transmountain Drive and Northern Pass Drive, and between Thorn Avenue and US 85. Segment 1 interim improvements along with estimated cost and timeframe are shown in Figure 10-5.

(b) Segment 3

Pavement reconstruction is recommended as an interim improvement to replace mainlane pavement between Copia Street and Raynolds Street.

Construction on the US 54 interchange to facilitate new movements and streamline access to Bridge of the Americas will begin shortly. A bottleneck currently exists east of US 54, caused by the weaving between the US 62 (Paisano Drive) entrance and the US 54 exit. Congestion in this area will likely increase with the planned expansion of Medical Center of the Americas. Interim operational improvements may be able to improve the flow of mainlane traffic. Two potential ramp removals in this area are the eastbound Chelsea Street exit and the westbound US 62 (Paisano Drive) entrance. The eastbound Chelsea Street exit could be barrier separated from the mainlanes to maintain access from US 54. Removal of the Chelsea Street underpass might further improve operations in this area. The westbound Raynolds Street entrance would carry higher volume as a result of the westbound US 62 (Paisano Drive) entrance ramp removal. The I-10 mainlanes should be more capable of handling this high-volume entrance west of the US 54 exit, where volume on the mainlanes are lower (only vehicles exiting at Copia Street would need to be in the far right lane).

Pavement reconstruction is recommended as an interim improvement to replace mainlane pavement between Raynolds Street and Buffalo Soldier Road, and between McRae Boulevard and Lomaland Drive.

The worst areas of congestion in the Segment 3 2042 No Build VISSIM model are along frontage roads and at intersections. Synchro results were analyzed to determine the intersections with the greatest delay in the 2042 No Build scenario. These intersections, and interim improvements, are as follows:

Buffalo Soldier Road

Signalize the Buffalo Soldier Road intersection with the westbound Frontage Road.

Airway Boulevard

Convert the U-turn lane to a left-U turn lane and the left-thru lane to a thru lane on the eastbound Frontage Road approach. Convert the rightmost thru lane to a right turn lane on the westbound Frontage Road approach. Make the right turn lane from the southbound Airway Boulevard approach channelized and free flowing. Optimize Airway Boulevard interchange signals.

McRae Boulevard

Convert the U-turn lane to a left-U turn lane and the left-thru lane to a thru lane on the eastbound Frontage Road approach. Convert the left-thru lane to a thru lane on the northbound McRae Boulevard approach. Convert the left-thru lane to a thru lane on the westbound Frontage Road approach. Add a right turn lane with significant storage length to the southbound McRae Boulevard approach. Optimize McRae Boulevard interchange signals.

Yarbrough Drive

Convert the U-turn lane to a left-U turn lane and the left-thru lane to a thru lane on the eastbound Frontage Road approach. Convert the left-thru lane to a thru lane on the northbound Yarbrough Drive approach. Convert the U-turn lane to a left-U turn lane and the left-thru lane to a thru lane on the westbound Frontage Road approach. Add a right turn lane with significant storage length to the southbound Yarbrough Drive approach. Optimize Yarbrough Drive interchange signals.

Lee Trevino Drive

Convert the left-thru lane to a left turn lane on the northbound Lee Trevino Drive approach. Restripe the bridge portion to eight 11-foot lanes. On the southbound Lee Trevino Drive approach, add a left turn lane and convert the left-thru lane to a thru lane. Also convert the rightmost thru lane to a thru-right turn lane. Optimize the Lee Trevino Drive interchange signals.

Zaragoza Road

Convert the left-thru lane to a left turn lane on the eastbound Frontage Road approach. Convert the left-thru lane to a thru lane on the northbound Zaragoza Road approach. Add a right turn lane to the southbound Zaragoza Road approach. Optimize Zaragoza Road interchange signals.

Segment 3 interim improvements along with estimated cost and timeframe are shown in Figure 10-6.

(c) Segment 4

The Eastlake Boulevard and Horizon Boulevard interchanges are projected to have significant delay in the 2042 No Build scenario. Changes to lane assignment at these interchanges may alleviate congestion. Recommended interim improvements are as follows:

Eastlake Boulevard Interchange

Convert the left-thru lane to a left turn lane on the eastbound Frontage Road approach. Convert one thru lane to an additional right turn lane on the southbound Eastlake Boulevard approach. Optimize Eastlake Boulevard interchange signals.

Horizon Boulevard Interchange

Convert the left-thru lane to a left turn lane on the eastbound Frontage Road approach. Convert one thru lane to an additional right turn lane on the southbound Horizon Boulevard approach. Optimize Horizon Boulevard interchange signals.

Additionally, three ramps (the eastbound Horizon Boulevard exit, westbound Horizon Boulevard entrance, and westbound Eastlake Boulevard entrance) in Segment 4 are projected to be over capacity in the No Build 2042 scenario. If improvements were made to these ramps, they would likely not be salvageable, so a break out project is not prioritized. Interim improvements could address capacity issues by adding a lane to each of these ramps. Segment 4 interim improvements along with estimated cost and timeframe are shown in Figure 10-7.

Project ID	Cost Estimates	Timeframe
1-A	$ 1,000,000.00	Short
1-B	$ 10,000,000.00	Short

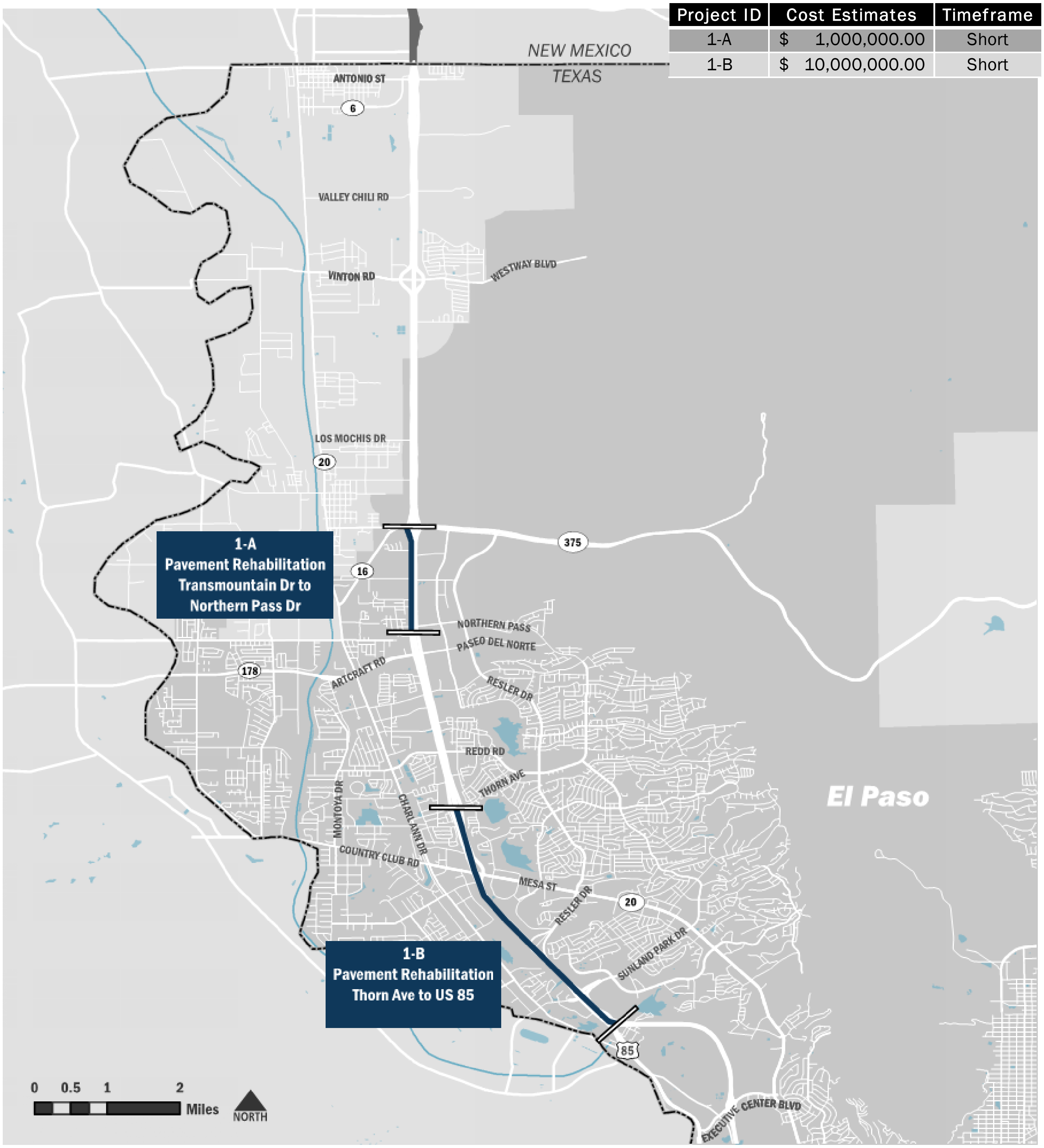
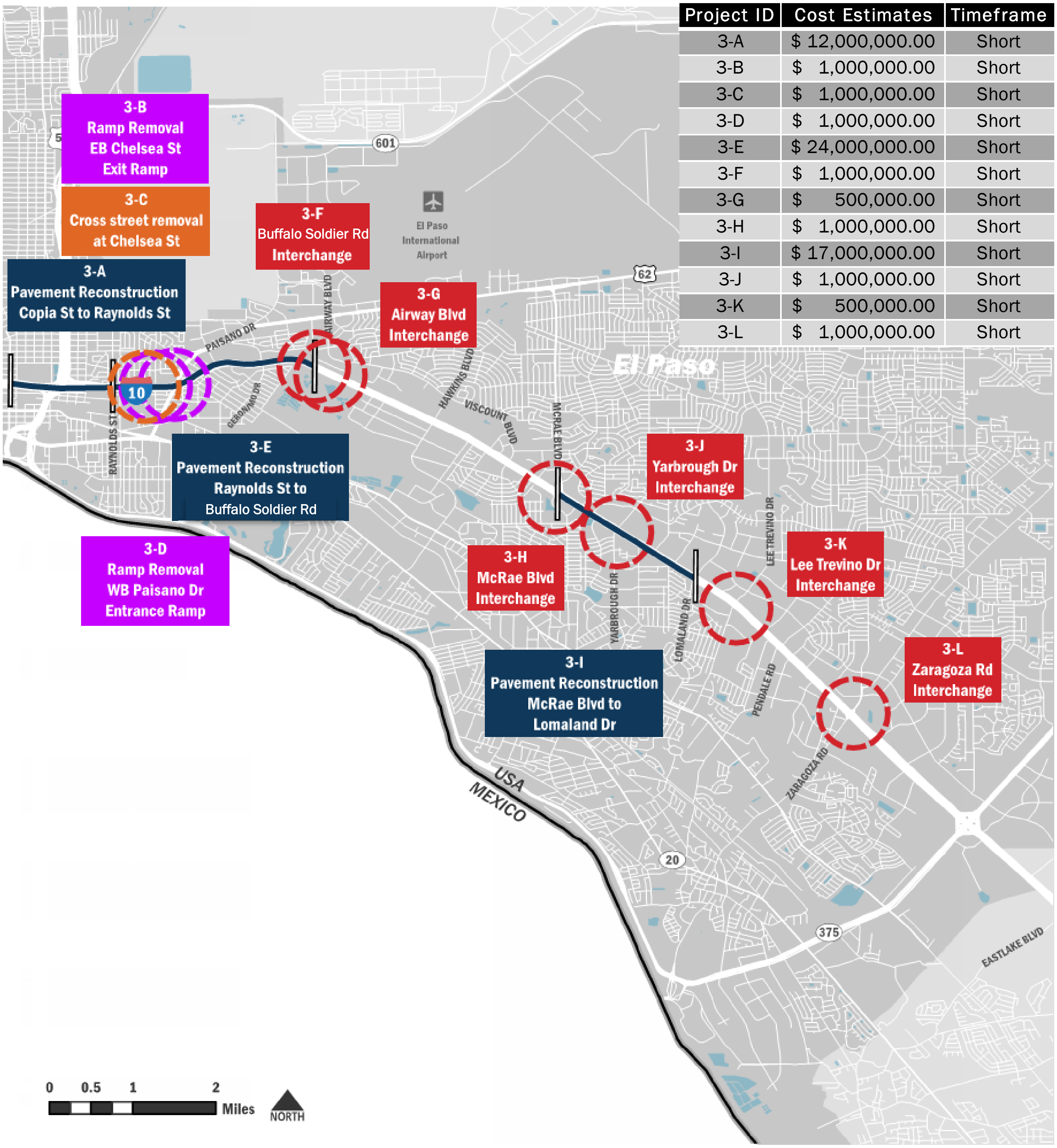
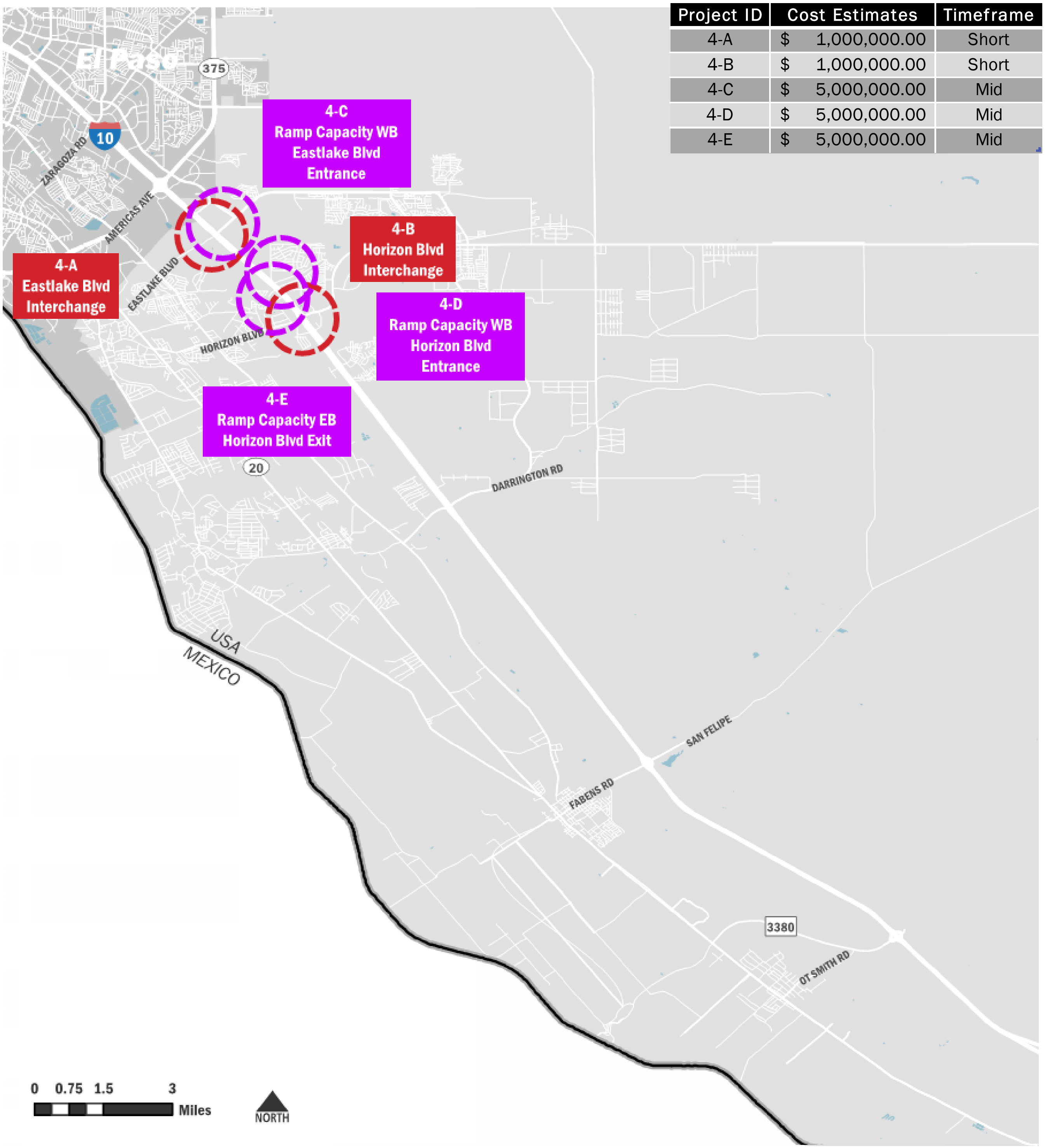


Figure 10-5. Segment 1 Interim Improvements



Project ID	Cost Estimates	Timeframe
3-A	$ 12,000,000.00	Short
3-B	$ 1,000,000.00	Short
3-C	$ 1,000,000.00	Short
3-D	$ 1,000,000.00	Short
3-E	$ 24,000,000.00	Short
3-F	$ 1,000,000.00	Short
3-G	$ 500,000.00	Short
3-H	$ 1,000,000.00	Short
3-I	$ 17,000,000.00	Short
3-J	$ 1,000,000.00	Short
3-K	$ 500,000.00	Short
3-L	$ 1,000,000.00	Short

Figure 10-6. Segment 3 Interim Improvements



Project ID	Cost Estimates		Timeframe
4-A	$	1,000,000.00	Short
4-B	$	1,000,000.00	Short
4-C	$	5,000,000.00	Mid
4-D	$	5,000,000.00	Mid
4-E	$	5,000,000.00	Mid

Figure 10-7. Segment 4 Interim Improvements

11. Benefit Cost Analysis

11.1 Preliminary Cost Estimate

Preliminary cost estimates were developed for each of the four segments using TxDOT statewide average low bid unit prices from 2018. Costs include earthwork and landscape, subgrade treatments and base, surface courses and pavement, structures, miscellaneous construction, lighting, signing, markings and signals. Costs were then inflated to future years, which vary by segment. Preliminary cost estimates are shown in Table 11-1. It should be noted that these cost estimates are very high-level and intended to show the magnitude of the costs. More specific cost estimates will be performed in later phases of project development.

Table 11-1. Preliminary Cost Estimates

	Segment 1	Segment 2	Segment 3	Segment 4
	New Mexico State Line (MM 0) to Executive Center Blvd (MM 16)	Executive Center Blvd (MM 16) to Chelsea St (MM 23)	Chelsea St (MM 23) to Loop 375 (MM 35)	Loop 375 (MM 35) to FM 3380 (MM 58)
Earthwork and Landscape Subtotal	$104,610,000	$109,820,000	$252,140,000	$30,650,000
Subgrade Treatments and Base Subtotal	$94,140,000	$46,290,000	$74,130,000	$186,160,000
Surface Courses and Pavement Subtotal	$169,480,000	$83,120,000	$133,770,000	$338,720,000
Structures Subtotal	$405,440,000	$449,510,000	$332,990,000	$143,850,000
Miscellaneous Construction Subtotal	$97,720,000	$41,560,000	$67,400,000	$134,340,000
Lighting, Signing, Markings and Signals Subtotal	$37,990,000	$24,070,000	$32,560,000	$47,430,000
Current Estimate Total (2018)	$909,380,000	$754,370,000	$892,990,000	$881,150,000
Inflated Current Estimate	$1,196,680,000	$1,161,320,000	$1,739,460,000	$1,716,390,000
Year of Inflated Current Estimate	2025	2029	2035	2035

A more detailed cost breakdown can be found in Appendix J.

11.2 Benefit-Cost Analysis

A benefit-cost analysis (BCA) was performed to determine the cost effectiveness of Reimagine I-10 recommendations. The BCA considers travel time savings, vehicle operating costs, trucking costs, crash costs, emissions costs, operations and maintenance costs, and capital costs to calculate net present value (NPV) and benefit-cost ratio (BCR). Results are shown both undiscounted and discounted to future years in Table 11-2 below.

Table 11-2. Benefit-Cost Analysis Results

Summary of Results Over the Study Period. All Values in Millions of 2018$

Impact Categories	NPV Over 20 Years of Operations	
	Undiscounted	7%
Benefits		
Travel Time Savings	$1,071.4 M	$209.9 M
Vehicle Operating Cost Savings	($146.9 M)	($28.8 M)
Avoided Trucking Costs	$274.4 M	$53.8 M
Safety Improvement Benefits	$295.2 M	$61.4 M
Emission Reduction Benefits	($2.1 M)	($0.5 M)
O&M Cost Savings	($45.4 M)	($9.4 M)
PV Benefits	**$1,446.6 M**	**$286.4 M**
Costs		
Capital Costs	$3,437.9 M	$1,335.3 M
PV Costs	**$3,437.9 M**	**$1,335.3 M**
Net Present Value (NPV)	**($1,991.3 M)**	**($1,048.9 M)**

Summary of Key Financial Metrics. All Values in Millions of 2018$

Key Financial Metrics	Undiscounted	7%
Total Benefits	$1,446.62 M	$286.42 M
Total Costs	$3,437.89 M	$1,335.31 M
Net Present Value (NPV)	($1,991.27 M)	($1,048.89 M)
Return on Investment (ROI)	-58%	-79%
Benefit-Cost Ratio (BCR)	0.42	0.21
Payback Period (years)	>20 yrs	>20 yrs
Internal Rate of Return (IRR)	-7.2%	

The undiscounted BCR is 0.42 and the discounted BCR (using a 7% discount rate) is 0.21. This difference is due to the fact that benefits come at a later year than costs. Both BCRs are low due to high project costs. All corridor study recommendations were included in the BCA. Many recommendations identified as break out projects and interim improvements likely have higher BCRs.

The full benefit-cost analysis can be found in Appendix K.

12. Projects, Reports, and Studies

Below is a list of projects, reports, and studies that were considered in the Reimagine I-10 Study:

- Page 2-5. TxDOT Border Transportation Masterplan 2018 Border Crossing Data (October 2019)
- Page 2-6. TxDOT Analysis of Mitigation Strategies for I-10 Corridor Hot Spots (August 2007)
- Page 2-6. TxDOT I-10 and Loop 375 Corridor Simulation Study (August 2009)
- Page 2-6. TxDOT Zaragoza Preliminary Improvement Concepts (September 2009)
- Page 5-9. TxDOT El Paso County Regional Transit Institutional Options Feasibility Study (April 2019)
- Page 8-1. City of El Paso Bike Plan (August 2016)
- Page 9-4. TxDOT Truck Parking Study (February 2020)

Additional projects, reports, and studies incorporated:

- I-10 third lane New Mexico state line to SH 20 (Mesa St) (CSJ 2121-01-094)
    - VE Study Recommendations
        - Los Mochis Drive
        - Thorn Avenue
- SH 178
- Mesa Street - SH 20 Corridor Study (CSJ 0001-02-059)
- Go10 (CSJ 2121-02-137)
- Mesa Park Drive Interchange (CSJ 2121-02-150)
- Border West Expressway (CSJ 2552-04-027)
- Paseo Del Norte Deck Plaza
- UPRR improvements
- I-10 Connect (CSJ 0167-01-113)
- MCA masterplan
- Borderland Expressway (CSJ 0924-06-136)
- Private developments at Eastlake Boulevard interchange
- Horizon Boulevard (FM 1281) Corridor Study (CSJ 3451-01-032)
- Border Highway East Study (CSJ 0924-06-090)
- Fabens airport enhancements

Additional reports are referenced in documents in the appendices.

Appendix A

Existing Conditions Tech Memo

Reimagine I-10 Corridor Study

Existing Transportation Conditions Technical Memorandum

CSJ: 2121-01-095

September 2019

Table of Contents

List of Figures

List of Tables

1. Introduction

1.1 Purpose

Texas Department of Transportation (TxDOT) in coordination with, El Paso Metropolitan Planning Organization (MPO), and City of El Paso is conducting a study of the Interstate Highway 10 (I-10) Corridor from the New Mexico Stateline to FM 3380 (Aguilera International Highway) (Figure 1-1). The study's purpose is to analyze current and future transportation needs for the El Paso I-10 Corridor.

Figure 1-1. I-10 Study Limits

1.2 Study Context

To better evaluate the elements of the corridor, the corridor was broken into four segments, or context areas, to identify unique characteristics and needs specific to that segment which may not be applicable to the entire project area. The four segments are as follows:

- Segment 1: Northern Gateway (New Mexico State Line to Executive Center Boulevard)
- Segment 2: Downtown (Executive Center Boulevard to Raynolds Street)
- Segment 3: Airport (Raynolds Street to Eastlake Boulevard)
- Segment 4: Southern Gateway (Eastlake Boulevard to FM 3380)

Figure 1-2 shows the breakdown of each segment along I-10.

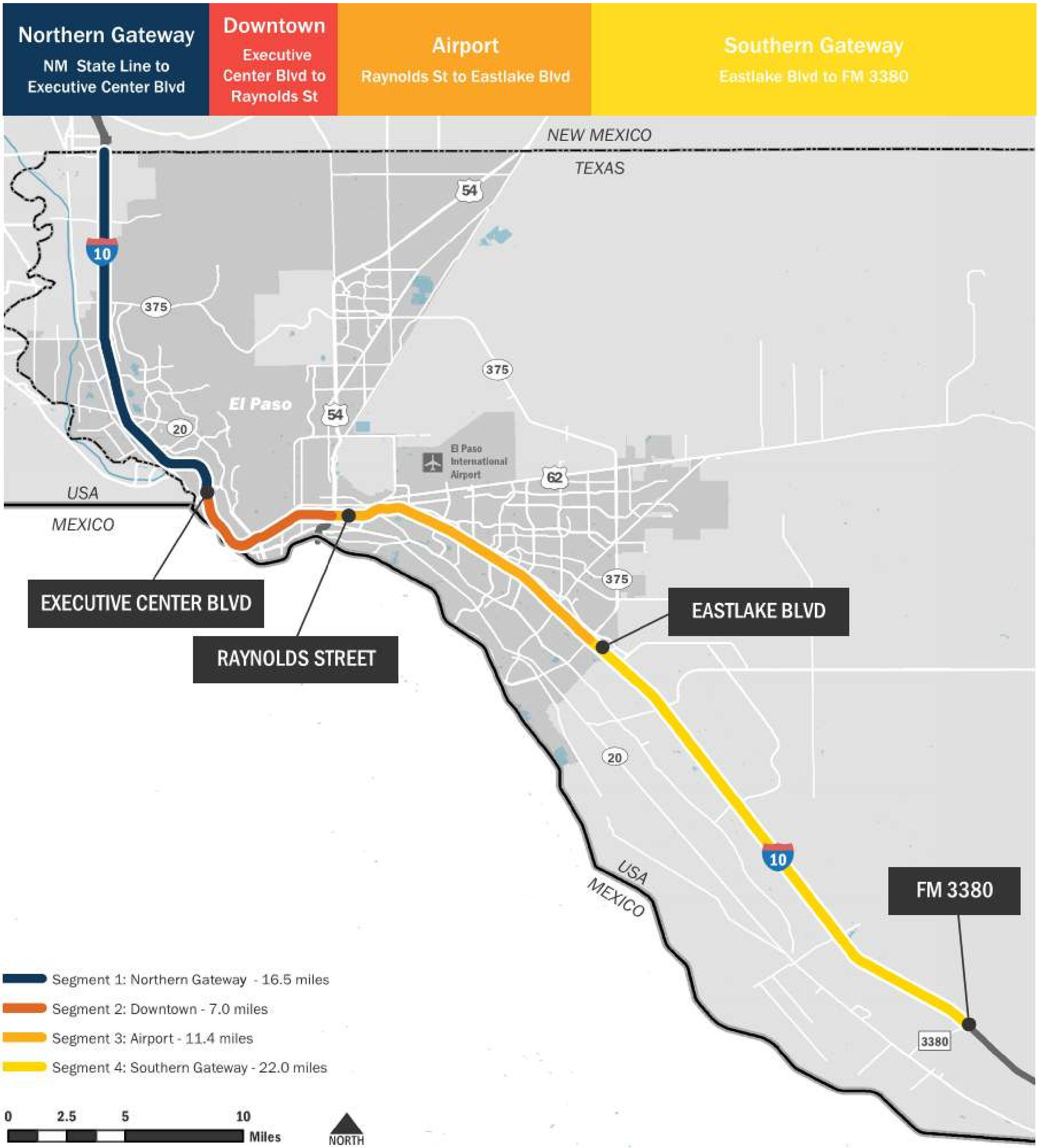


Figure 1-2. I-10 Segments

(a) Segment 1: Northern Gateway

I-10 is a four-lane divided highway from the New Mexico state line to SH 20 (Mesa Street) and a six-lane separated highway from SH 20 (Mesa Street) to Executive Center Boulevard. This section has a posted speed limit of 75 miles per hour (mph) from Antonio Street to Redd Rd where the speed limit decreases to 60 mph. This section has continuous frontage roads from Antonio Street to SH 20 (Mesa Street) with a posted speed limit of 55 mph.

Land use in this segment is primarily residential with several industrial sites and a few major entertainment and retail attractions. These attractions include Wet 'N' Wild Waterworld near the New Mexico State Line, the Outlet Shoppes at El Paso just north of the Loop 375 interchange, and Sunland Park Mall between Sunland Park Drive and the SH 85 interchange. Long stretches of undeveloped land border I-10 north of Loop 375, but some major development is taking place around the Loop 375 interchange. South of Artcraft Road/Paseo del Norte density increases and land use is primarily residential. The two-mile stretch along I-10 between the SH 85 interchange and Executive Center Boulevard is undeveloped with uneven terrain.

The north end of Segment 1 has a wide unpaved median, frontage roads, and two mainlanes in each direction. In the immediate vicinity of the Redd Road interchange, the median is paved. South of SH 20 (Mesa Street) there are no frontage roads and three mainlanes in each direction. The GO 10 project is added mainlanes and collector distributor roads to the corridor between SH 20 (Mesa Street) and Executive Center Boulevard.

(b) Segment 2: Downtown

I-10 is primarily an eight-lane highway from Executive Center Drive to Prospect Street. Once entering the business district at Yandell Drive the lanes decrease to a six-lane highway. From Dallas Street to Copia Street the lanes increase to a ten-lane highway and from Copia Street to Raynolds Street is then reduced to an eight-lane highway. The posted speed limit for this section is 60 mph. The westbound frontage road exists east of downtown, and the eastbound frontage road exists east of Piedras Street. The mainlanes are depressed through downtown with steep walls connecting the outside shoulder edges to ground level.

Land use in this segment is extremely varied but dominated by commercial, industrial, and residential uses. Major trip attractors include Downtown, the Bridge of the Americas Port of Entry, and The University of Texas at El Paso (UTEP). Segment 2 is extremely dense with the exception of the 1.5 mile stretch between Executive Center Boulevard and UTEP. Union Pacific Railroad (UPRR) rail lines exist along the eastbound side of I-10 for the majority of Segment 2 and a UPRR rail yard exists between downtown and Piedras Street.

(c) Segment 3: Airport

I-10 is an eight-lane highway from Raynolds Street to McRae Boulevard and a six-lane highway from McRae Boulevard to Eastlake Boulevard with continuous frontage roads throughout the entire section. The posted speed limit for the mainlanes is 60 mph and the posted speed limit for the frontage roads is 45 mph. The median is paved and inside shoulders are narrow at spots. Several recent studies have been conducted in this segment regarding additional north-south connectivity and capacity.

Land use in this segment is dominated by commercial and residential with the exception of a very large industrial area on the eastbound side of I-10 between Marlow Road and Tony Lama Street. A few additional industrial sites are scattered throughout the remainder of Segment 3. Major attractions in this segment include the El Paso International Airport, Fort Bliss, the Fountains at Farah, Cielo Vista Mall, University Medical Center, the Zaragoza Port of Entry, and Bassett Place.

(d) Segment 4: Southern Gateway

I-10 is a four-lane highway from Eastlake Boulevard to FM 3380 with a posted speed limit of 75 mph. There are continuous frontage roads from Eastlake Boulevard to FM 1110 (Darrington Road) that have a posted speed limit of 55 mph.

The Loop 375 interchange is surrounded by commercial, industrial and agricultural zones. The remainder of this segment is primarily residential with small businesses interspersed. Major trip attractors are Horizon area truck stops. There is very little development along I-10 in Segment 4 except at the Loop 375 and Horizon Boulevard interchanges. Density is lower compared to the rest of the corridor.

The remainder of this memo will be focused on the existing conditions of I-10 on and adjacent to these segments.

2. Existing Roadway Conditions

2.1 Functional Classification

Functional Classification is an essential component in all planning projects. While all roadways function by connecting places and people, identifying the functional classification of a roadway provides planners and engineers a means of access from specific locations as well as design criteria, social and economic objectives, and funding sources.

The Reimagine I-10 corridor study focuses primarily on I-10, which serves as a principal arterial within a large, urbanized area with populations greater than 200,000. Principal arterials are defined as the main movement of people and goods with high mobility and limited access. I-10's mainlanes or general-purpose lanes are further classified as an interstate, which is the highest classification of arterials. Interstates were designed with mobility and long-distance as the prime focus. Whereas the frontage roads along I-10 are classified as a major collector, where the primary function of this roadway is to gathering traffic from local roads and funneling into the arterial network.

All though I-10 is primarily designated as interstate, segments of the corridor have additional designations. Starting with Segment 1, I-10 shares joint designation with US 180, US 85 and CanAm Highway. CanAm Highway is an international highway which facilitates movement to/from Mexico to Canada through the United States. I-10 loses the two of three joint designations after the Sunland Park Drive Interchange where US 85 and CanAm highway diverge off to their own alignment, also known as US 62 (Paisano Dr). The I-10/US 180 designations continue through Segment 2 to Segment 3, where US 180 diverges off onto the alignment of US 62 (Paisano Dr) ultimately follows Montana Avenue to the east.

2.2 Network Connectivity

The I-10 corridor is within an urbanized area and provides access to 53 cross streets. They are classified as "Other Freeway/Expressway" (3); "Other Principal Arterials" (20), "Minor Arterials" (17); "Local" (1); and "Major Collectors" (12). There are three system interchanges along the study limits. Table 2-1 lists these various roadways and classifications.

Table 2-1. I-10 Cross Streets and Functional Classification

Segment	Minor Arterial	Major Collector	Other Principal Arterial	Local	Other Freeway/ Expressway
Segment 1	2	1	5	0	2
Segment 2	11	6	4	1	0
Segment 3	4	2	8	0	1
Segment 4	0	4	3	0	2
Total	17	12	20	1	3

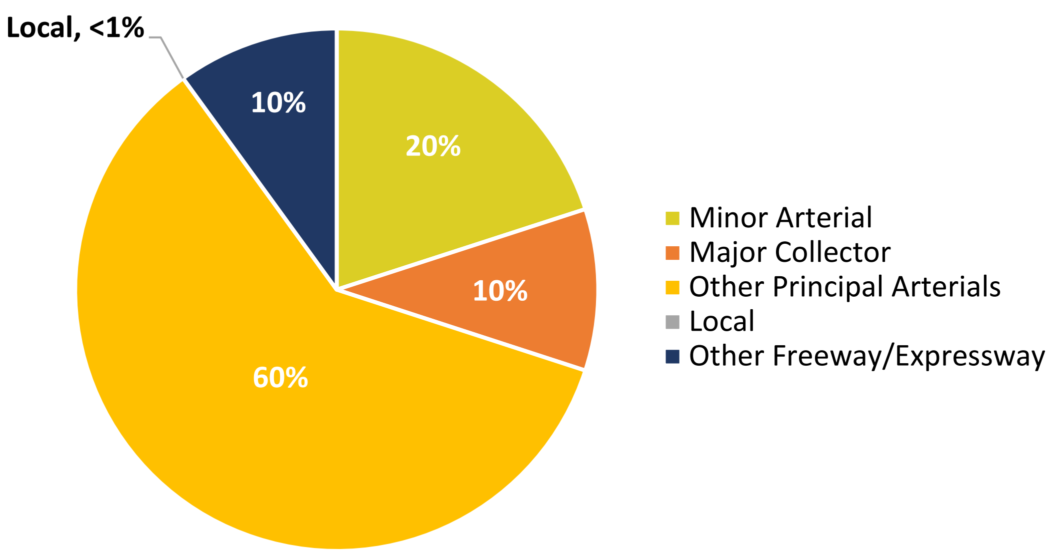


Figure 2-1. Cross Street Functional Classification

2.3 Roadway Characteristics

The existing roadway characteristics vary throughout the I-10 Corridor. Segment 1 is primarily composed of a flexible mixed bituminous surface. Some portions of the segment have a rigid continuously reinforced concrete pavement (CRCP). Segments 2, 3, and 4 are primarily composed of a CRCP surface with some portions of flexible mixed bituminous pavement. The base type throughout the corridor primarily consists of a flexible granular base and a hot mix, asphaltic, concrete base. A few areas have a granular stabilized earth base.

The speed limits and number of lanes are briefly summarized in Section 1.2 above. The existing lane width throughout the corridor is generally 12 feet. There are few exceptions for areas with lateral constraints. The inside shoulder width for Segment 1 varies between four and ten feet. Segments 2 and 3 have inside shoulder widths greater than ten feet. Segment 4 has an inside shoulder width between four and six feet. The outside shoulder width is generally ten feet throughout the corridor with few exceptions for areas with lateral constraints.

In addition to speed limits, number of lanes, roadway widths, surface types, and base types, the summary includes flexible and rigid Equivalent Single Axle Load (ESAL) values for the corridor. ESAL values help generalize the effect that any given vehicle will have on a pavement structure. This will account for all vehicles ranging from passenger cars to freight vehicles.

2.4 Access

The I-10 Corridor within the El Paso County serves as the lifeline for the region. However, because of the natural and cultural constraints as well as the international border with Mexico, the El Paso region is limited to alternative routes. There are three major system interchanges which exist along the corridor. State Loop (SL) 375 intersects I-10 in two locations, once in Segment 1 and second in Segment 3. The third system interchange is US 54 in Segment 2. This puts an additional strain along I-10 as the Principal Arterial and results in higher than anticipated ramp densities for similar interstate class arterials. Segments 2 and 3, which are located in the heavily urbanized and developed area and therefore have a relatively high ramp density when compared to the rural Segments 1 and 4 which are not as dense. Table 2-2 lists the existing ramp densities per Segment.

Table 2-2. Segment Average Ramp Density

Segment	Ramps/Mile
Segment 1	1.16
Segment 2	2.21
Segment 3	2.25
Segment 4	0.47

Ramp density correlates to Total Ramp Density (TRD) in the Highway Capacity Manual. The Highway Capacity Manual utilizes TRD as one of the factors to determine the reduction in free flow speed (FFS). In turn free flow speed is one of the many components which determine the level of service. Level of service is a measure of density of passenger cars per mile per lane. A higher TRD in essence will reduce the FFS, which ultimately reduces the level of service for the facility. Figure 2-2 illustrates the effects of the TRD onto the corridor by segment.

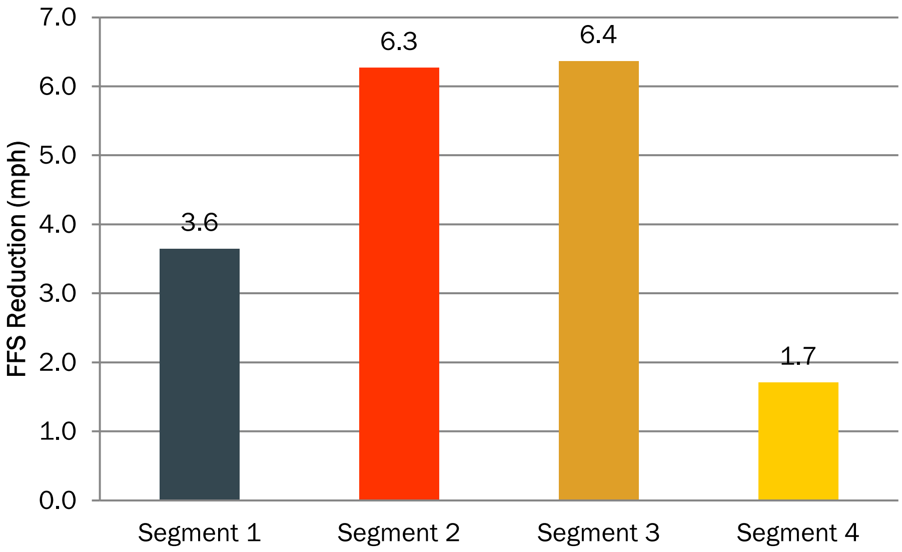


Figure 2-2. Total Ramp Density Impacts by Segment

As mentioned earlier, the urban segments (Segments 2 and 3) have higher ramp density and therefore have a higher FFS reduction. It becomes difficult to reduce the number of ramp per mile due to public resentment and impacts to local businesses.

2.5 Right-of-Way

Along the I-10 El Paso Corridor, right-of way width varies between 220 feet and 760 feet. Right-of-way width increases near undeveloped plots of land and where frontage roads shift out away from the highway (often at interchanges). Right-of-way is limited in other areas by developments along I-10, particularly in dense urban segments.

The right-of-way width in Segment 1 ranges from 300 feet to 580 feet and is typically about 400 feet. There is sufficient width to allow for expansion. LBJ Park, Keystone Dam, Resler Canyon Nature Preserve, and Buena Vista Park border the existing right-of-way in this segment.

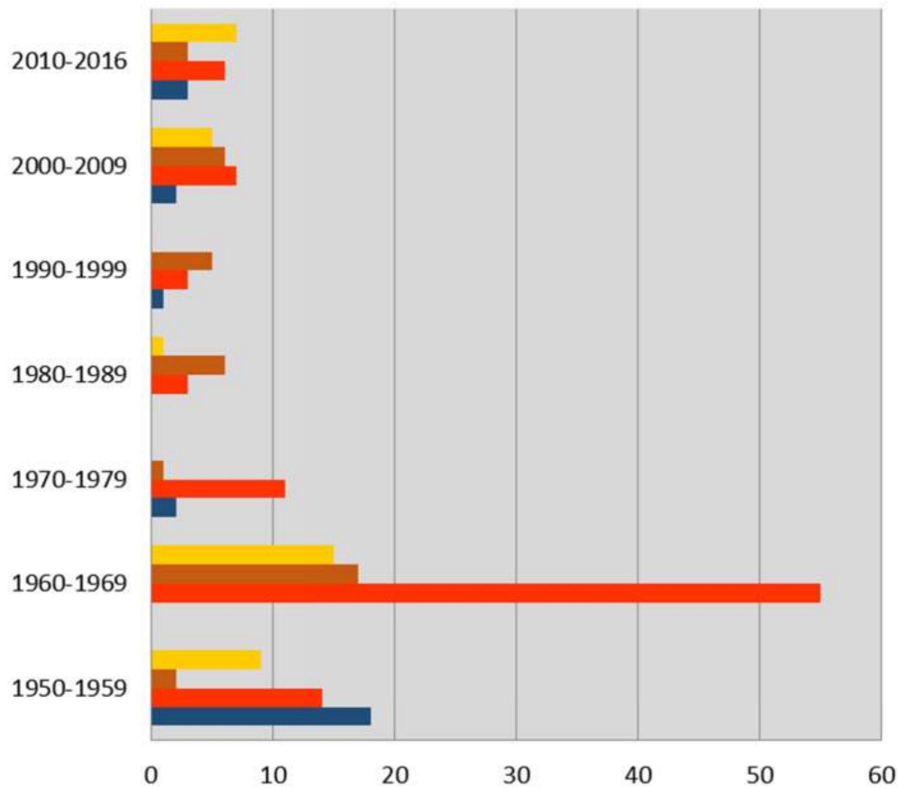
Right-of-way width in Segment 2 is the most constraining, varying between 220 feet and 470 feet. Between UTEP and the UPRR railroad crossing immediately east of Cotton Street, there is approximately 250 feet of right-of-way width. Due to substantial development bordering I-10, there is little room for expansion within existing right-of-way. Smelter Cemetery, Sunset Heights Historic District, Grace Chope City Park, Old San Francisco Historic District, Cavalry Park, Independent Historic District, Concordia Cemetery, Mt. Sinai Cemetery, B'nai Zion Cemetery, and Lincoln Park border the existing right-of-way in this segment.

Along Segment 3, right-of-way width varies between 260 feet and 480 feet. Right-of-way width is approximately 300 feet in the heavily developed area between US 62 (Paisano Drive) and Zaragoza Road and is constraining. Lincoln Park, Saipan-Ledo Park, and San Juan Park border the existing right-of-way in this segment.

Right-of-way width exceeds 350 feet along the majority of Segment 4 and varies between 270 feet and 760 feet. There is ample room for future additions or widening.

2.6 Bridges

There are approximately 202 bridge class structures along I-10 within the project limits. For analysis purposes, PonTex reports were utilized to determine any potential structural deficiencies. PonTex is a bridge inspection data management intended to replace but not retire BRINSAP. Within the report 31 bridges are classified as Functionally Obsolete. FHWA classifies bridges Functionally Obsolete if it fails to meet its design criteria either by its deck geometry, its load-carrying capacity, its vertical and horizontal clearances, or the approach roadway alignment to the bridge. Over half of the structures within the corridor were built before 1970, during the construction of the interstate system. Figure 2-3 illustrates how many structures were built within a given year range.



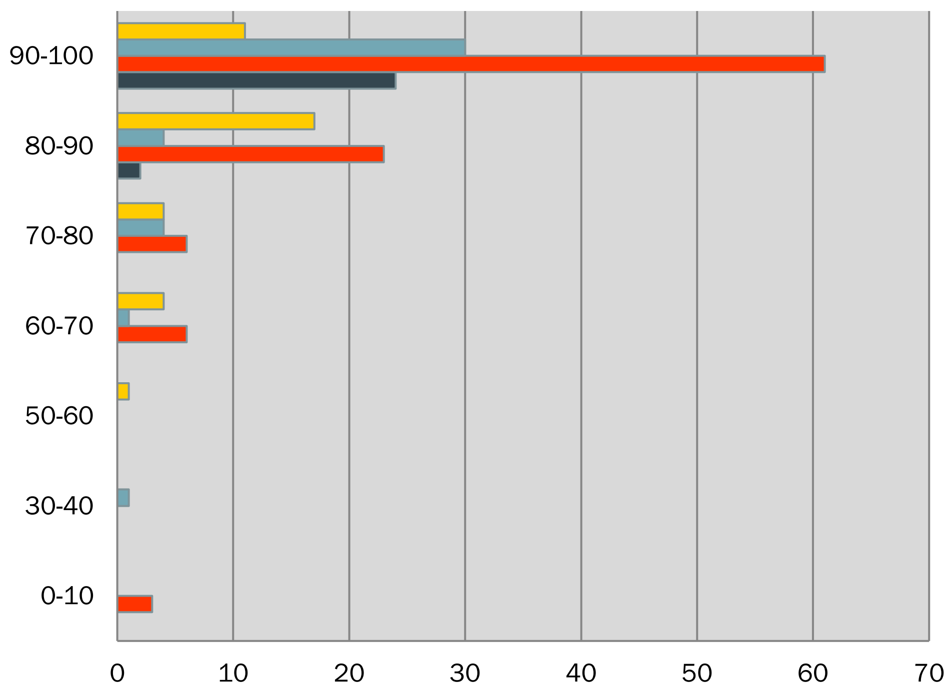
	1950-1959	1960-1969	1970-1979	1980-1989	1990-1999	2000-2009	2010-2016
Segment 4	9	15		1		5	7
Segment 3	2	17	1	6	5	6	3
Segment 2	14	55	11	3	3	7	6
Segment 1	18		2		1	2	3

Figure 2-3. Year of Construction by Segment

Over 50% of the structures within Segments 1, 2, and 4 and 47% of the structures in Segment 3 were built before the year 1970.

For planning purposes another key factor regarding bridge structures is the sufficiency rating. TxDOT's Bridge Development Manual defines sufficiency rating as "A single numerical rating ranging from 0 to 100 that is based on federal criteria and takings into consideration a bridge's structural adequacy and safety, serviceability and functional obsolescence, and essentiality of traffic service". A more detailed definition can be found in the TxDOT Bridge Inspection Manual Section 3 – Sufficiency Ratings.

Six of the 31 Functionally Obsolete had sufficiency rating below 70 with the lowest being 58.6. One structurally deficient structure in Segment 3 is on I-10 Eastbound Frontage Road has a sufficiently rating of 31.4 and is closed to traffic. Segment 2 contains three utility bridge structures which span over the I-10 mainlanes and do not contain a sufficiency rating. Figure 2-4 illustrates the sufficiency ratings of all of the bridge class structures per segment.

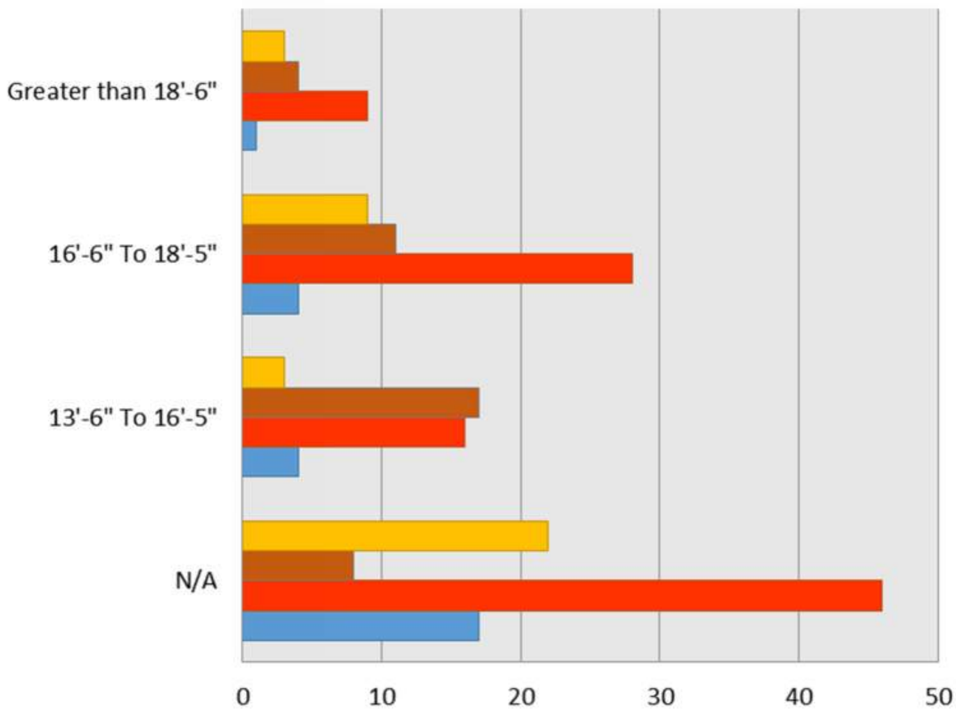


	0-10	30-40	50-60	60-70	70-80	80-90	90-100
Segment 4			1	4	4	17	11
Segment 3		1		1	4	4	30
Segment 2	3			6	6	23	61
Segment 1						2	24

Figure 2-4. Sufficiency Ratings by Segment

Even though over half of the structures were built before 1970, 85% of all of the structures have a sufficiency rating over 80.

The TxDOT Roadway Design Manual specifies that all controlled access highway grade separation structures, including railroad underpasses, should provide 16’-6” minimum vertical clearance over the usable roadway. Roadways under the mainlanes of interstate or controlled access highways must meet the appropriate clearance required by the undercrossing roadway classification. PonTex reports indicate that all overpasses over I-10 mainlanes meet or exceeded the 16’-6” clearance minimum.



	N/A	13'-6" To 16'-5"	16'-6" To 18'-5"	Greater than 18'-6"
Segment 4	22	3	9	3
Segment 3	8	17	11	4
Segment 2	46	16	28	9
Segment 1	17	4	4	1

Figure 2-5. Vertical Clearances

Vertical clearances on structures crossing drainage or pedestrian walkways are shown as not applicable (N/A) as they do not cross any functional classified roadway. It should be noted that the Texas Freight Plan recommends vertical clearances of 18’-6” and when compared to the I-10 corridor only a handful achieve this recommendation.

2.7 Previous Transportation Studies

Several studies have been prepared for I-10 and its adjacent roadways. This section provides comprehensive summaries and recommendations of the most recent and relevant transportation studies that have been developed for this corridor.

(a) Airway Boulevard Feasibility Study (December 2005)

The purpose of this study was to identify feasible alternatives for a north-south connector between the south side of the city of El Paso and the area north of I-10 in order to connect citizens to a retail district and the El Paso International Airport. The focus of the study was between Trowbridge Drive/North Loop Drive and I-10. Hawkins Boulevard is the major north-south roadway that serves this area, and an additional connection is needed. The study recommended a connection from Airway Boulevard to the Border Highway, which was divided into three phases. Phase 1 is a two-lane connector between Airway Boulevard and Market Street. Phase 2 is a four-lane connector between Airway Boulevard and Delta Drive. Phase 3 is a study to determine a potential connection to the Border Highway. *HDR does not recommend constructing this connector because there are many utility and ROW conflicts and a railroad in close proximity. The I-10 Connect project should provide the desired additional north-south connectivity in the east El Paso area.*

(b) Analysis of Mitigation Strategies for I-10 Corridor Hot Spots (August 2007)

This study identified "hot spots" along I-10 reflecting traffic conditions in the year 2030. Freeway mainlanes that drop below 40 mph and/or speed reductions for extended periods of time qualify as "hot spots." During the AM peak in the eastbound direction, there is a constant speed reduction to 40 mph from Vinton Road to Transmountain Drive; a speed drop to 30 mph between Sunland Park Drive and Executive Center Boulevard; heavy congestion at the Buena Vista interchange; heavy traffic exiting at UTEP (with speed drops to 20-30 mph); fairly heavy congestion between Geronimo Drive and Airway Boulevard; (average speed 45 mph) and very heavy volume exiting at Eastlake Boulevard (Eastlake Boulevard shows heavy congestion in both directions during morning peak hours). During the AM peak in the westbound direction, there is heavy traffic going to/from SH 20 (Mesa Street); a large amount of westbound traffic exiting at Executive Center Boulevard and turning left towards US 62 (Paisano Drive); stop and go traffic between Geronimo Drive and US 62 (Paisano Drive); a constant two hour speed reduction below 40 mph from Lee Trevino Drive to Geronimo Drive; and a constant speed reduction below 40 mph from Horizon Boulevard to Loop 375 with a concentration of traffic at Americas interchange. During the PM peak in the eastbound direction, there is a constant speed reduction to 40 mph between Transmountain Drive and Redd Road; stop and go traffic between Cotton Street and Raynolds Street; and constant slow speed below 40 mph between US 62 (Paisano Drive) and Zaragoza Road (with heavy congestion at Airway Boulevard). There are also random large speed reductions below 10 mph between SH 20 (Mesa Street) and Schuster Avenue concentrated at the Executive Center Boulevard and Buena Vista interchanges. During the PM peak in the westbound direction, there is heavy traffic from SH 20 (Mesa Street) to Vinton Road (SH 20 significantly contributes to I-10 westbound traffic), extreme congestion between UTEP and Sunland Park Drive (particularly between the Executive Center Boulevard and Buena Vista interchanges), parking lot traffic conditions between Geronimo Drive and US 62 (Paisano Drive), and consistent heavy congestion from Horizon Boulevard to Loop 375 (the Horizon interchange shows extremely heavy congestion).

Direct connectors from eastbound I-10 to northbound Buffalo Soldier Road and from southbound Buffalo Soldier Road to westbound I-10 are proposed to encourage the use of Montana Avenue as an alternate route to I-10 (it is assumed that Montana Avenue is a four-lane tollway with two-lane frontage roads in each direction by the year 2030). The westbound direct connector acts like an accident (due to high volumes entering I-10) and worsens congestion upstream of Geronimo Drive. The eastbound direct connector provides significant congestion relief for afternoon peak hour traffic between Airway Boulevard and Zaragoza Road. *HDR does not recommend constructing the direct connector from eastbound I-10 to northbound Buffalo Soldier Road because Montana Avenue has not yet been upgraded to a four-lane tollway with two-lane frontage roads in each direction. HDR does not recommend constructing the direct connector from southbound Buffalo Soldier Road to westbound I-10 because this direct connector creates more congestion on I-10.*

A four-lane divided freeway tying Airway Boulevard to Border Highway is recommended for further analysis. The route would run adjacent to Western Refinery and have access points at both Market Street and Buffalo Soldier Road. This connection causes more congestion than relief on I-10 when modeled without the Zaragoza Port of Entry (which didn't exist at the time of this study). *HDR does not recommend constructing this freeway because there are many utility and ROW conflicts and a railroad in close proximity. The desired additional north-south connectivity in the east El Paso area should be provided by the I-10 Connect project which is to be constructed.*

It is recommended that the westbound US 62 (Paisano Drive) entrance ramp to I-10 be permanently closed. Currently, the amount of vehicles traveling on the far right lane (destined for US 54/Mexico) interacting with vehicles entering the freeway creates a bottleneck location on the freeway which disrupts the balanced flow of traffic. Ramp closure would improve freeway traffic congestion and increase mainlane speed at both upstream and downstream locations (creating a more balanced flow of traffic). *HDR recommends this suggestion for further evaluation. The stated benefits are appealing, but US 62 (Paisano Drive) is a major arterial, and removing its access to westbound I-10 at this location could negatively impact other parts of the network.*

An additional lane is needed in both the eastbound and westbound directions on I-10 between Sunland Park Drive and Executive Center Boulevard to accommodate traffic volumes. *HDR recommends this suggestion for further evaluation.*

It is recommended that the lane reduction on the westbound frontage road ramp near Sunland Park Drive be extended further to reduce the amount of queuing on several approaches to the interchange. Currently, this lane reduction is beneficial because the transition from one to two lanes acts like a ramp meter, controlling the volume of vehicles entering the mainlanes. However, the location of the lane reduction results in inadequate storage, causing queues to spill back to and congest the Sunland Park Drive intersection. By extending the lane reduction, storage could be increased and queue lengths could be reduced. *HDR recommends this suggestion for further evaluation.*

(c) Evaluation of Alternatives for Zaragoza/I-10 Interchange (June 2007)

The Zaragoza Road/I-10 interchange is currently operating at saturation levels, and intersections in and around this interchange experience heavy congestion during peak periods. The study recommends the construction of three direct connectors to reduce traffic volumes at intersections along Zaragoza Road. The proposed connections are eastbound I-10 to northbound Pullman Drive, southbound Pullman Drive to westbound I-10, and northbound Zaragoza Road to westbound I-10. Construction of these direct connectors shifts a large amount of traffic to Pullman Drive and to Pellicano Drive (between Pullman Drive and Zaragoza Road). Upgrades to Pellicano Drive and its intersections with Zaragoza Road and Pullman Drive must be further analyzed. There is substantial congestion relief on Zaragoza Road between George Dieter Drive and Rojas Drive in both the northbound and southbound directions. *HDR recommends this alternative for further evaluation. It would likely improve operations along Zaragoza Road, but has little effect on I-10 traffic.*

(d) Evaluation of Design Alternatives for US 62/SH 20 Intersection (February 2008)

A double roundabout has since been built at this location. The study recommended construction of a single roundabout because it showed consistent improvement in all performance measures for the network (a double roundabout was not analyzed). *HDR does not recommend further evaluation. Changes to this intersection would likely have little effect on I-10 traffic.*

(e) I-10 and Loop 375 Corridor Simulation Study (August 25, 2009)

This study identified issues along the I-10 corridor from the Texas/New Mexico state line to SH 20 (Mesa Street) (12 miles) and along the Loop 375 corridor from I-10 to Franklin Mountains State Park (2.1 miles). No Build and Build scenarios were evaluated with year 2015 and 2035 traffic projections. Recommendations begin at the north end of the study area and move south.

At the FM 1905/Mountain Pass Boulevard interchange with I-10, the westbound Mountain Pass Boulevard approach currently has one channelized right turn and one through lane. Provision of an additional through lane would improve operations and reduce queuing. The eastbound FM 1905 approach experiences congestion due to the high right turning volume passing through the signalized intersection. Channelization of this movement and provision of an acceleration lane would improve operation of the eastbound approach. The I-10 southbound entrance ramp is less than 200 ft from the FM 1905/S Desert Boulevard intersection. This is extremely close and relocating this ramp further south would increase the weaving distance available, thus improving traffic operations on this segment. *HDR recommends these proposed improvements for further evaluation.*

At the Vinton Road/Westway Boulevard interchange with I-10, traffic operation on the northbound approach is adversely affected by the proximity of the northbound exit ramp to Vinton Road/Westway Boulevard. This results in inadequate weaving distance, which could be increased by moving the ramp south. On the eastbound Vinton Road approach, high right turn demand and the existing unchannelized right turn results in extensive queuing. A channelized right turn will improve approach operation. On the westbound Westway Boulevard approach, the addition of an exclusive right turn bay is recommended. *HDR recommends these proposed improvements for further evaluation.*

On Loop 375, two weaving segments are problematic. The first is on westbound Loop 375 between the entrance ramp from Resler Drive and the direct connect ramp to southbound I-10. The second is on westbound Loop 375 between the entrance ramp from Northwestern Drive and the intersection of Loop 375 with N Desert Boulevard. Increasing the weaving lengths or removing these weaving segments will improve operations. *HDR recommends additional evaluation to develop potential solutions.*

At the Artcraft Road/Paseo del Norte Drive interchange with I-10, the eastbound Artcraft Road approach is unable to serve the projected right turn demand. Dual right turns are needed. Widening the northbound approach to five lanes with the provision of a u turn, three left turn lanes, two through lanes, and a dedicated right turn bay is recommended. *HDR recommends these proposed improvements for further evaluation.*

At the Redd Road/I-10 interchange, dual left turns are recommended on the northbound and southbound approaches by providing a shared left turn/u turn configuration. Extending the existing turn bay on the eastbound Redd Road approach by way of median improvements is recommended. Due to the high volume on southbound I-10 mainlanes, volume south of the interchange on the southbound entrance ramp from Redd Road experiences significant delay when merging with mainlane traffic, resulting in queue spillback from the entrance ramp to S Desert Boulevard. The addition of an auxiliary lane on I-10 between Redd Road and SH 20 (Mesa Street) could mitigate this queuing and delay. *HDR recommends these improvements for further evaluation.*

At the Thorn Avenue/I-10 interchange, it is necessary to expand Thorn Avenue to a four lane roadway west of I-10 to improve traffic operations. The addition of a channelized right turn bay to the eastbound approach would reduce queuing and further increase capacity. *HDR recommends these improvements for further evaluation.*

At the SH 20 (Mesa Street) interchange with I-10, dual lefts are warranted on the eastbound and westbound approaches. The northbound entrance ramp from SH 20 (Mesa Street) has a short taper where it meets the I-10 mainlanes, making it difficult for vehicles to find a suitable gap. This results in significant delay, causing queues to spill back to the interchange and create gridlock. Adjustments to this ramp/merge or the addition of an auxiliary lane on I-10 between SH 20 (Mesa Street) and Redd Road could reduce queuing. A right turn bay is recommended for westbound SH 20 (Mesa Street). U turns and triple left turns are recommended for the northbound and southbound approaches. Additional alternatives were considered for the SH 20 (Mesa Street) interchange with I-10. A direct connector from N Desert Boulevard to westbound SH 20 (Mesa Street) (tying in west of Osborne Drive) is recommended along with a northbound to southbound u turn. *HDR recommends further evaluation to develop/compare potential solutions.*

In order to improve I-10 mainlane operations, it is recommended that three ramps in this corridor be upgraded from single-lane ramps to two-lane ramps. These ramps are the northbound exit ramp to Artcraft Road, the northbound exit ramp to Redd Road, and the southbound entrance ramp from Redd Road. Auxiliary lanes are recommended on the northbound I-10 mainlanes between the entrance ramp from SH 20 (Mesa Street) and the exit ramp to Redd Road, and on the southbound I-10 mainlanes between the entrance ramp from Redd Road and the exit ramp to SH 20 (Mesa Street). A shift from diamond to X ramp configuration throughout the corridor was analyzed. This moves traffic from the mainlanes to the service roads, improving mainlane operation but resulting in severe service road congestion. For this reason, the study did not recommend the X ramp configuration. *HDR will consider these proposed changes for further evaluation.*

(f) I-10 Restriping Plan Report (Unknown Date)

The goal of the restriping is to provide a minimum of eight lanes (four in each direction) on I-10 from Redd Road to Loop 375 (25 miles). This would require the reallocation of lane assignments on I-10 at four separate locations and would require new pavement in many areas where the shoulder does not have adequate structural capacity to support mainlane traffic. *HDR recommends this suggestion for further evaluation. The restriping is feasible, but no information regarding the projected performance of the new facility was given. Changing the nature of the merge/diverge movements at some ramps (by converting entrance and exit lanes to mainlanes) would likely have adverse impacts.*

(g) IAJR Hawkins Boulevard (October 13, 2008)

The proposed ramp reversal has been constructed along with a dedicated right turn at Hawkins Boulevard for westbound traffic. Although the entire I-10 corridor in this area is becoming increasingly congested, the improvements are beneficial to traffic flow in the immediate area of the Hawkins Boulevard interchange.

(h) IAJR Loop 375 (August 2009)

The eight proposed direct connectors were recently constructed. It is expected that this new interchange may shift some traffic from the Zaragoza interchange. The first westbound entrance ramp from Eastlake Boulevard to the I-10 mainlanes exceeds the capacity of a single-lane ramp in the year 2033. There is another ramp downstream which is predicted to be well below its capacity. The study says signage could be placed on the frontage road to better distribute traffic volumes between these two ramps. *HDR recommends evaluating alternatives that address the entrance ramp capacity issue.*

(i) Montana Avenue Corridor Study (February 27, 2009)

Montana Avenue (a four to six-lane arterial with speed limits from 35 to 60mph) is a primary east-west corridor on the east side of El Paso. The corridor is currently congested at major intersections, and significant future population growth (which is projected) will only add to this problem. An access controlled four-lane divided highway/toll road with frontage roads is proposed from the Border

Highway to Desert Meadows Road to accommodate growth and relieve other east-west routes (such as I-10). The facility could shift some traffic from the I-10 corridor, but not a substantial amount. The proposed highway runs north-south from the Border Highway to the existing Montana Avenue/Buffalo Soldier Road intersection, then follows the alignment of Montana Avenue between Buffalo Soldier Road and Desert Meadows Road. *HDR recommends evaluating alternatives to the proposed alignment.*

(j) Zaragoza Preliminary Improvement Concepts (September 11, 2009)

Significant traffic congestion occurs at the Zaragoza Road/I-10 interchange and nearby major intersections. The principal issue is the need to remove (to the greatest extent possible) truck traffic from the existing interchange and find ways to bring this traffic efficiently into the warehouse/distribution facilities in all four quadrants of the interchange. Tight diamond interchanges were proposed along I-10 at Pendale Road and at Don Haskins Drive/Alza Drive to offer alternate routes. I-10 exit ramps to Pendale Road and a frontage road bypass for the eastbound frontage road at Zaragoza Road were also recommended to facilitate access to the new interchanges. *HDR recommends the frontage road bypass for the eastbound frontage road at Zaragoza Road for further evaluation. HDR does not recommend constructing the tight diamond interchanges or exit ramps, as these would have little impact to traffic on I-10 and be costly to construct.*

Committed Projects TxDOT's Project Tracker and the El Paso MPO's TIP were utilized to determine currently committed projects along the I-10 corridor.

Table 2-3 lists only projects that are currently committed for I-10.

Table 2-3. TxDOT Committed Projects

I-10 Corridor Study Nearby Projects					
Status	**Highway**	**CSJ**	**Type of Work**	**Description**	**Estimated Cost**
Construction Scheduled	I-10	212101092	Rehab and Operational Improvements	Rehab and operational improvements, Phase II	$14,991,565
Construction Scheduled	I-10	212101087	Improve Traffic Signal	Improve traffic signal at SH 20	$481,505

I-10 Corridor Study Nearby Projects					
Status	**Highway**	**CSJ**	**Type of Work**	**Description**	**Estimated Cost**
Construction Scheduled	I-10	212102137	Collector Distributor Lanes	Collector distributor lanes and interchange construction	$151,106,761
Construction Scheduled	I-10	212102132	Rehabilitation	Diamond grind concrete pavement and repair longitudinal	$2,316,341
Construction Scheduled	I-10	212102152	Bridge Enhancement	Enhance pedestrian rail, clean & paint	$5,301,269
Construction Scheduled	I-10	212102155	Enhancement Project	Aesthetic development, Phase III	$3,596,591
Construction Scheduled	I-10	212102146	Install High Mast Lighting	Install high mast lighting	$1,453,755
Construction Scheduled	I-10	212102151	Enhancement Project	Aesthetic development, Phase II	$8,077,333
Construction Scheduled	I-10	212104098	Widen Roadway	Widen roadway to 8 lanes	$15,135,187
Construction Scheduled	I-10	212104093	Interchange Improvement Including Constructing Direct Connector	Interchange improvements/Construction of DC S LP 375 to EB I-10	$34,486,587
Finalizing for Construction	I-10	212101091	Rehab and Operational Improvements	Rehab and operational improvements, Phase III	$7,100,000

I-10 Corridor Study Nearby Projects					
Status	**Highway**	**CSJ**	**Type of Work**	**Description**	**Estimated Cost**
Finalizing for Construction	I-10	212102159	Upgrade Bridge and Approach Railing	Replace bridge and approach railing	$688,500
Finalizing for Construction	I-10	212102158	E-3 Rail Replacement	E-3 rail replacement	$4,394,201
Finalizing for Construction	I-10	212102134	Rehabilitation	Diamond grinding and striping	$4,500,001
Finalizing for Construction	I-10	212102149	Rehab Existing Road	Remove and replace bonded overlay	$6,200,000
Finalizing for Construction	I-10	212102147	Add 1 Lane (Operational Improve)	Add 1 lane in each direction by restriping	$5,200,000
Finalizing for Construction	I-10	212104086	Rehabilitation	Frontage road overlay (seal coat)	$3,100,000
Under Development	FM 1905	255101010	Overlay	Overlay	$1,450,000
Under Development	I-10	212101094	Expand from 4 to 6 Lanes	Expand from 4 to 6 lanes	$61,658,920
Under Development	I-10	212102160	Expands from 6 to 8 Lanes	Expand from 6 to 8 lanes	$53,230,000
Under Development	SL 375	255204046	Overlay	Rework & cement treat base & HMA overlay	$1,120,000
Under Development	I-10	212102157	Install Overhead Sign Bridges	Install overhead sign bridges	$4,500,000
Under Development	SL 375	255202029	Add 1 Lane Each Direction	Add 1 lane each direction	$35,000,000

I-10 Corridor Study Nearby Projects					
Status	**Highway**	**CSJ**	**Type of Work**	**Description**	**Estimated Cost**
Under Development	I-10	212103159	Add 1 Lane (Operational Improve)	Add 1 lane in each direction by restriping	$1,000,000
Under Development	I-10	212103150	Rehabilitation	Micromill and longitudinal joint repair	$16,075,000
Under Development	I-10	21210361	Rehab/Intersection Improvement	Roadway rehabilitation and intersection improvements	$850,000
Under Development	I-10	212103060	Rehabilitation	Rework & cement treat base, HMCAC, CRCP, signing & striping	$8,500,000
Under Development	I-10	212103146	Construct Interchanges	Construct interchanges	$14,000,000
Under Development	I-10	212104106	Upgrade Bridge and Approach Railing	Replace bridge and approach railing	$352,988

3. Existing Traffic Conditions

3.1 Field Visit

A field visit, carried out by HDR, provided firsthand knowledge and experience of the traffic conditions in the study area during the AM and PM peak periods. The following observations were made from the field:

1. Traffic pattern/Congestion locations
2. Travel time calculations
3. Volume calibrations and turning movement counts
4. Geometry and lane assignment verifications at intersections
5. Turn bay measurement validations
6. Queue length observations

3.2 Historical Growth and Existing AADTs

TxDOT's Statewide Traffic Analysis Reporting System (STARS) was used to obtain the traffic volumes in the project area to calculate a historic growth rate. Traffic data was also gathered for turning movements online through traffic data online public portal.

A total of 24 stations with counts from 1997 to 2015. Overall, each segment has experienced both growth and losses within various locations. Table 3-1 provides an overall comparison between segments.

Table 3-1. Historic Growth Summary

Segment	Trend Veh/Year			Average Growth
	Average	High	Low	
Segment 1	903.69	1,672.00	(140.07)	1.0%
Segment 2	31.92	1,006.70	(882.12)	0.1%
Segment 3	(2,062.51)	1,797.90	(3,782.10)	-1.6%
Segment 4	(54.17)	345.77	(1,077.80)	-0.2%

Overall, the historic data appears to be quite volatile, with the corridor having peak volumes in 2005-2007. After 2007 the volumes appear to drop almost 20% within segments 2 and 3. This would co-inside with the Recession of 2008. When evaluating the 2015 and 2014 counts, an average corridor growth increase of 4.4% is observed. FHWA recorded a cumulative travel increase of 3.5% when comparing the year to dates of 2015 to 2014. This would indicate that the I-10 El Paso Corridor is above the national average of growth.

3.3 Freeway and Interchange Level of Service

An operational analysis was performed using Highway Capacity Software (HCS7) Facilities, which is based on the procedures outlined in the Highway Capacity Manual 6th Edition (HCM6). The analysis included determining the LOS for mainlane sections, ramp junctions, and weaving areas. The LOS is a measure of effectiveness used to evaluate traffic operations based on density where LOS A represents the least congested operational conditions and LOS F is considered the most congested operational conditions. Analysis for both the northbound and southbound directions for all sections were conducted for the AM and PM Peak. The definitions of segment types are as follows:

- Mainlane Segments: A mainlane segment is defined as a portion of the mainlanes that is connected between two ramp junctions.
- Ramp Merge/Diverge Junctions: The mainlane volume and ramp volume are the controlling features in a ramp junction analysis. According to the *HCM 2010*, the influence area of a ramp extends 1,500 feet downstream/upstream of an entrance/exit ramp.
- Weaving Segments: A weaving segment is defined by the *HCM 2010* as an auxiliary lane that is connected between entrance ramp junctions followed by an exit ramp with less than 2,800 feet between them. The weaving area occurs between the entrance and exit ramps as two or more traffic paths traveling in the same general direction cross each other without the aid of traffic control devices. Weaving segments that are greater than 2800 feet were analyzed as a mainlane segment.

Table 3-2 presents LOS and the ranges of density per vehicle for freeway, merge/diverge, and weave segments.

Table 3-2. Freeway and Ramp LOS Thresholds and Definitions[1]

LOS	Density (pc/mi/ln)			Description
	Freeway Segment	Merge/Diverge Segment	Weave Segment	
A	≤ 11	≤ 10	≤ 10	Free-flow operations.
B	>11 and ≤18	>10 and ≤20	>10 and ≤20	Reasonably free-flow, the ability to maneuver is only slightly restricted.
C	>18 and ≤26	>20 and ≤28	>20 and ≤28	Speeds are at or near free-flow, although freedom to maneuver is noticeably restricted. Queues may form behind any significant blockage.
D	>26 and ≤35	>28 and ≤35	>28 and ≤35	Speeds decline slightly with increase in flow and freedom to maneuver is more noticeably limited. Queuing occurs with minor incidents.
E	>35 and ≤45	>35 and ≤43	>35 and ≤43	Operation is at or near capacity with no usable gaps in the traffic stream. Any disruption causes queuing.
F	> 45	> 43	> 43	Demand is greater than capacity, which causes breakdown in flow. These conditions generally exist within queues behind breakdown points.

(a) Intersection Analysis

Utilizing procedures in the HCM and the MOEs (measures of effectiveness) reported by SYNCHRO 9 traffic simulation software, LOS was determined for intersections within the project limits. Intersection LOS is a qualitative measure of operating conditions and is directly related to average vehicle delay. LOS is reported using the letter designations from A to F, as shown in Table 3-3.

[1] *HCM 2010*, Transportation Research Board

Table 3-3. Interchange LOS Thresholds and Definitions[2]

LOS	Control Delay (sec/veh)		Description
	Signalized Interchange	Unsignalized Interchange	
A	≤ 10.0	≤ 10.0	Very low vehicle delays, short cycle length/exceptionally favorable signal progression.
B	10.1 to 20.0	10.1 to 15.0	Low vehicle delays, short cycle length/highly favorable signal progression, more vehicular stops than LOS A.
C	20.1 to 35.0	15.1 to 25.0	Favorable signal progression/moderate cycle length, potential cycle failures, significant number of vehicular stops.
D	35.1 to 55.0	25.1 to 35.0	Ineffective signal progression/long cycle length, many vehicular stops, noticeable cycle failures.
E	55.1 to 80.0	35.1 to 50.0	Ineffective signal progression, long cycle length, frequent cycle failures.
F	> 80.0	> 50.0	Poor signal progression, long cycle length, cycle failures during most cycles.

The results indicate that 12 of the 18 interchanges currently operate within desirable LOS goals (D or better) in the AM period for section 1. Six are shown to operate with poor LOS (E or worse) in the AM period for section one. In the PM period there was a significant increase in interchanges operating with a poor LOS. There were only 8 of 18 interchanges operating at a desirable LOS and 3 of those 8 operating at a LOS D. There are 10 interchanges operating at a poor LOS. The interchanges that changed from a good LOS to a poor LOS are Vinton WB Frontage Road, Artcraft Westbound Frontage Road, Thorn Avenue Eastbound Frontage Road, SH 20 (Mesa Street) Westbound Frontage Road, and Sunland Park Eastbound Frontage Road. The largest delay in this section was 221.6 seconds at Executive Center Drive. For section two, there are a total of 47 interchanges. 39 of the 47 interchanges operate with an acceptable LOS while eight do not. Section 4 has a total of 10 interchanges. In the AM Peak there are 6 of the 10 interchanges operating with an acceptable LOS. The other 4 interchanges all operate with a LOS F with the larges delay being

[2] *HCM 2010*, Transportation Research Board

3489 sec. The PM peak has no interchanges operating with an acceptable LOS meaning all 10 intersections are operating with a poor LOS.

3.4 Trip Patterns

(a) Origin-Destination Data

Streetlight data was utilized to extract Origin-Destination information. Figure 3-1 illustrates Eastbound traffic on I-10 entering from the Texas New Mexico State Line.

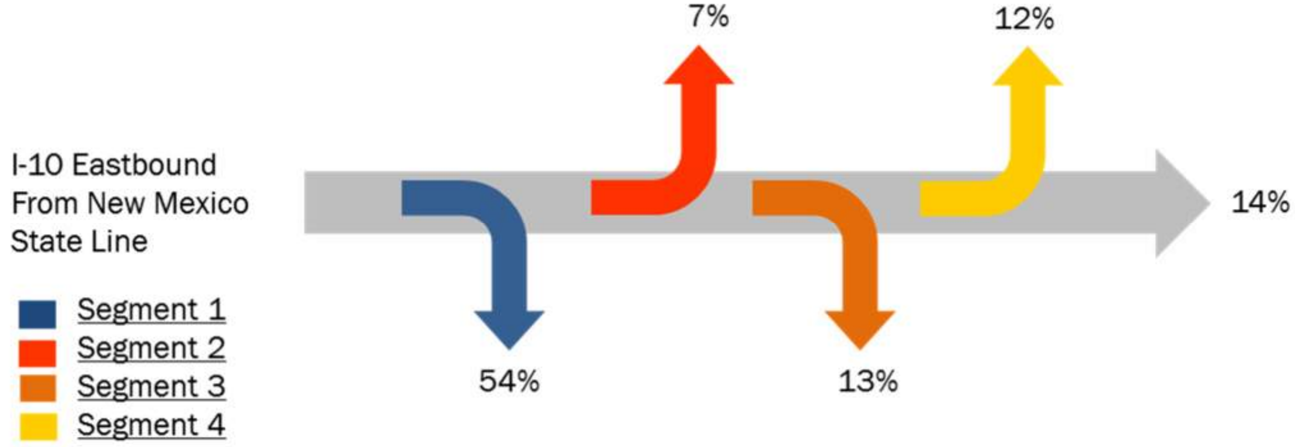


Figure 3-1. New Mexico Eastbound I-10 O-D (All-Day Average)

The results above indicate that over half of the traffic originating from New Mexico is departing I-10 in Segment 1 and only 14% is continuing through the I-10 El Paso Corridor.

(b) Travel Demand Model

Travel demand modeling is used to forecast the demand and behavior for a transportation facility for a specific future time frame. Conceptually, the travel demand model has a traditional four step approach comprising of trip generation, trip distribution, mode choice, and trip assignment. Trip generation determines the origin and destination of trips in a specific zone. Socio-economic factors, land use data, household demographics and are used to determine the amount of trips produced and attracted to a Traffic Analysis Zone (TAZ). Trip purposes are used to describe these trips. Typical trip purposes include home-based work, home-based school, home-based shopping, home-based other, and non-home-based. These trip purposes define what the origin and destination is of each trip. Trip distribution determines where the trips will go once exiting the TAZ. A matrix of origin and destinations for each zone and trip purpose is created to identify the attractiveness of a zone based on the number of trips produced in the zone, the number of trips attracted to the zone, and travel time. Mode choice describes the method of transportation used between a trip's origin and destination. This step can be simple or complex depending on the amount of transit in the study area. In the travel demand model, mode choice is performed by going through multiple iterations of the trip distribution and assignment as a part of a feedback loop. Mode choice yields which mode of transportation will be used and the mode split, percentage of people using a certain type of transportation. The last step is trip assignment. This step determines which route is taken to get from origin to destination. There are different methods of performing this step such as using minimum travel time to determine which route a traveler is most likely going to take. The model then yields traffic volumes for the roads in the network.

HDR was given two travel demand models for the City of El Paso to use and run for data collection. The first, named the Horizon model, has the scenario for the year 2007, 2010, 2020, 2030, and 2040 to use and extract data from. The Horizon travel demand model uses TxDOT trip generation and trip distribution programs that run on TransCAD travel demand modeling software. The model follows the four-step travel demand model. The Horizon Model Interface allows users to configure the following options, Model Setup, Network Update, Run Skim, Assignment, and Reporting. The year 2020 and 2040 were run with the purpose of 2020 being the design year and 2040 being the future year. The output of the Horizon travel demand model was maps for the total traffic, total truck traffic, and volume/capacity ratio. The second model is an updated travel demand model by Cambridge Schematics. This model is currently pending review of the Federal Highway Administration but includes a more in-depth transit data. HDR used this model to update existing information given from the previous model. The new model includes the year 2012 and has a greater transit network.

3.5 Truck Freight Patterns

(a) TEXAS STATEWIDE ANALYSIS MODEL VERSION 3 (SAM-V3)

HDR was given one travel demand model for the state of Texas created by Alliance Transportation Group, Inc. for TxDOT. The Texas Statewide Analysis Model Version 3 (SAM-V3) model includes scenarios for the year 2010, 2020, 2030, and 2040. The SAM model is based on the four-step model and is a multimodal travel demand model that focuses on forecasting traffic volumes for passenger and freight transportation, rail ridership, freight rail tonnage, and train and rail projections. The interface includes the model steps of Network Update, Trip Generation, Freight Trip Generation, Trip Distribution, Freight Trip Distribution, Mode Choice, Freight Mode Choice, Assignment, Optional Assignment, and Reports. HDR ran the SAM-V3 model for the years 2020 and 2040 to gather additional information about freight assignment along the I-10 corridor.

4. Existing Safety Conditions

4.1 Historic Crash Trends

To analyze the current safety impacts along the I-10, crash data from years 2011 through 2015 was obtained from TxDOT and reviewed for crash patterns, trends, and types.

A total of 3701 crashes were reported during the five-year analysis period within the project limits. Of those, 3339 occurred along the mainlanes; 53 occurred along the frontage roads; and 242 occurred on the ramps; and 7 occurred on direct connectors. The locations of the remaining 60 crashes were reported as “other.” There were a total of 64 fatal crashes of which the majority happened on the mainlanes. Table 4-1 provides a summary of the crashes by facility and severity. Figure 4-1 through Figure 4-3 breakdown total crashes and fatalities by segment.

Table 4-1. Crash Type and Severity Summary (2011-2015)

Facility Type	Number of Crashes	Crash Severity			
		Fatality	Injury*	Non-Injury	No Information
Mainlanes	3339	60	1347	7427	651
Frontage Road	53	0	25	90	8
Ramps	242	3	64	458	55
Direct Connectors	7	0	3	11	1
Other	60	1	26	99	54
Total	3701	64	1465	8085	769

*Injury includes incapacitating crashes, non-incapacitating crashes, and possible injury cases

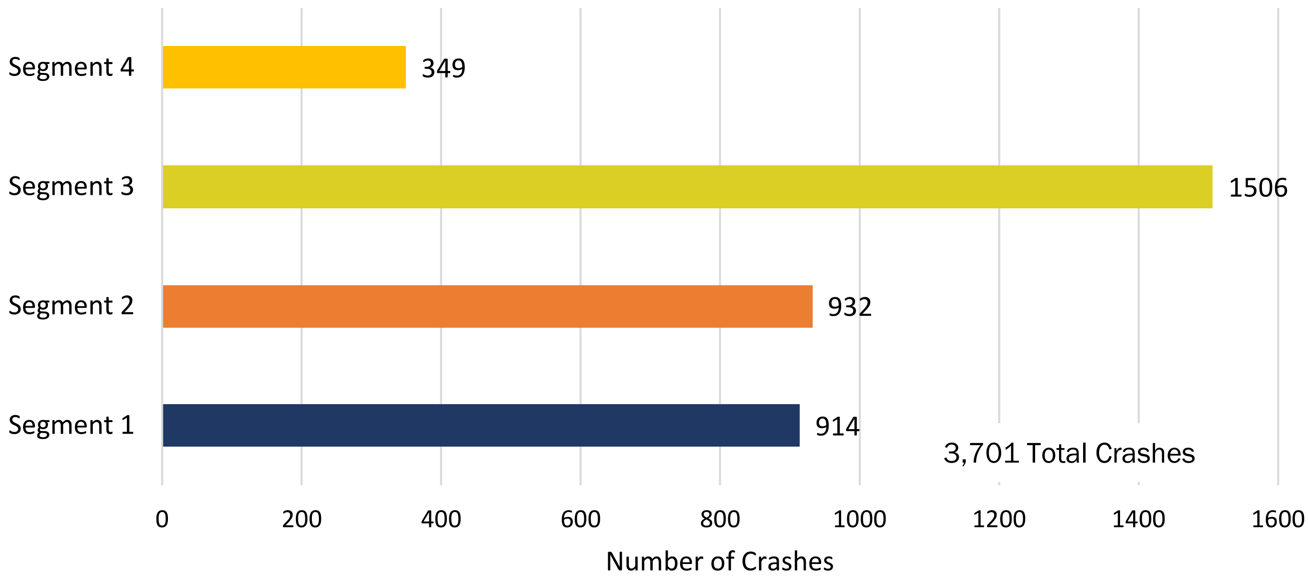


Figure 4-1. Total Crashes by Segment (2011-2015)

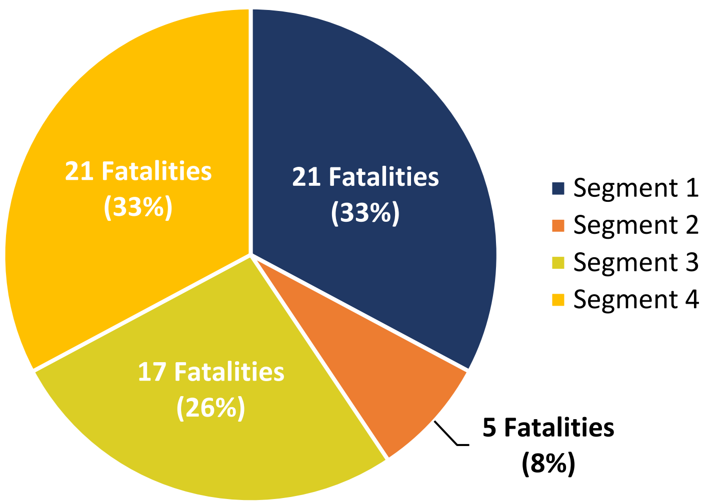


Figure 4-2. Total Fatality Crashes by Segment (2011-2015)

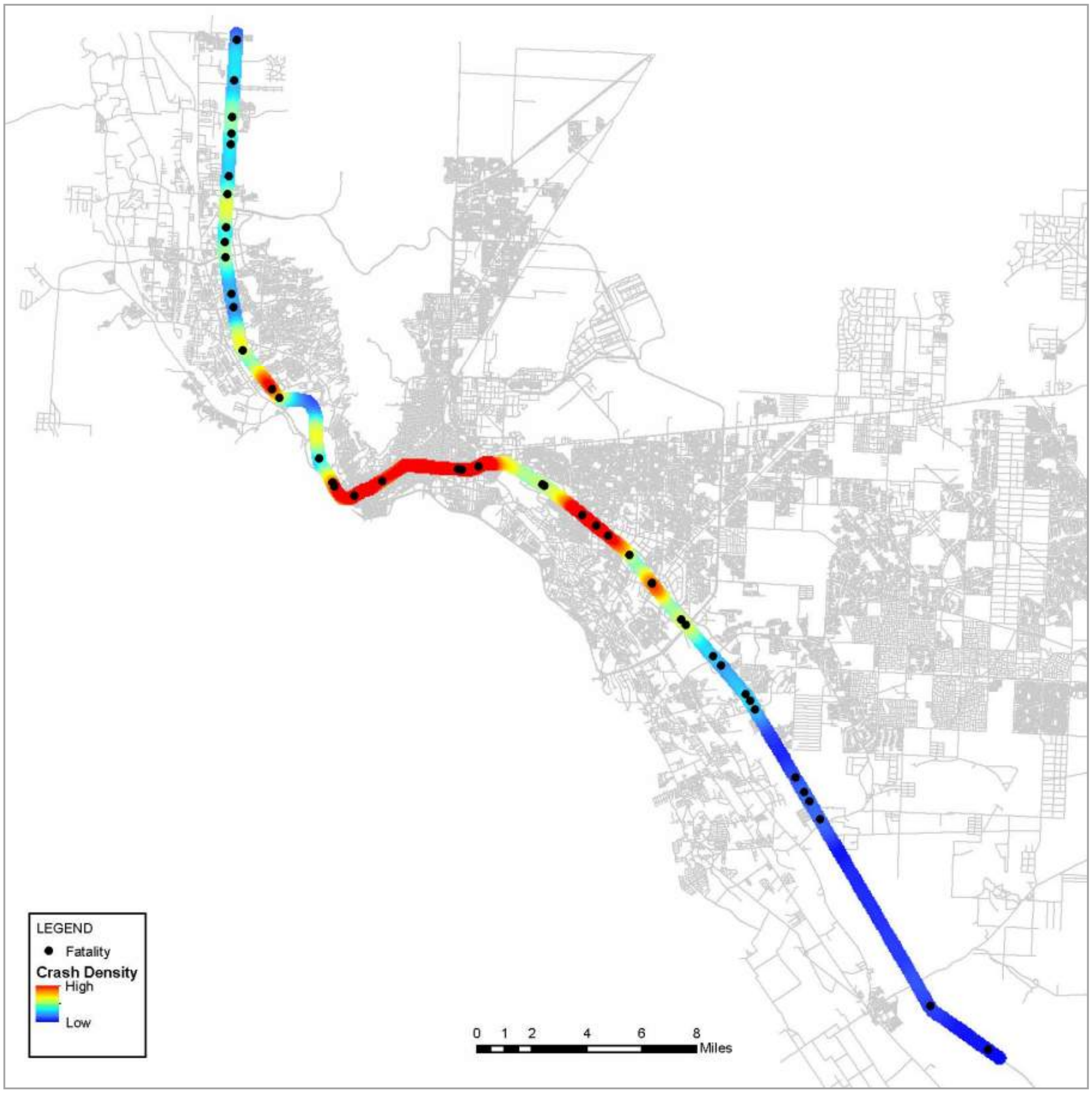


Figure 4-3. I-10 Crash Density (2011-2015)

(a) Crash Rates

The crash rate along the project limits was compared with the statewide average from the Texas Strategic Safety Highway Plan to obtain safety ratios as well as crash and fatality rates per 100 million vehicle miles traveled (100MVMT) for the years 2011 through 2015. Per the latest TxDOT *El Paso District Urbanized Areas and Cities Map*, the I-10 corridor is within El Paso's large urbanized area, thus the corridor crash crate was compared to the statewide average urban crash rate.

Texas statewide five-year (2011-2015) average crash rate for similar interstate facilities reported 103 crashes per 100MVMT. The entire length of I-10 corridor had a five-year average crash rate of 34 crashes per 100MVMT, which is 67% lower than the five-year statewide average. The results are summarized in Table 4-2.

Table 4-2. I-10 Crash Rate Analysis Summary (2011-2015)

	Year				
	2011	2012	2013	2014	2015
Yearly Total	410	658	411	607	1705
Average Daily Traffic Volume*	115,467	115,901	121,025	102,827	106,710
I-10 Corridor Crash Rate	17.50	27.98	16.73	29.09	78.73
Statewide Average Crash Rate**	70.21	94.14	99.44	108.82	142.21
Corridor Safety Ratio	0.25	0.30	0.17	0.27	0.55
Five-Year Annual Average Safety Ratio	0.31 or 69% less crashes than other urban interstate facilities				

*TxDOT Transportation Data Management System
**TxDOT Statewide Traffic Crash Rates for an Urban Interstate facility.

(b) Crash Contributing Factors

There were over 30 different contributing factors were identified along the corridor. Only the top contributing factors are shown in Table 4-3. Top Crash Contributing Factors by Segment (2011-2015) The table below shows that 35% (1,306 crashes) of the total number of crashes involved speeding; 10% (364 crashes) involved driver inattention/distraction, and 9% (327 crashes) involved unsafe lane changes. Segment 3 contained the majority of these crash factors.

Table 4-3. Top Crash Contributing Factors by Segment (2011-2015)

	Segment 1	Segment 2	Segment 3	Segment 4
Speeding	267	338	600	101
Driver Inattention/Distraction	96	102	134	32
Unsafe Lane Change	85	93	134	15
Followed Too Closely	13	27	60	5
Fatigued or Asleep	16	5	4	4
Faulty Evasive Action	23	15	25	8
Failed to Drive in Single Lane	19	9	8	11
Alcohol Related	29	27	25	23
Other	167	101	127	88
Information Not Reported	199	215	389	62
Total Crashes	914	932	1506	349

(c) Crash Types

Over 20 different crash types were identified along the corridor, only the top types are shown below (Table 3-X). The table below shows that 35% (1,306 crashes) of the total number of crashes involved were rear end crashes and 28% (1,033 crashes) involved one motor vehicle going straight. Segment 3 contained the majority of rear-end, sideswipe, one straight-one stopped, and "other" crashes. Segment 1 contained the most one motor vehicle-going straight crashes.

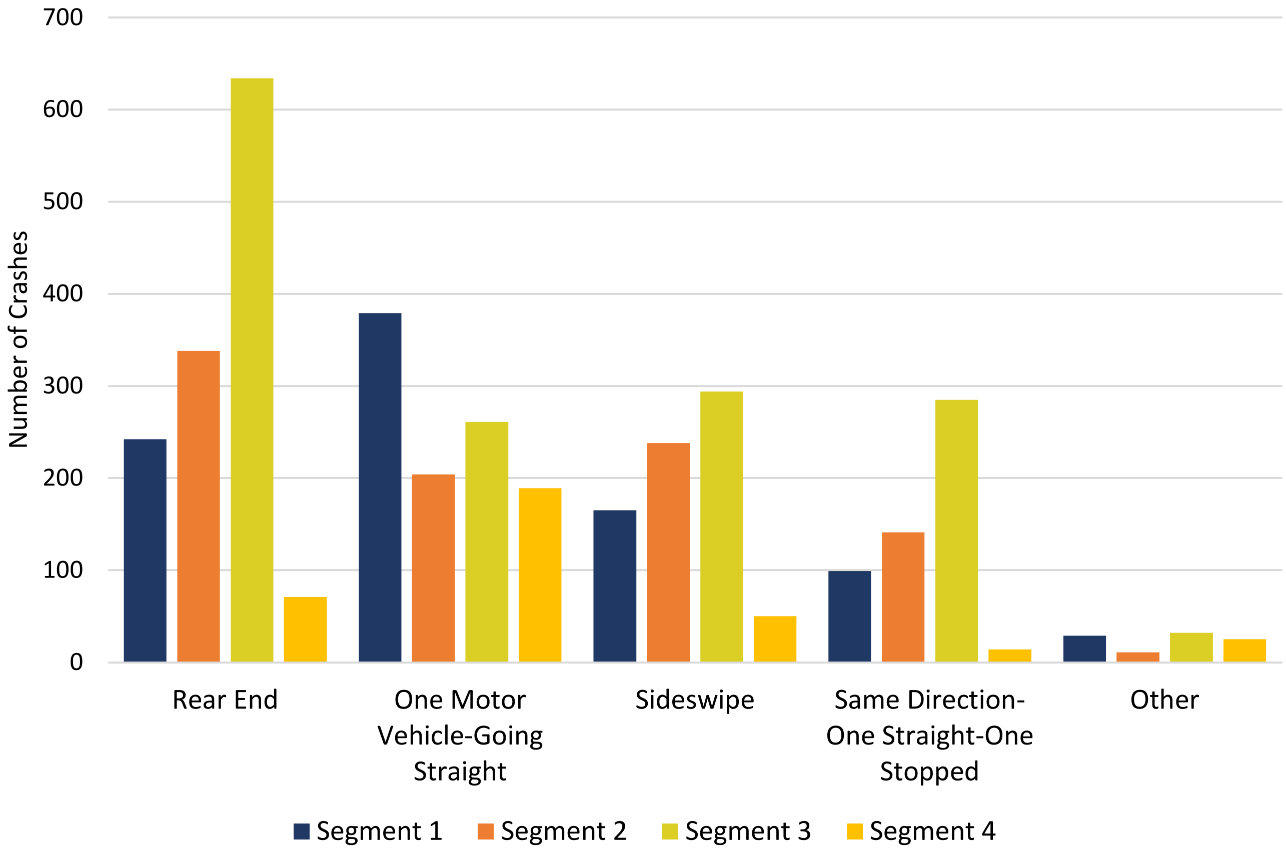


Figure 4-4. Top Crash Types by Segment (2011-2015)

In summary, over a five-year period, 90% (3,339 crashes) of the crashes were on the I-10 corridor mainlanes. The corridor had a five-year average safety ratio of 0.31 meaning the study segment had 69% less crash occurrence than similar urban interstate facilities. Although the project area has fewer crash occurrences, the I-10 corridor is in an urbanized area and will continue to be a major east-west route which could likely increase in traffic over the next 20 years. This increase could likely lead to higher crash rates. In order to improve safety along the corridor, alternatives should be explored to improve access, capacity, and the movement trucks and freight along I-10.

5. Existing Alternative Modes of Transportation

5.1 Bicycle and Pedestrian

The City of El Paso maintains various types of bicycle and pedestrian facilities throughout the city. The existing bicycle network has over 100 miles of on-street bicycle facilities (e.g., bike routes, bike lanes, and wide shoulders) and over 30 miles of shared use paths (including sidepaths)[3]. In addition to linear facilities, a bike share system called SunCycle, operates an eight-station bike share system in and around the Downtown El Paso and the UTEP area[4]. Sidewalks are generally located throughout the city and are used for shorter trips. The sidewalks in El Paso provide connections within neighborhoods, commercial and retail areas, downtown, and to bus stops.

In November 2016 the El Paso MPO completed their Multimodal Plan which outlined the demand of bicycle and pedestrian facilities compare to the availability, or supply, of those facilities. The preliminary findings of this report show that the demand of bicycle and pedestrian facilities is in more demand than there are existing facilities (Figure 5-1 through Figure 5-2)[5]. According to a multimodal behavioral survey in the plan, 6% of respondents bike to school or work at least once a week; 63% would bike more if they felt safer in traffic; and 32% would be willing to bike more if connected lanes existed. Regarding walking, 13% of respondents walk to school or work at least once a week and 72% would be willing to walk more if a larger number of safer walking routes existed[6].

In addition to the Multimodal Plan, the Transportation Policy Board of the El Paso MPO approved the Active Transportation System in July 2016. This System designates seven key corridors that would promote biking, walking, and improved air quality along the Texas-Mexico border and major thoroughfares within El Paso County.

Bicycle and pedestrian modes are evaluated because these their facilities intersect and are adjacent to I-10. Should there be future improvements to I-10, these facilities would need to be maintained or improved upon. Another reason for evaluation is due to the proximity of the different transit services that intersect or use I-10. Bicycle and pedestrian facilities are critical to complete the “last mile,” especially to and from transit stops. The following paragraphs describe bicycle facilities as they relate to each segment of the I-10 Corridor. As shown in Figure 5-1 there are several existing bicycle facilities that intersect, terminate, or are parallel to the I-10 Corridor.

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[3] City of El Paso, *City of El Paso Bike Plan*, 2016, pp. 26.

[4] Ibid. pp. 24.

[5] Texas A&M Transportation Institute, *El Paso MPO Multimodal Plan: Summary of Multimodal Final Report*, 2016, pp. 7-8.

[6] Ibid. pp. 14-15.

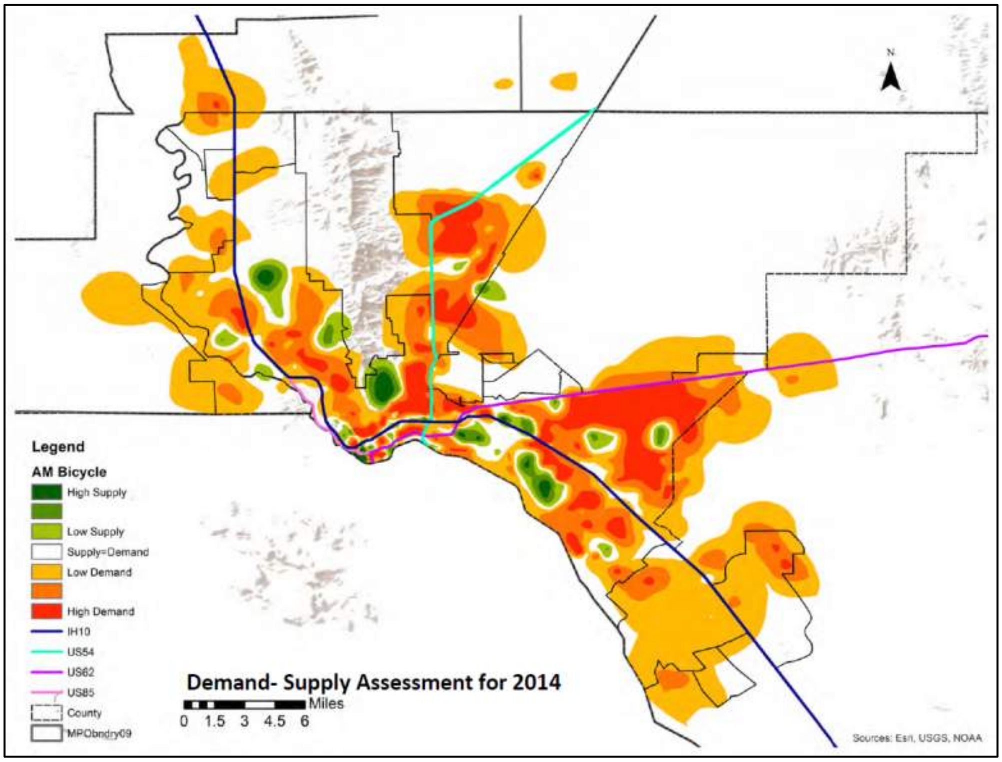

Figure 5-1. Bicycle Demand-Supply Assessment for 2014[7]

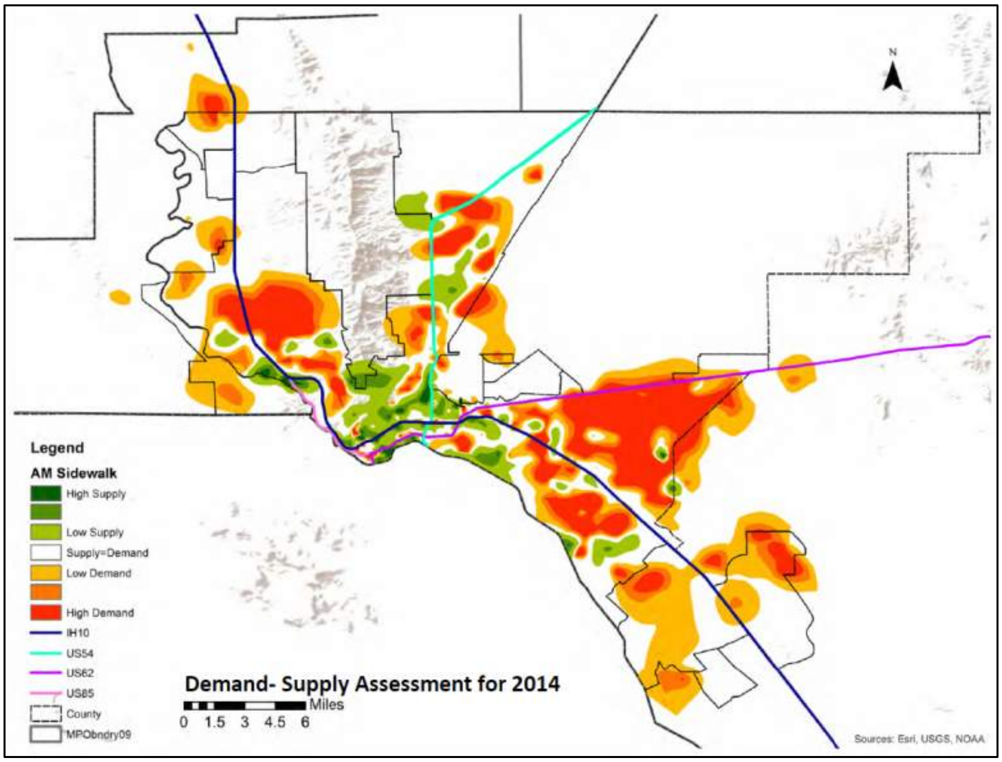

Figure 5-2. Walking Demand-Supply Assessment for 2014[8]

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[7] El Paso MPO Multimodal Plan

[8] El Paso MPO Multimodal Plan

Segment 1 contains a shared use path along I-10 between Loop 375 and Ohara Road and a shared use path that intersects I-10 along Loop 375. In addition, a bike lane I-10 along Redd Road. Segment 2 contains bike lanes and shared lane markings. Bike lanes are located on Prospect Street and Los Angeles Drive which intersect and terminate at I-10, respectively. Shared lane markings can be found along Yandell Street between downtown to east of US 54 and on Sun Bowl Road which terminates into the I-10 eastbound frontage road. SunCycle bike share stations are clustered downtown and north of I-10 between the interstate and UTEP. In Segment 3, only a bike lane crosses I-10 along Yarborough Drive. All other streets that with bicycle facilities terminate into I-10. These streets include Yandell Drive which has shared lane markings and Lee Trevino Drive and Hunter Drive which have bike lanes. There are no bicycle facilities near I-10 in Segment 4. The closest facility is a widened shoulder on North Loop Drive that is over a mile southwest of I-10.

As shown in Figure 5-3 below there are existing gaps and linkages near the I-10 corridor that need to be connected. The City of El Paso's Bike Plan outlines in detail proposed bicycle connections and which facility types should be used. Bicycle facilities in this plan include bike lanes, cycle tracks, bicycle boulevards, shared roadways, shared use paths, and additional SunCycle bike share stations.

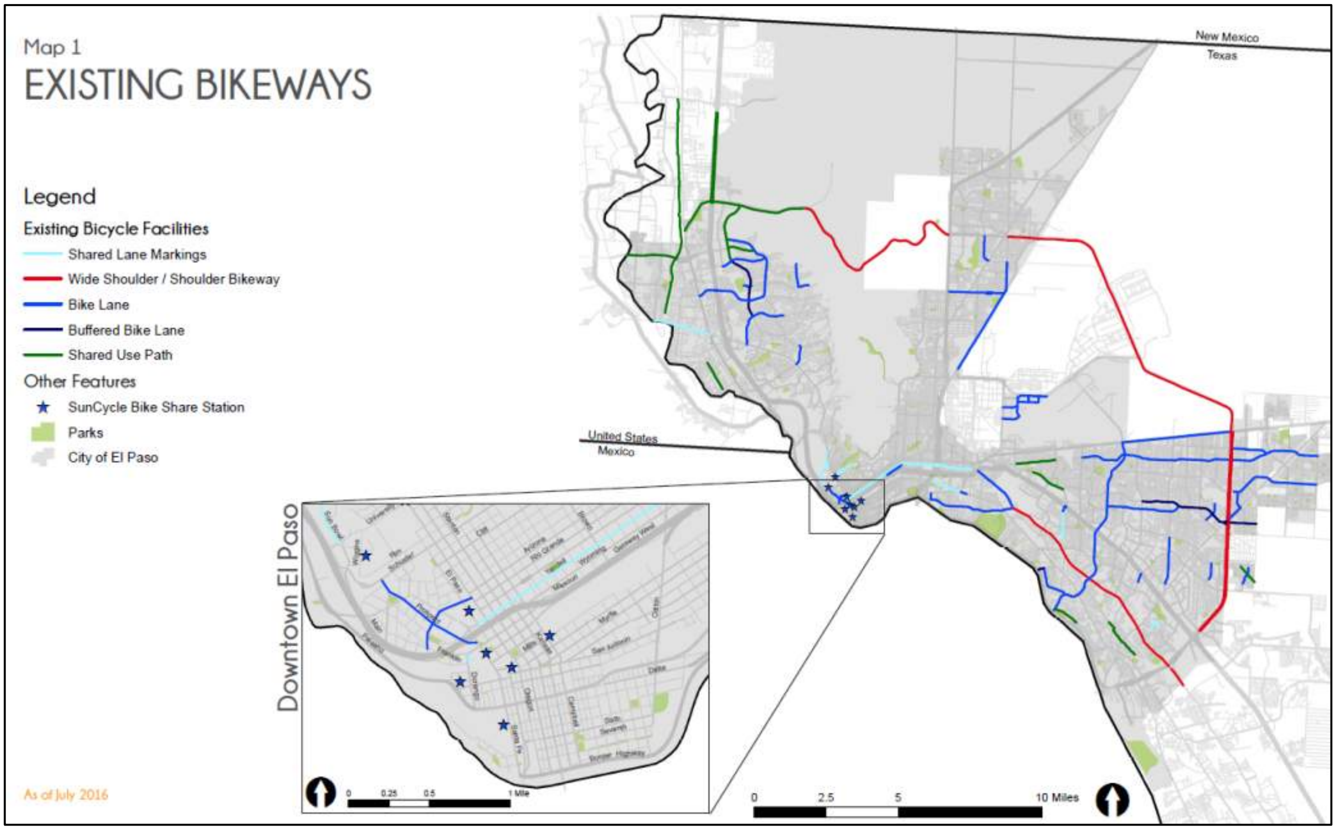

Figure 5-3. El Paso Existing Bicycle Facilities[9]

[9] City of El Paso Bike Plan

5.2 Transit Services

Sun Metro provides fixed route bus service, paratransit service, and Rapid Transit System (RTS) service throughout El Paso and its surrounding areas. It provides service to shopping centers, employment centers, public facilities, healthcare facilities, and education. Transit services in El Paso serve over 820,000 people throughout 255 square miles, employs nearly 600 people, and as of 2013 has an annual ridership of over 16.5M[10]. According to the El Paso Multi Modal Plan summary report, approximately 8% of residents use transit to commute to work or school at least once a week[11]. The existing and proposed transit network in El Paso is comprehensive and uses all thoroughfare types, including I-10.

Transit services were evaluated because their services impact the I-10 corridor in two ways: 1) they affect the capacity of the I-10 mainlanes by using the Corridor as a part of their system's routes and 2) proposed Corridor alternatives may affect transit system operations, connections, and "last mile" linkages to destinations or other forms of transportation. Figure 5-4 shows the full-service network of Sun Metro's transit system. The following sections describe the different service types Sun Metro operates.

(a) Fixed Route Bus Service

Sun Metro's fixed route bus service contains over 59 routes and 3,363 bus stops (490 shelters) throughout the City of El Paso. This operation supports its patrons by providing connectivity throughout the city by its eight transfer centers and six Park and Ride facilities. Sun Metro has a fixed bus route fleet of 167 buses that are compressed natural gas (CNG), which emit 50% less pollutants than a typical bus[12].

To ensure that the functions of this service is operating efficiently, a variety of metrics can be used to measure the systems performance. These measures include route-level average and ranked data for ridership, passengers per mile, and passengers per hour, average trip length, and the origin and destination of trips.

Since this service spans a large area, we must take into consideration the context of the bus routes and their connections relative to the location of each Corridor segment. Figure 5-4 shows Sun Metro's fixed route bus service.

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[10] http://www.sunmetro.net/~/media/files/sunmetro/factsheet.ashx?la=en (accessed March 14, 2017).

[11] Teas A&M Transportation Institute, *Summary of Multimodal Final Report*, 2016, pp 16.

[12] City of El Paso, *Plan El Paso*, 2012, Volume 1, pp 4.13.

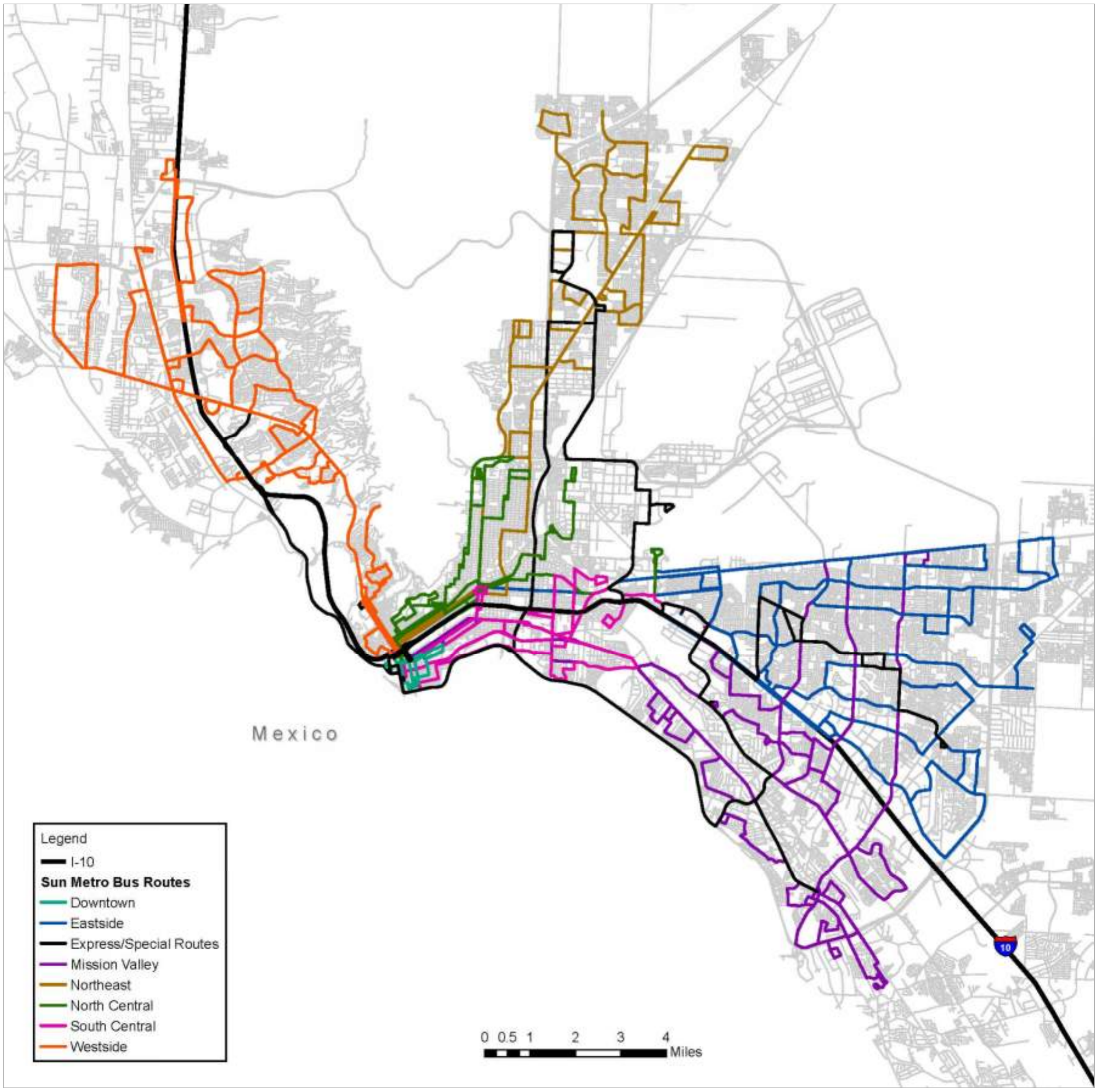

Figure 5-4. Sun Metro Fixed Route Bus System

Segment 1 contains two Express/Special routes and one Westside route which uses I-10 and its frontage roads between Loop 375 and Sunland Park Road. There are no routes along I-10 between Sunland Park Road and Executive Center Boulevard, however, there are segments of the Express/Special routes that run parallel to the Corridor along SH 20 (Mesa Street) and US 62 (Paisano Drive). East-west connections across I-10 are maintained within this segment at Loop 375, Thorn Avenue, Country Club Road, and Sunland Park Road. The Al Jefferson Westside Transfer Center in located just east of I-10 on Remcon Circle.

Six routes use I-10 in the Segment 2 area (Downtown) between Santa Fe Street and US 54. These routes are mostly Express/Special routes and one Downtown route. The Express/Special routes provide limited stop access up to Loop 375 along I-10; UTEP along SH 20 (Mesa Street); Loop 375 along US 54; and to various neighborhoods in southeast El Paso. There are no routes that use I-10 between Executive Center Boulevard and Santa Fe Street. Two routes run parallel to I-10 between these cross-streets. North-south connections across I-10 are maintained by several Downtown, Express/Special, South Central, and Eastside routes. In addition, there are four transfer centers/terminals within the Segment 2 area: the Glory Road Transfer Center; Union Depot; the Union Plaza Transit Terminal; and the Bert Williams Downtown Santa Fe Transit Center.

Segment 3 contains five Express/Special routes and four Eastside routes that use I-10. These routes provide access to the neighborhoods within southeast El Paso as well as the El Paso International Airport. No routes use I-10 east of Lomaland Drive, however Rojas Drive is used as a parallel route. North-south and east-west connection across I-10 are maintained by the South Central, Express/Special, Eastside, and North Central routes. The Eastside Terminal and the Mission Valley Transfer Center are the closest transfer centers to this segment.

Segment 4 does not contain any routes on I-10. Sun Metro's fixed route bus service area extends slightly past Loop 375 and only services neighborhoods to the north and south of I-10.

Currently, the fixed bus route service does not offer a continuous regional alternative within the project limits along I-10. The Express/Special routes offer longer routes on and parallel to I-10. Regardless of the route, riders are still required to make a stop downtown. In addition, routes that use the I-10 corridor share the mainlanes with traffic. This increases delay during peak-hour trips and causes a more unreliable trip in general.

(b) Paratransit and Job Express Services

The LIFT is Sun Metro's paratransit service for ADA paratransit-eligible clients that provides curb-to-curb, on-demand transportation up to 1.5 miles beyond its fixed route bus service within the El Paso city limits using small buses equipped with hydraulic mobility device lifts and tie downs. This service also has a door-to-door service for those that qualify[13]. LIFT only has one facility and it is located on Fred Wilson Road near US 54.

Similar to LIFT, the Job Express service is an on-demand, shared ride service that provides low-income clients with job and employment related trips such as providing trips to and from work, searching for employment, and daycare[14].

(c) Rapid Transit System

Since 2010 The City of El Paso and Sun Metro have been planning for and implementing a four-line (Mesa, Alameda, Dyer, and Montana) rapid transit system (RTS) that would radiate from downtown El Paso thorough the region[15]. This system, known as the Sun Metro Brio, would 60-foot articulated buses that would share a traffic lane. Station stops would be about a mile apart and buses would run

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[13] http://www.sunmetro.net/lift/about (accessed March 20, 2017).

[14] http://www.sunmetro.net/lift/job-express (accessed March 20, 2017).

[15] City of El Paso, *Plan El Paso*, 2012, Volume 1, pp 4.14.

a frequent as every 10 minutes in the peak-hours. This would allow passengers to reach their destinations faster than the conventional fixed route bus system.

The SH 20 (Mesa Street) corridor, the first of the four lines, opened in the fall of 2014. This corridor is 8.6 miles long and provides service between the Downtown Transfer Center and the Westside Transfer Center. Construction on the second corridor, Alameda, is tentatively scheduled to be completed in early 2018. This corridor is 14.5 miles long and provides service between the Downtown Transfer Center, Five Points Transit Terminal, and the Mission valley Transfer Centers. The Dyer and Montana corridors are tentatively scheduled to be operational in 2018 and 2020, respectively. The Dyer corridor will be 10.2 miles long and provide service between the Downtown Transfer Center, Five Points Terminal, and the Northeast Terminal. The Montana corridor will be 16.8 miles long and provide service between the Five Points Terminal, Eastside Terminal, the Transit Operations Center, and the proposed Far East Transfer Center[16]. Figure 5-5 shows the location of the existing Mesa corridor and proposed Alameda, Dyer, and Montana RTS corridors.

To ensure that this service is operating efficiently, a variety of metrics can be used to measure the systems performance. These measures include route-level average and ranked data for ridership, passengers per mile, and passengers per hour, average trip length, and the origin and destination of trips.

[16] http://www.sunmetrobrio.net/ (accessed March 20, 2017).

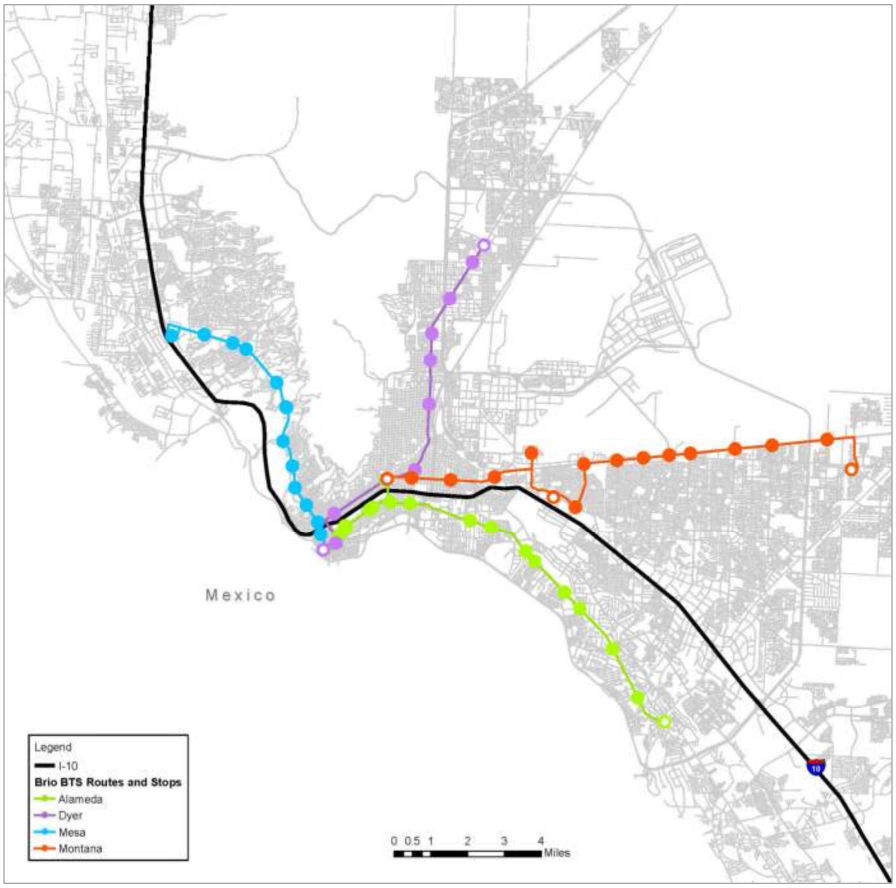

Figure 5-5. Sun Metro Brio Existing and Proposed Corridors

The existing SH 20 (Mesa Street) corridor and the three proposed corridors do not use I-10 for any of their RTS service, however, the RTS services does cross I-10 at Oregon Street (Mesa), Kansas Street (proposed Dyer), and Piedras Street (proposed Alameda), all within Segment 2 of the Corridor. The SH 20 (Mesa Street) corridor and the proposed Alameda corridor run somewhat parallel to I-10 and only extend as far north as SH 20 (Mesa Street) and I-10 intersection (Mesa) and as far south as Loop 375 (proposed Alameda).

(d) Streetcar

Construction of the 4.8-mile streetcar route (Figure 5-6) from Downtown El Paso to the University of Texas El Paso campus is currently underway. The route will consist of two loops: a Downtown Loop and an Uptown Loop. The intent of the proposed streetcar route is to provide connectivity between UTEP and Downtown including neighborhoods, retail centers, public facilities, and the medical center. Once operational, Sun Metro will operate and maintain the Streetcars and associated facilities[17].

The proposed streetcar route will cross I-10 on Oregon Street and Stanton Street within Segment 2. The Downtown Loop will provide a stop at the Downtown Transfer Center.

[17] http://www.sunmetro.net/streetcar (accessed March 20, 2017).

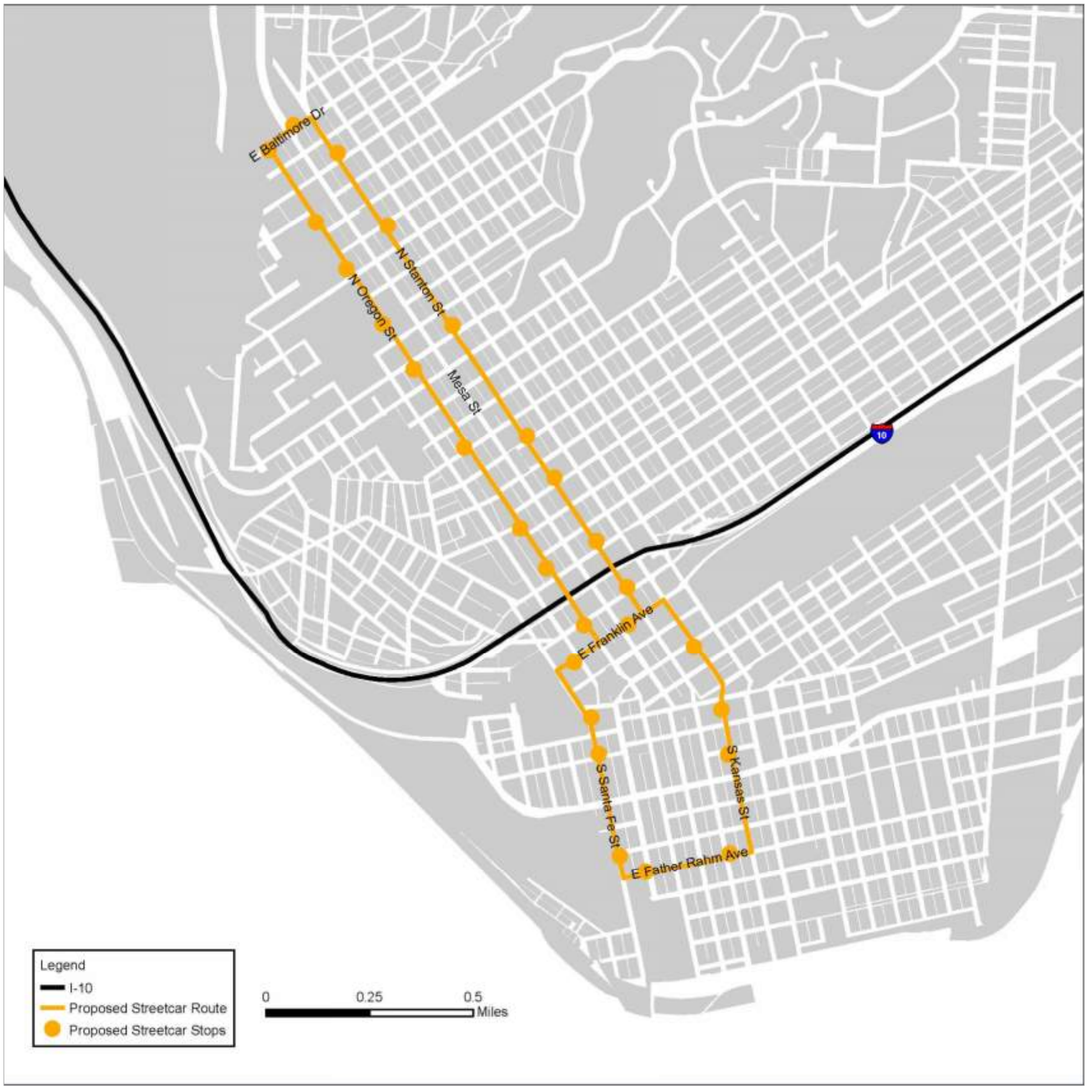

Figure 5-6. Proposed El Paso Streetcar Route

(e) Light Rail

El Paso does not currently have a light rail system, but the City's comprehensive plan, *Plan El Paso*, explores the possibility of converting parts of the RTS network or freight rail network to light rail service[18].

[18] City of El Paso, *Plan El Paso*, 2012, Volume 1, pp 4.71.

5.3 Passenger Rail (Amtrak)

Two Amtrak routes (Texas Eagle and Sunset Limited) have stops in El Paso. Texas Eagle begins in Chicago and ties into Sunset Limited in San Antonio. Sunset Limited begins in New Orleans and ends in Los Angeles. Amtrak routes facilitate travel across the country, and individual routes primarily contribute to the overall Amtrak network rather than catering specifically to the travel needs of any individual state/region. Due to the speed and frequency of Amtrak trips through El Paso, Amtrak is not a great option for commuters making trips of short length or duration. One-way end to end trips last nearly two full days and only pass through El Paso three times a week (going each direction). For these reasons, 96% of the passengers on Sunset Limited in 2005 were taking leisure trips. The remaining 4% were making business trips[19].

Within the project area, Amtrak runs parallel to I-10. In Segment 4, the tracks are consistently offset about 2 miles to the southwest of I-10. In Segment 3, this margin decreases from 2 miles to 1000 feet. Tracks run within 200 feet of I-10 for a significant portion of Segment 2, getting as close as 40 feet to the edge of travelled way. Amtrak utilizes El Paso Station just west of downtown for boarding. Towards the end of Segment 2, the tracks veer west and head into New Mexico. See Figure 5-7 for the Amtrak alignment through the project area.

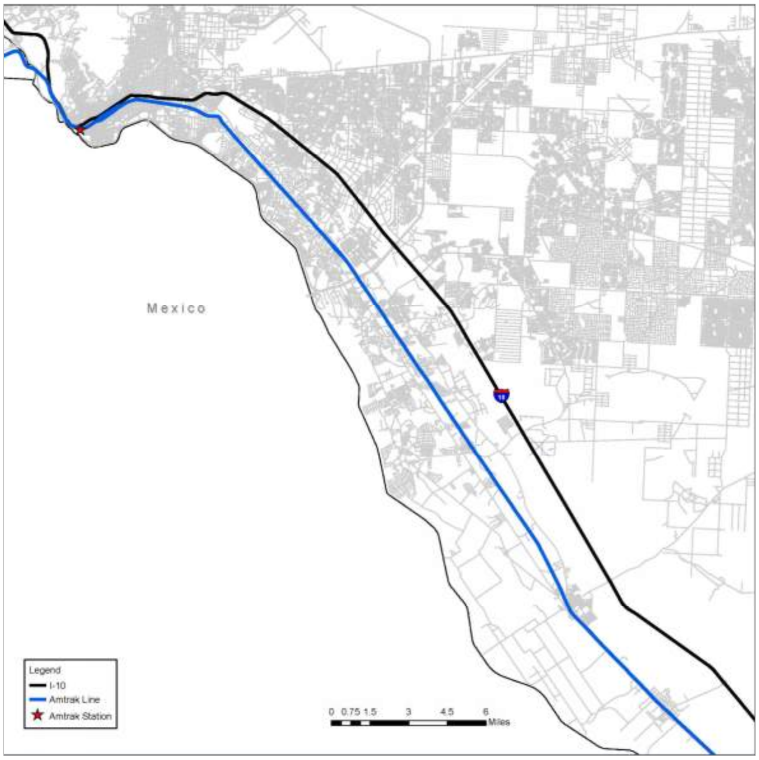

Figure 5-7. Amtrak Alignment in El Paso

[19] TxDOT, *2016 Texas Rail Plan Update*, 2016, Chapter 2, pp 2-23.

5.4 Freight Transport

El Paso is a significant entry point into the U.S. from Mexico and serves as a commercial freight, truck and air hub for the region. In addition, it is anticipated that combined rail and truck traffic will increase nearly 50% by 2025[20]. Rail and truck freight transport is important in this study because they have the ability to affect the capacity and travel conditions of I-10 and the surround street network. In principle, if alternatives can be developed to improve the ways freight is transported through El Paso, travel conditions such as access, delay, safety, and congestion would ultimately improve. According to the EMPO, future plans related to freight transport include the use freight shuttles that would move containers only. Some of the benefits of freight shuttles include less traffic congestion, improved safety, lower emissions, and lower prices on goods achieved through a more efficient shipping practice[21]. As shown in Figure 5-8, *Horizon 2040* proposes freight shuttle Ports of Entry (POEs) at the Zaragoza and Billy the Kid POEs.

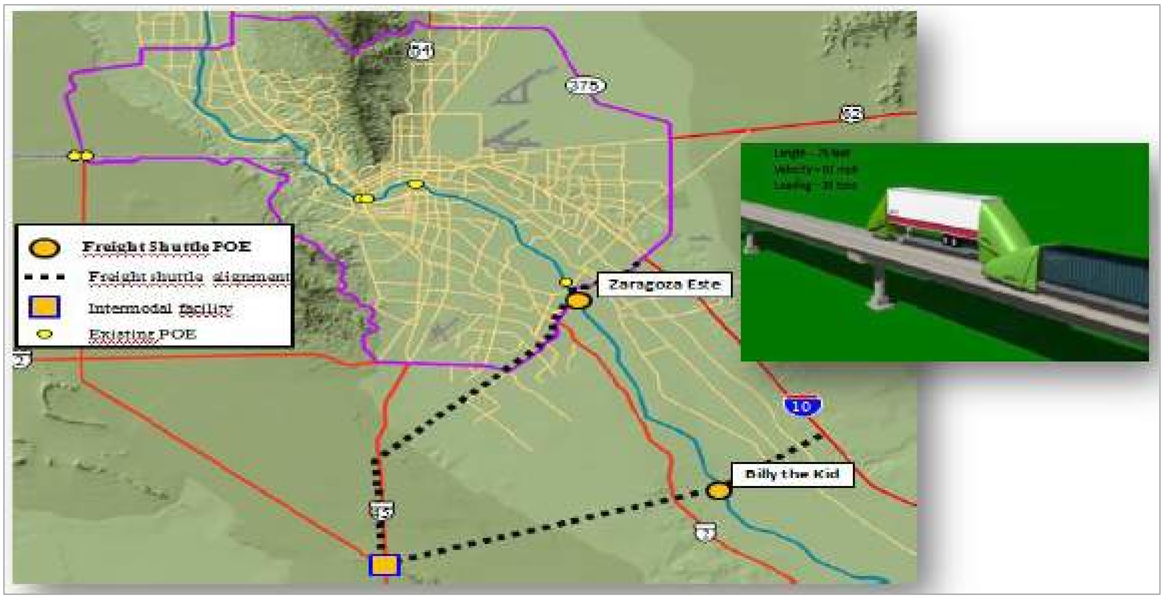

Figure 5-8. Proposed Freight Shuttle for Zaragoza East and Billy the Kid POEs

(a) Rail Freight

Only three companies provided all rail service to El Paso; these companies include UPRR, Burlington Northern Santa Fe (BNSF), and Ferromex. UPRR is the most dominant railroad in El Paso. They operate four rail yards and are responsible for about 40 trains per day passing through El Paso. Of these trains, 25% travel to the Midwest and the remainder travel through Texas via Dallas or Houston. BNSF has only a single line that terminates at its rail yard just west of Downtown. This yard serves local customers and interchanges rail cars with UPRR and Ferromex. Feromex is the largest railroad

[20] Ibid, pp. 4.21.

[21] https://www.freightshuttle.com/the-fss-solution/the-benefits/ (Accessed April 11, 2017).

in Mexico. Its trains pass through Juárez into El Paso where cars are transferred to either UPRR or BNSF railyards. Ferromex trains are only allowed to pass through El Paso between 12:00 AM and 6:00 AM because of the traffic conflicts they create during the daytime. The existing railroad has 68 at-grade crossings, which at times causes traffic delay when longer trains pass through. Figure 5-9 shows the existing railroads and yards in El Paso[22].

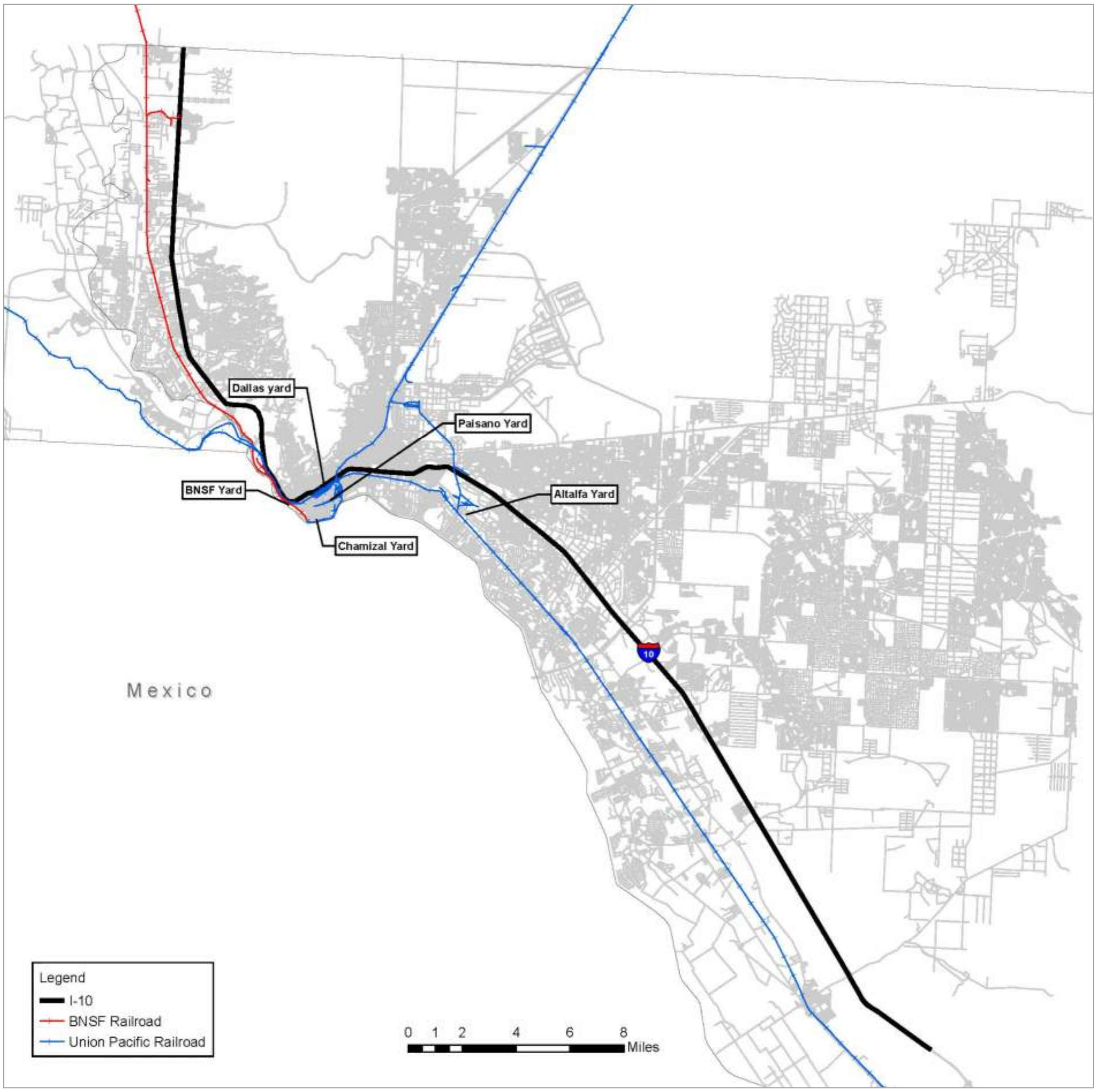

Figure 5-9. Existing Rail Network

[22] City of El Paso, *Plan El Paso*, 2012, Volume 1, pp 4.23.

In general, the UPRR rail line runs parallel to I-10 corridor the entire length of the study area. UPRR's Dallas yard and BNSF's yard are both adjacent to I-10 in Segment 2. UPRR's Alfalfa yard is just over a mile southwest of I-10 near Segment 3.

Relevant plans and studies that focus on rail locally and throughout the El Paso Region include the *El Paso Downtown 2015 Plan*, *Plan El Paso*, the *El Paso Regional Freight Rail Study*, and the *Santa Teresa International Rail Study*. The *El Paso Downtown 2015 Plan* and *Plan El Paso,* discuss using the west end of UPRR's Dallas railyard to develop a large park space near city hall[23] or residential mixed use[24], respectively. The *El Paso Regional Freight Rail Study* focused on providing an analysis of freight rail mobility for the region (TxDOT's El Paso District). The results of this study included a review of the existing rail system and improvements planned for the region. An initiative that came from this report was the *Santa Teresa International Rail Study*. This study evaluated rail bypass alternatives between Chihuahua and New Mexico. The recommended alternative (ALT HYB) would terminate at the BNSF rail line in New Mexico, west of I-10 and just north of the limit of Section 1[25].

(b) Truck Freight

This subsection of the report is focused on the origins and destinations of freight and the network of roadways that are used to transport it. As of 2016, trucks consisted of 10% of vehicles that travel along Segment 1 during peak periods, 5% of vehicles that travel along Segment 2 during peak periods, 7% of vehicles that travel along Segment 3 during peak periods, and 20% of vehicles that travel along Segment 4 during peak periods. Truck freight uses the I-10 corridor and surrounding street network and is distributed throughout El Paso in one of four ways: 1) through trips; 2) POE destinations; 3) local destinations; and 4) intermodal destinations such as rail yards and the airport. Figure 5-10 shows these elements as they relate to the I-10 corridor.

Through truck freight is freight passing through El Paso along I-10 east to Dallas-Fort Worth area or San Antonio or west to New Mexico. 26% of truck freight passed through El Paso in 2016.

There are five POEs parallel to the I-10 corridor within the El Paso region. These include the Fabens POE; the Ysleta-Zaragoza POE (Segment 3); the Bridge of the Americas (BOTA) POE (Segment 2/3); the Paso Del Norte POE (Segment 2); and the Stanton POE (Segment 2). Of these POEs, truck freight is restricted to the BOTA and Zaragoza POEs. The operating hours for the BOTA are from 6:00 AM to 6:00 PM, while the Zaragoza POE operates six hours longer (6:00 AM to midnight). Because the BOTA POE closes earlier in the evening, truck freight shifts to the Zaragoza POE and causes congestion and delays[26].

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[23] City of El Paso, *Plan El Paso*, 2012, Volume 1, pp 4.74.

[24] City of El Paso, *El Paso Downtown 2015 Plan*, 2006, pp. 47.

[25] El Paso Metropolitan Planning Organization, *Santa Teresa International Rail Study Update*, 2016, pp. 7.

[26] City of El Paso, *Plan El Paso*, 2012, Volume 1, pp 4.21.

Local distribution of truck freight includes freight traveling to, from, or within El Paso. These trips originate or end at various commercial, industrial, or manufacturing locations. Intermodal destinations include the BNSF and UPRR rail yards and the El Paso International Airport.

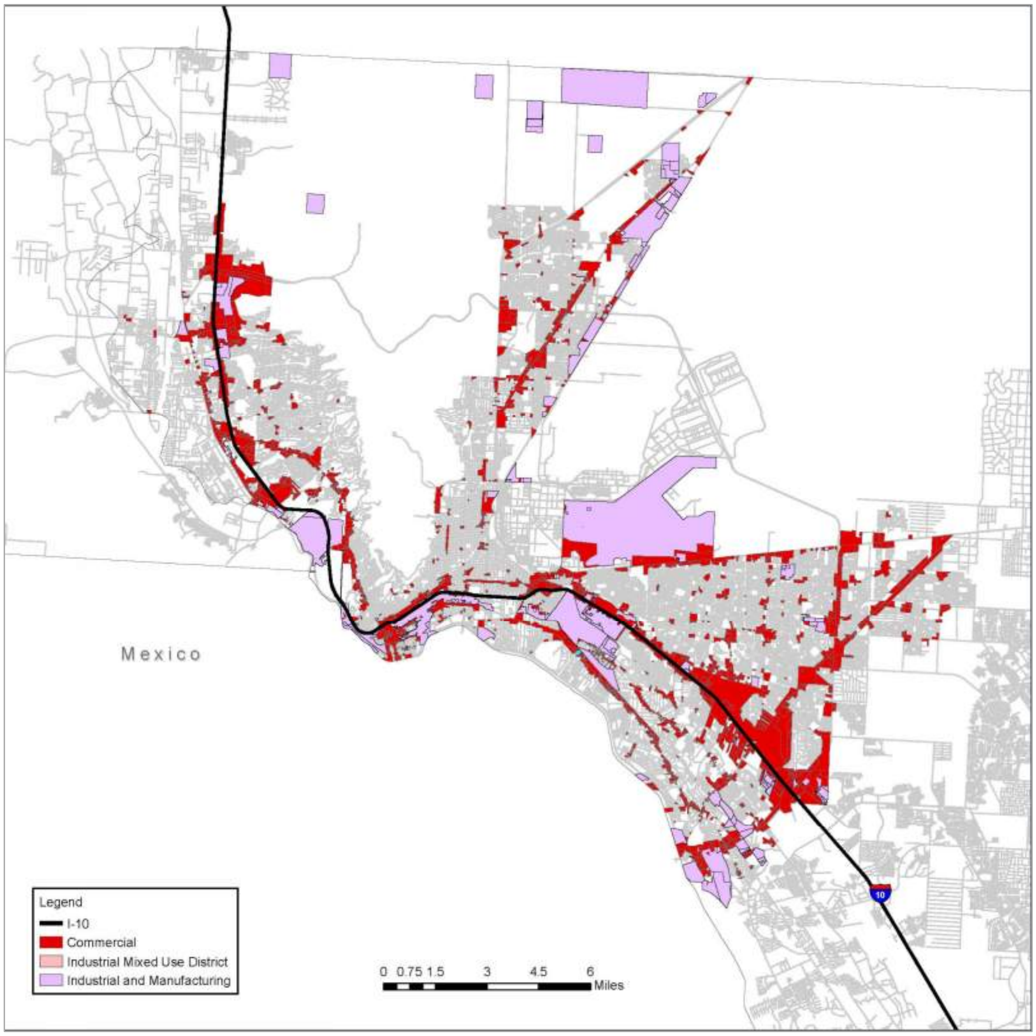


Figure 5-10. Truck Freight Origin and Destinations by Land Use

Appendix B

Environmental Constraints Maps

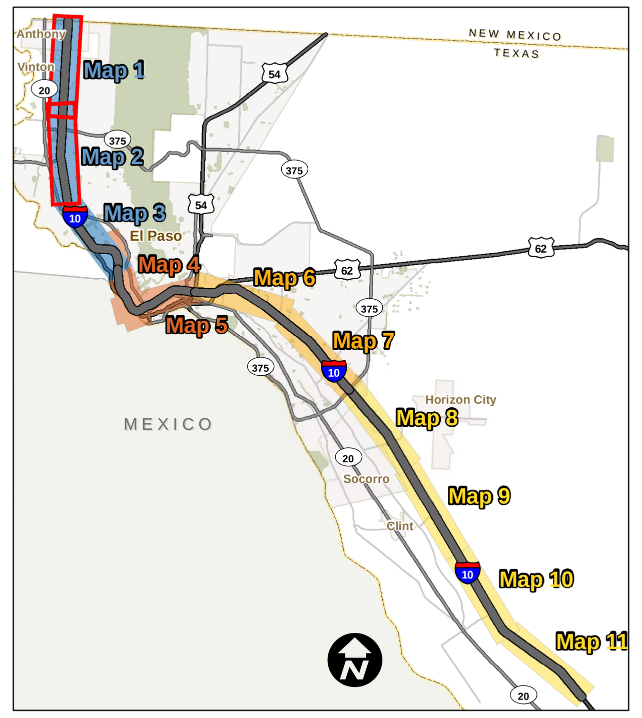
Reimagine I-10 Preliminary Constraints Map

- School
- Potential Hazardous Material Site
- NRHP-Listed Property
- Museum
- Place of Worship
- State/U.S. Border Line
- Railroad
- Arroyo/River
- 100-yr Floodplain
- National Wetlands Inventory (NWI) Feature
- Colonia
- Park
- Cemetery
- Texas Historic Site
- NRHP-Listed Historic District
- Study Area (1,500-ft Buffer)

1 inch = 500 feet

500 250 0 500 1,000 1,500

Feet



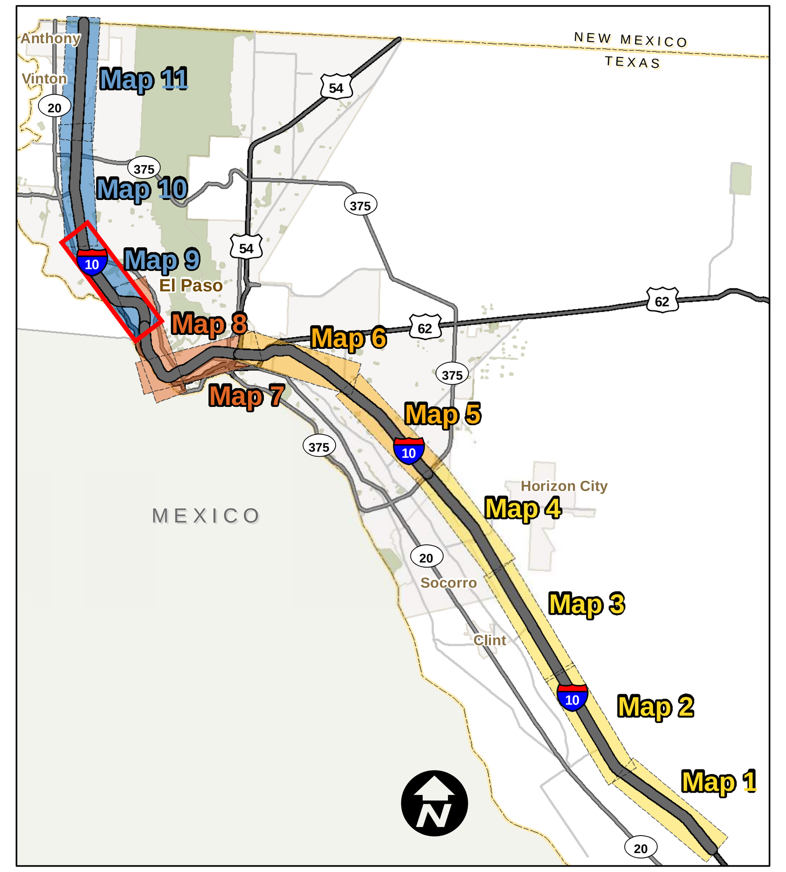
Base Map: NAIP Aerial Imagery, 2016; ESRI-USA Base Map

Reimagine I-10 Preliminary Constraints Map

	School
	Potential Hazardous Material Site
	Place of Worship
	State/U.S. Border Line
	Railroad
	Arroyo/River
	100-yr Floodplain
	National Wetlands Inventory (NWI) Feature
	Park
	Cemetery
	NRHP-Listed Historic District
	Study Area (1,500-ft Buffer)

1 inch = 500 feet

500 250 0 500 1,000 1,500
Feet



Base Map: NAIP Aerial Imagery, 2016;
ESRI-USA Base Map

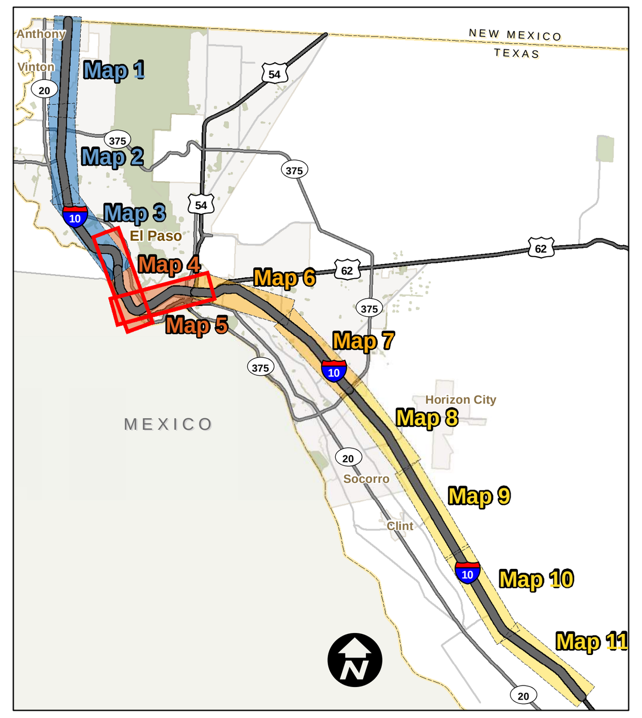
Reimagine I-10 Preliminary Constraints Map

- School
- Potential Hazardous Material Site
- NRHP-Listed Property
- Museum
- Place of Worship
- State/U.S. Border Line
- Railroad
- Arroyo/River
- 100-yr Floodplain
- National Wetlands Inventory (NWI) Feature
- Colonia
- Park
- Cemetery
- Texas Historic Site
- NRHP-Listed Historic District
- Study Area (1,500-ft Buffer)

1 inch = 500 feet

500 250 0 500 1,000 1,500

Feet



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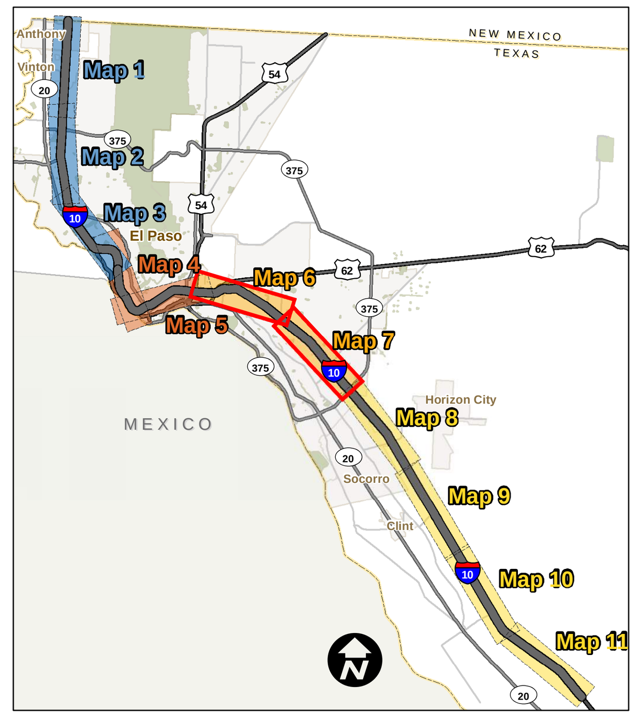

Base Map: NAIP Aerial Imagery, 2016;
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Reimagine I-10 Preliminary Constraints Map

School
Potential Hazardous Material Site
NRHP-Listed Property
Museum
Place of Worship
State/U.S. Border Line
Railroad
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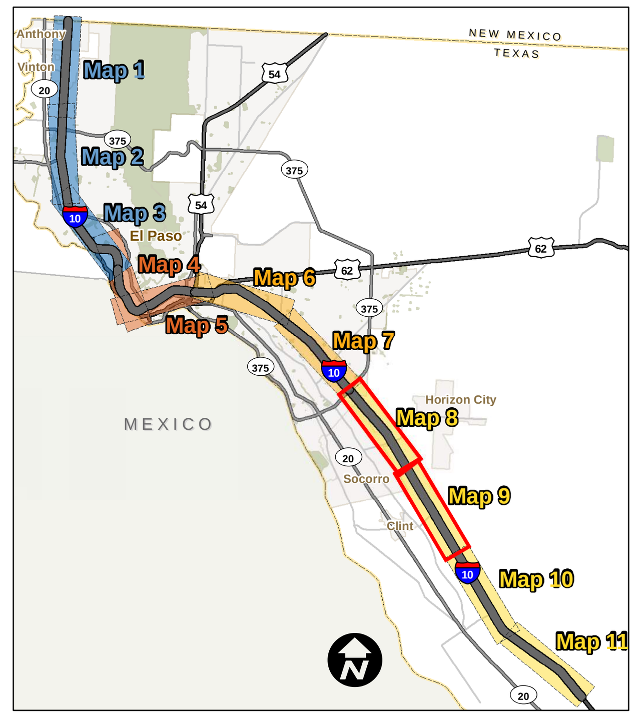
Feet



Base Map: NAIP Aerial Imagery, 2016;
ESRI-USA Base Map

Reimagine I-10 Preliminary Constraints Map

REIMAGINE El Paso 10

- School
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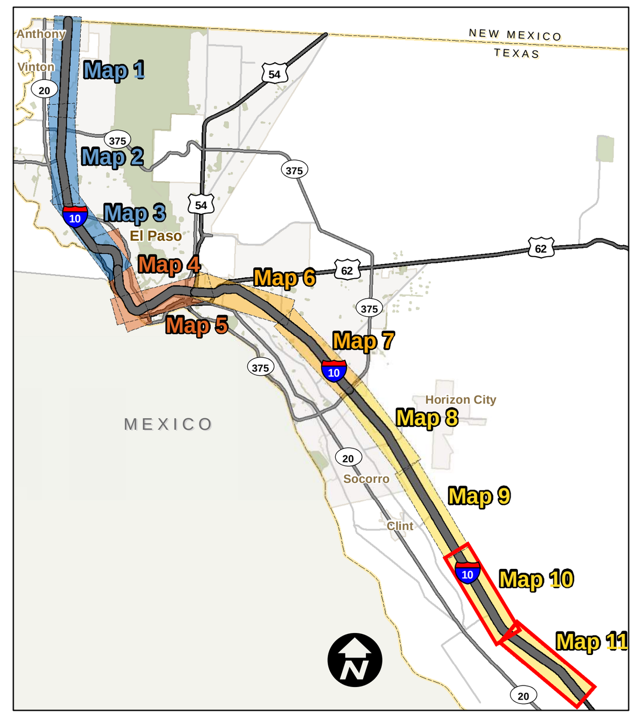

Base Map: NAIP Aerial Imagery, 2016;
ESRI-USA Base Map

Appendix C

ISATe Ramp Predictive Crash Analysis and Methodology

Reimagine I-10 Corridor Study

ISATe Predictive Crash Analysis Summary

CSJ: 2121-01-095

September 2019

Table of Contents

List of Tables

1. Ramping Alternatives

In order to determine the safety impact of various entrance ramp designs, predictive crash analysis was performed for three scenarios: Direct Merge, Merge Lane, and Lane Add.

The direct merge scenario includes no speed change lane (modeled as 0.04 miles, which is the minimum).

The merge lane scenario includes a speed change lane (modeled as 0.30 miles, which is the maximum).

The lane add scenario includes an additional lane after the entrance ramp gore.

The freeway was modeled as a one mile, 8 lane, symmetrical facility with an entrance ramp in either direction. Symmetry allows for results to be divided in half to determine the impacts of a single ramp design. AADTs of 150000 in 2022 and 200000 in 2042 were used for the mainlanes, and AADTs of 7500 and 10000 were used for each ramp. A summary of the results of the predictive crash analysis are shown in the table that follows. All values are in crashes/yr.

Table 1-1. Predictive Crash Analysis Results

Alt	Total	% Dec.	K	A	B	C	PDO	Ranking (1-3, 3 being worst)
Direct Merge	27.7	0	0.15	0.35	2.45	4.8	19.95	3
Merge Lane	25.25	-9.70	0.15	0.35	2.3	4.45	18	2
Lane Add	23.15	-19.65	0.1	0.3	2.15	4.15	16.4	1

The “Lane Add” scenario was modeled as 10 lanes instead of 8 lanes due to the additional lane in each direction. Results shown in the table are for half of the facility (one ramp and mainlanes for one direction of travel).

2. Corridor-Wide Alternatives

Below are the results of the ISATe predictive crash analysis for the No Build and four build alternatives. A one-mile straight segment (with no ramps) of the typical section was modeled for each case. All values are in crashes per year for the years 2022-2042.

Table 2-1. ISATe Predictive Crash Analysis Results Summary

Alt	Total	K	A	B	C	PDO
No Build	527.5	2.2	5.8	40.4	81.0	398.0
1	452.2	2.1	5.5	38.3	76.8	329.5
2	415.0	2.0	5.1	35.3	70.9	301.8
3	452.2	2.1	5.5	38.3	76.8	329.5
4	524.4	2.4	6.1	42.1	84.3	389.7

Overall traffic was the same for each alternative. The largest projected 2042 PHV for each segment and a peak hour factor of 0.1 was used for analysis, and 2022 volumes were determined using the projected growth rate for the corridor. The traffic volumes used were as follows:

Table 2-2. ISATe Predictive Crash Analysis Overall AADTs

Segment 1		Segment 2		Segment 3		Segment 4	
2022	2042	2022	2042	2022	2042	2022	2042
90100	133400	155600	230300	155500	230200	48800	72200

The No Build alternative was modeled as four lanes in Segments 1 and 4 and as six lanes in Segments 2 and 3.

Alternative 1 was modeled as six lanes in Segments 1 and 4 and as eight lanes in Segments 2 and 3.

Alternative 2 was modeled as six lanes in Segments 1 and 4 and as eight lanes in Segments 2 and 3. The inside shoulder was modeled as 12' due to software limitations (ISATe allows a maximum inside shoulder width of 12'), but the median width accounts for 15' inside shoulders.

Alternative 3 was modeled exactly the same as Alternative 1 due to software limitations (ISATe has no input for the 2' buffer). It is likely that potential high differences in speed between the adaptive lanes and mainlanes will lead to more severe crashes because the facilities are not physically separated.

For Alternative 4, the barrier separated adaptive lanes were modeled separately as a four-lane facility due to software limitations (the minimum number of lanes for a facility is four). The mainlanes were modeled as 4 lanes in Segments 1 and 4, and as six lanes in Segments 2 and 3. It was assumed that during peak periods 1000 vph will use each barrier separated adaptive lane in Segment 1, 1700 vph will use each barrier separated adaptive lane in Segments 2 and 3, and 500 vph will use each barrier separated adaptive lane in Segment 4. These volumes were scaled to AADTs (using the peak hour factor of 0.1) and subtracted from the overall volumes for the mainlane analysis. Table 1 includes the combined mainlane and adaptive lane crashes for this alternative (traffic for four lanes was modeled on the barrier separated adaptive lanes and then crashes were divided in half before being added to the mainlane crashes). The traffic and crash breakdown can be found in Tables 3-5.

Table 2-3. Alternative 4 Mainlane Traffic

Segment 1		Segment 2		Segment 3		Segment 4	
2022	2042	2022	2042	2022	2042	2022	2042
76600	113400	132700	196300	132600	196200	42100	62200

Table 2-4. Alternative 4 Barrier Separated Adaptive Lane Traffic

Segment 1		Segment 2		Segment 3		Segment 4	
2022	2042	2022	2042	2022	2042	2022	2042
27000	40000	45900	68000	45900	68000	13500	20000

*Shows traffic for four-lane facility

Table 2-5. Alternative 4 Mainlane and Adaptive Lane Crashes

	Total	K	A	B	C	PDO
Mainlanes	480.3	2.1	5.4	37.5	75.2	360.1
Barrier Separated Adaptive Lanes*	88.2	0.5	1.3	9.1	18.1	59.2

*Shows crashes for four-lane facility

Page 3 of the ISATe User Manual states, “The predictive method for freeways does not account for the influence of the following conditions on freeway safety: Freeways with limited access managed lanes that are buffer-separated from the general-purpose lanes.”

Page 58 of the ISATEe User Manual states, “ISATe can be used to evaluate freeways with barrier-separated managed lanes. The managed lanes are considered to be part of the median… The safety of the managed lanes is not addressed by this technique. The estimate of expected average crash frequency only includes crashes that occur in the general-purpose lanes.”

Appendix D

Recommended Alternative Roll Plots

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972.960.4400

REIMAGINE El Paso 10

I-10 CORRIDOR STUDY

SEGMENT 1
RECOMMENDED ALTERNATIVE

LEGEND:

PROPOSED MAINLANE	yellow
PROPOSED RAMP, DC OR C-D ROAD	cyan
PROPOSED FRONTAGE ROAD	green
PROPOSED CROSS STREET	orange
PROPOSED ADAPTIVE LANE	magenta
PROPOSED REMOVAL	red

PRELIMINARY
FOR INTERIM REVIEW ONLY. NOT FOR PERMITTING, BIDDING, OR CONSTRUCTION.

0 100 200 300 400
SCALE IN FEET

SCALE: 1"=200'

SHEET 1 OF 6

USER: DDIJOSEPH CSJ: 2121-01-095 DATE: 1/17/2019 FILE: c:\pwworking\central\hd0538633\I10_I-ALT-3-RD_SCH-PL-01.dgn

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REIMAGINE El Paso 10

I-10 CORRIDOR STUDY

SEGMENT 1
RECOMMENDED ALTERNATIVE

LEGEND:

PROPOSED MAINLANE
PROPOSED RAMP, DC OR C-D ROAD
PROPOSED FRONTAGE ROAD
PROPOSED CROSS STREET
PROPOSED ADAPTIVE LANE
PROPOSED REMOVAL

PRELIMINARY
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0 100 200 300 400
SCALE IN FEET

SCALE: 1"=200'

SHEET 2 OF 6

USER: DDIJOSEPH CSJ: 2121-01-095 DATE: 1/17/2019 FILE: c:\pwworking\central01\d0538633\I10_I-ALT-3-RD_SCH-PL-02.dgn

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REIMAGINE El Paso 10

I-10 CORRIDOR STUDY

SEGMENT 1
RECOMMENDED ALTERNATIVE

LEGEND:
PROPOSED MAINLANE
PROPOSED RAMP, DC OR C-D ROAD
PROPOSED FRONTAGE ROAD
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PROPOSED ADAPTIVE LANE
PROPOSED REMOVAL

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0 100 200 300 400
SCALE IN FEET
SCALE: 1"=200'

SHEET 3 OF 6

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I-10 CORRIDOR STUDY

SEGMENT 1
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0 100 200 300 400
SCALE IN FEET

SCALE: 1"=200'

SHEET 4 OF 6

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I-10 CORRIDOR STUDY

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0 100 200 300 400
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SHEET 5 OF 6

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REIMAGINE El Paso 10

I-10 CORRIDOR STUDY

SEGMENT 2
RECOMMENDED ALTERNATIVE

LEGEND:
- PROPOSED MAINLANE
- PROPOSED RAMP, DC OR C-D ROAD
- PROPOSED FRONTAGE ROAD
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0 100 200 300 400
SCALE IN FEET

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SHEET 1 OF 3

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SHEET 2 OF 3

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SHEET 1 OF 5

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REIMAGINE El Paso 10

I-10 CORRIDOR STUDY

SEGMENT 3 RECOMMENDED ALTERNATIVE

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SHEET 2 OF 9

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I-10 CORRIDOR STUDY

SEGMENT 4
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LEGEND:

PROPOSED MAINLANE	yellow
PROPOSED RAMP, DC OR C-D ROAD	cyan
PROPOSED FRONTAGE ROAD	green
PROPOSED CROSS STREET	orange
PROPOSED ADAPTIVE LANE	magenta
PROPOSED REMOVAL	red

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SHEET 4 OF 9

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SCALE IN FEET
SCALE: 1"=200'

USER: DDIJOSEPH CSJ: CSJ DATE: 1/18/2019 FILE: $$FILE$$

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0 100 200 300 400
SCALE IN FEET

SCALE: 1"=200'

SHEET 7 OF 9

USER: DDIJOSEPH CSJ: CSJ DATE: 1/18/2019 FILE: $$FILE$$

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I-10 CORRIDOR STUDY

SEGMENT 4
RECOMMENDED ALTERNATIVE

LEGEND:
PROPOSED MAINLANE
PROPOSED RAMP, DC OR C-D ROAD
PROPOSED FRONTAGE ROAD
PROPOSED CROSS STREET
PROPOSED ADAPTIVE LANE
PROPOSED REMOVAL

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0 100 200 300 400
SCALE IN FEET

SCALE: 1"=200'

SHEET 8 OF 9

USER: DDIJOSEPH CSJ: CSJ DATE: 1/18/2019 FILE: $$FILE$$

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REIMAGINE El Paso 10

I-10 CORRIDOR STUDY

SEGMENT 4
RECOMMENDED ALTERNATIVE

LEGEND:
PROPOSED MAINLANE
PROPOSED RAMP, DC OR C-D ROAD
PROPOSED FRONTAGE ROAD
PROPOSED CROSS STREET
PROPOSED ADAPTIVE LANE
PROPOSED REMOVAL

PRELIMINARY
FOR INTERIM REVIEW ONLY. NOT FOR PERMITTING, BIDDING, OR CONSTRUCTION.

0 100 200 300 400
SCALE IN FEET

SCALE: 1"=200'

SHEET 9 OF 9

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Appendix E

Traffic Tech Memo

Reimagine I-10 Corridor Study

Traffic Tech Memo

CSJ: 2121-01-095

January 2020

Table of Contents

List of Figures

List of Tables

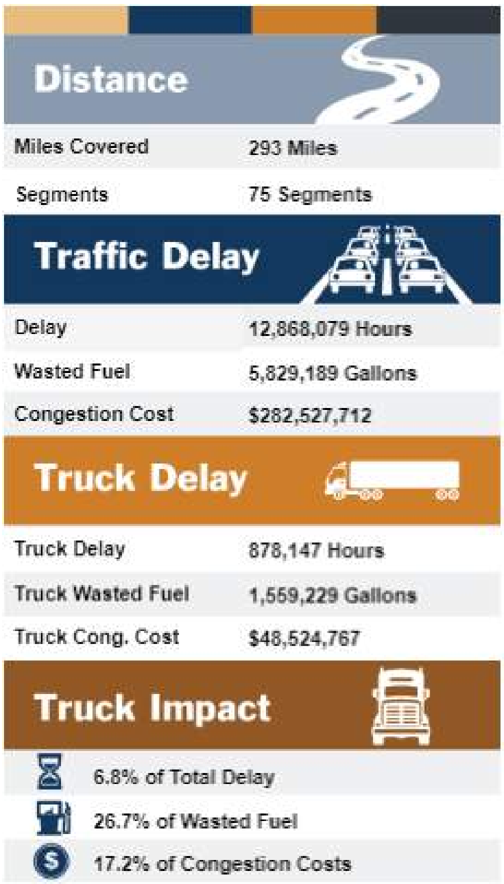
1. Study Background

HDR was retained by the Texas Department of Transportation (TxDOT) El Paso District to perform operational traffic analysis for a corridor-wide feasibility and planning study of current and future transportation needs for the IH 10 corridor. IH 10 is a major east to west Interstate Highway spanning approximately 2,460 miles in the Southern United States. Figure 1 shows the entire expanse of the IH 10 corridor. The section of IH 10 in Texas begins at Orange, Texas, and passes through the Cities of Houston and San Antonio before making its way to the City of El Paso, Texas. For this reason, IH 10 is a vital link for freight and commercial traffic between East and West Texas and points beyond. The study area is from the Texas-New Mexico state line to FM 3380 near Turnillo, Texas, and is approximately 55 miles in length.

Figure 1: IH 10 US Corridor

1.1 Purpose and Need

Because of the vital importance that IH 10 has on interstate and international commerce, any considerable delay will have significant costs. This cost was summarized by Texas' 100 Most Congested Road website, which estimates that regionally El Paso sees approximately 12.8M hours of delay each year on approximately 293 miles of roadway. This delay costs travelers an estimated $282.5M a year and waste approximately 5.8M gallons of fuel. Not only does this congestion have an adverse effect on daily travelers within the region, but this congestion also has a severe effect on the economy with an estimated $48.5M cost to industries that rely on the trucking industry. Figure 2 provides a snapshot of the overall cost and fuel wasted due to added delay.



Source: Texas A&M Transportation Institute

Figure 2: Regional Snapshot of Congestion Impact

The purpose of this traffic study was to determine how the existing IH 10 corridor operates, which includes determining existing delay and capacity constraints from mainlanes and ramps as well as frontage roads and intersections. The traffic study also went further to determine how future traffic volumes will be impacted if nothing is down to improve the system.

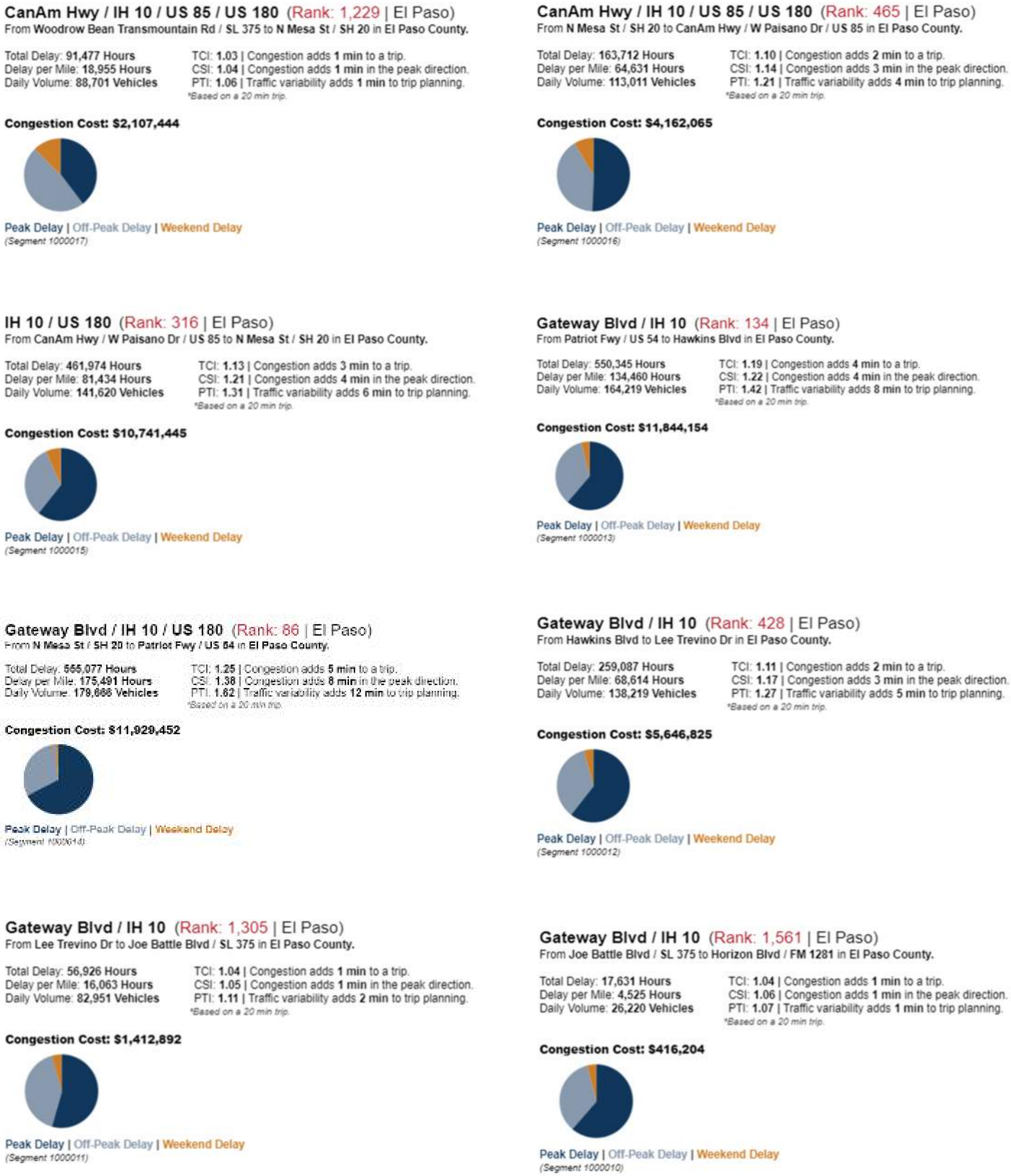
Preliminary research has found that IH 10 has one of the top 100 congested segments in the State of Texas. This segment, from North Mesa to US 54, currently ranks number 86. This section, which is approximately 11 miles in length, has over 555,000 hours of delay and has a congestion cost of over $11.9M. Another segment on IH 10, which is between US 54 and Hawkins, is currently ranked number 134 in the State. This four-mile segment has over 550,000 hours of delay and has a congestion cost of over $11.8M. Table 1 puts in perspective how much IH 10 cost users each year and how much of the total percentage it accounts for based on the Top 100 Congested Road research.

Table 1: Impacts of Congestion on IH 10

Total Delay (hours)	2,162,229
Congest Cost	$48,260,481
Percent of Regional Roads	11%
Percent of Regional Delay	17%
Percent of Regional Cost	17%

Source: Texas A&M Transportation Institute Texas' Most Congested Roadways – 2019

Figure 3 provides a snapshot of each segment on IH 10 with their subsequent statistics from Texas A&M Transportation Institute Texas' Most Congested Roadways – 2019.



Source: Texas A&M Transportation Institute Texas' Most Congested Roadways – 2019 El Paso District,

Figure 3: IH 10 Congestion Ranking by Segment

The congestion in the region and especially on IH 10, is expected only to increase. Census data, which was taken from the Freight Mobility Plan, shows that there was a population growth of 17.3 percent from 2000 to 2010 with the most significant growth in El Paso County. This can be viewed in Table 2. Employment also increased overall at 7.9 percent. With the population and employment growth in the region increasing, this will only increase the strain that IH 10 already experiences every day.

Table 2: Population and Employment Growth

	POPULATION			EMPLOYMENT		
County	2010 Census	2000 Census	Growth Rate	2010 Employment	2000 Employment	Growth Rate
Brewster	9,232	8,866	4.1%	4,591	4,188	9.6%
Culberson	2,398	2,975	-19.4%	1,096	957	14.5%
El Paso	800,647	679,622	17.8%	270,603	251,417	7.6%
Hudspeth	3,476	3,344	3.9%	1,171	800	46.4%
Jeff Davis	2,342	2,207	6.1%	1,000	895	11.7%
Presidio	7,818	7,304	7.0%	2,259	1,912	18.1%
TOTAL	**825,913**	**704,318**	**17.3%**	**280,720**	**260,169**	**7.9%**

Source: El Paso District Profile Texas Freight Mobility Plan 2018

With the anticipated growth of both population and employment, additional analysis was conducted to locate where the growth is anticipated to occur. From El Paso's MPO TDM, population growth is expected to occur between the border with New Mexico and Vinton and near America's Interchange (Loop 375 and IH 10). This will likely increase congestion on IH 10 because of travelers commuting to and from their residences. The employment growth is anticipated to grow along the entirety of IH 10, which may constrain capacity improvements because of geographic constraints. Figure 4 shows the anticipated location of growth.

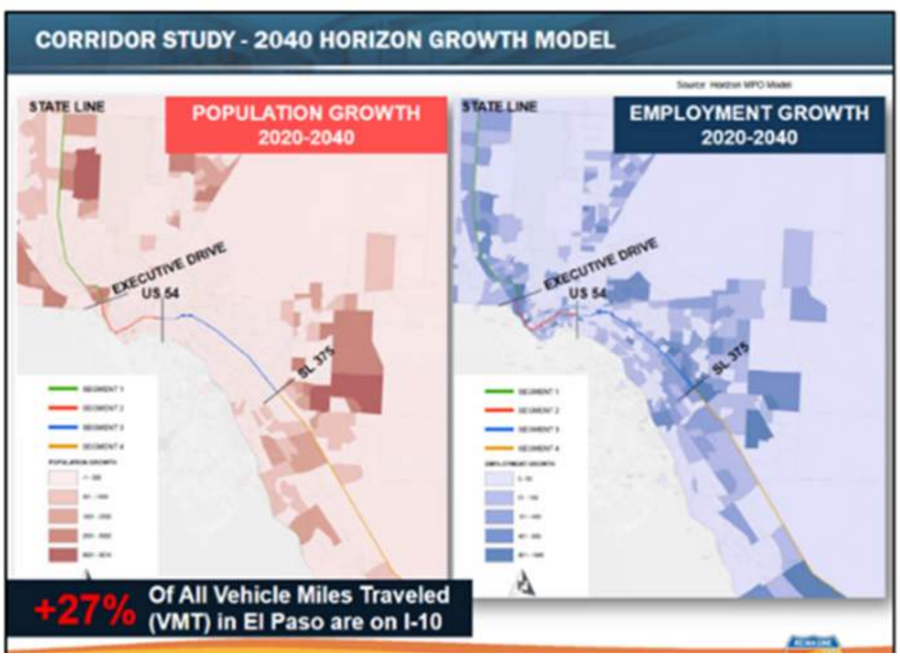


Figure 4: Location of Anticipated Growth

Another key indicator for the future demand on IH 10 is the historical growth of daily volume. Figure 5 shows TxDOT Planning Map historical traffic growth trends for each segment of IH 10. As shown in the figure, most of the locations show low to moderate traffic growth during the past 20 years. In Figure 5, each solid line represents the Average Annual Daily Traffic taken from TxDOT Planning Map. The dashed line represents the trend line for each segment of IH 10. Even though the trends show low to moderate increase of volume, the historical trend indicates that the slope of each trend line is positive and therefore, traffic is growing.

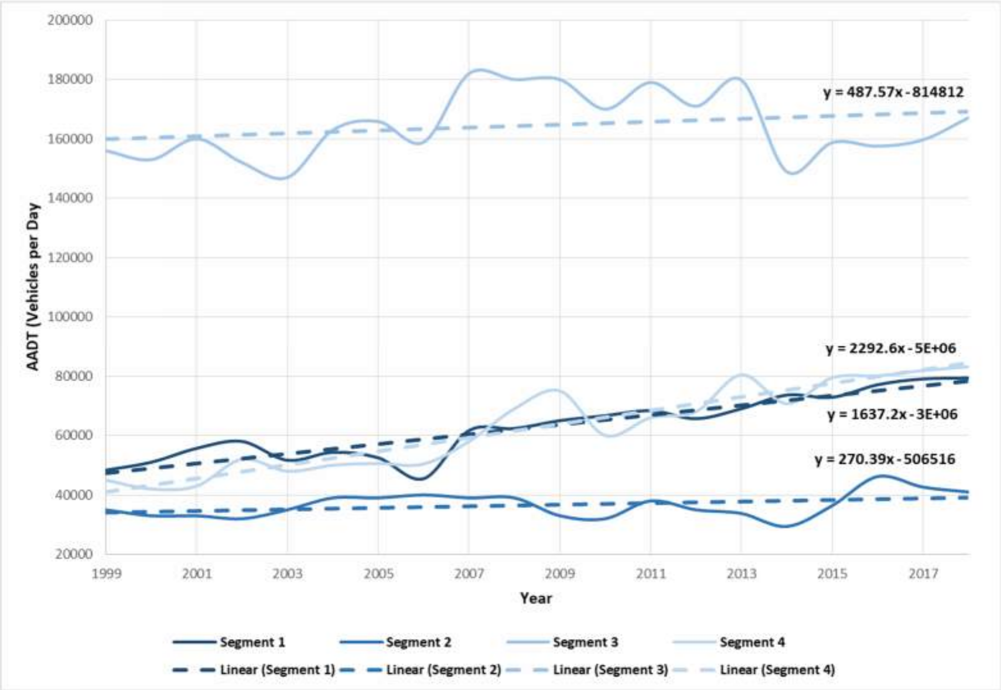


Figure 5: Historical Traffic Volume Trend

Going further than population and employment growth, freight is expected to increase on IH 10. El Paso's Freight Mobility Plan estimates that overall tonnage that is being shipped in and out of the region will increase by 64 percent by the year 2045. This increase will likely increase the number of heavy vehicles that are present on IH 10 and add more delay to an already overburdened facility. Table 3 provides a county breakdown of the growth in tonnage.

Table 3: Freight Tonnage Growth

County	2016 Tonnage	2045 Tonnage	% Change 2016-2045
Brewster	120,635	285,818	137%
Culberson	1,123,176	723,682	-36%
El Paso	33,567,333	55,866,640	66%
Hudspeth	320,359	372,510	16%
Jeff Davis	292,783	564,078	93%
Presidio	194,870	461,992	137%
TOTAL	**35,619,157**	**58,274,720**	**64%**

Source: El Paso District Profile Texas Freight Mobility Plan 2018

Because all the trends point to an increase in population, employment, and freight, the need to preserve the right of way and to increase capacity on IH 10 is vital. The improvements suggested in the Feasibility Study will allow El Paso to remain relevant economically, improve mobility for the residents of the region, and improve safety on the facility.

1.2 Project Location

Since IH 10 study area is 55 miles in length, it encompassed a wide range of land use and freeway cross-section types, which range from rural areas to dense urban areas. Because of these distinct patterns, IH 10 was segmented into four study segments. **Figure 6** shows the limits of each segment.

Figure 6: IH 10 Study Segments

a) Segment 1

In Segment 1, IH 10 is a four-lane divided highway from Antonio Street to North Mesa Street and a six-lane divided highway from North Mesa Street to Executive Center Boulevard. This section has a posted speed limit of 75 miles per hour (mph) from Antonio Street to Redd Road, where the speed limit decreases to 60 mph. This section has continuous frontage roads from Antonio Street to North Mesa Street with a posted speed limit of 55 mph.

Land use is primarily residential with several industrial sites and a few major entertainment and retail attractions. These attractions include Wet ‘N’ Wild Waterworld near the New Mexico State Line, the Outlet Shoppes at El Paso just north of the Loop 375 interchange, and Sunland Park Mall between Sunland Park Drive and the SH 85 interchange. Long stretches of undeveloped land border IH 10 north of Loop 375, but some significant development is taking place around the Loop 375 interchange. South of Artcraft Road/Paseo del Norte density increases, and land use is primarily residential. The two-mile stretch of uneven terrain along IH 10 between the SH 85 interchange and Executive Center Boulevard is an unrestricted manufacturing district and is undeveloped.

The north end of Segment 1 has a wide unpaved median, frontage roads, and two mainlanes in each direction. Near the Redd Road interchange, the median is paved. South of Mesa Street, there are no frontage roads and three mainlanes in each direction. The ongoing GO 10 project is adding mainlanes and collector-distributor roads to the corridor between Mesa Street and Executive Center Boulevard.

In addition to the mainlanes, ramps, and frontage roads, the following interchanges were analyzed:

- FM 1905 (Antonio Street)
- SH 37 (Vinton Road)
- Loop 375
- SH 178 (Artcraft Road)
- Redd Road
- Thorn Avenue
- SH 20 (Mesa Street)
- Sunland Park Drive
- Executive Center Boulevard

b) Segment 2

In Segment 2, IH 10 is primarily an eight-lane highway from Executive Center Boulevard to Yandell Drive. Once entering the business district at Yandell Drive, the lanes decrease to a six-lane highway. From Dallas Street to Copia Street, the lanes increase to a ten-lane highway, and from Copia Street to Raynolds Street is then reduced to an eight-lane highway. The posted speed limits for this section is 60 mph. The westbound (WB) frontage road exists east of downtown, and the eastbound (EB) frontage road exists east of Piedras Street. The mainlanes are depressed through downtown with steep walls connecting the outside shoulder edges to ground level.

Land use in this segment is widely varied but dominated by commercial, industrial, and residential uses. Major trip attractors include Downtown, the Bridge of the Americas Port of Entry, and The University of Texas at El Paso (UTEP). Segment 2 is extremely dense except for the 1.5 mile stretch between Executive Center Boulevard and UTEP. BNSF rail lines run along the eastbound side of IH 10 for the majority of Segment 2, and a BNSF rail yard exists between downtown and Piedras Street. In addition to the mainlanes, ramps, and frontage roads, the following interchanges were analyzed:

- Schuster Avenue
- Porfirio Diaz Street
- Franklin Avenue
- Central Business District Intersections
- Cotton Street
- Piedras Street
- Raynor Street
- Copia Street
- Raynolds Street

c) Segment 3

In Segment 3, IH 10 is an eight-lane highway from Raynolds Street to McRae Boulevard and a six-lane highway from McRae Boulevard to Eastlake Boulevard with continuous frontage roads throughout the entire section. The posted speed limit for the mainlanes and frontage road is 60 mph and 45 mph, respectively. The median is paved, and inside shoulders are narrow at spots. Several recent studies include the following for Segment 3:

- Analysis of Mitigation Strategies for IH 10 Corridor Hot Spots (August 2007)
- Zaragoza Preliminary Improvement Concepts (September 11, 2009)

Land use in this segment is dominated by commercial and residential except for an industrial area on the eastbound side of IH 10 between Marlow Road and Tony Lama Street. Major attractions in this segment include the El Paso International Airport, Fort Bliss, The Fountains at Farah, Cielo Vista Mall, University Medical Center, the Zaragoza Port of Entry, and Bassett Place. Ramp density along Segment 3 is dense.

In addition to the mainlanes, ramps, and frontage roads, the following interchanges were analyzed:

- Paisano Drive
- Geronimo Drive
- Hawkins Boulevard
- Giles Road/McRae Boulevard
- Yarbrough Drive
- Pendale Road
- Trowbridge Drive
- Airway Boulevard
- Hunter Drive/Viscount Boulevard
- Corral Drive/Sumac Drive
- Lomaland Drive
- George Dieter Drive/Zaragoza Road

d) Segment 4

In Segment 4, IH 10 is a four-lane highway from Eastlake Boulevard to Turnillo Road with a posted speed limit of 75 mph. There are continuous frontage roads from Eastlake Boulevard to Darrington Road that have posted speed limits of 55 mph. Commercial, industrial, and agricultural zones surround the Loop 375 interchange. The remainder of this segment is primarily residential, with small businesses interspersed. There is very little development along IH 10 in Segment 4 except at the Loop 375 and Horizon Boulevard interchanges.

In addition to the mainlanes, ramps, and frontage roads, the following interchanges were analyzed:

- Eastlake Boulevard
- Fabens Road
- Horizon Boulevard
- Turnillo Road

1.3 Data Collection

The IH 10 study area encompasses a wide range of land use and freeway cross-section types, which range from rural and transitional areas in Segments 1 and 4 to dense urban areas in Segments 2 and 3. Each segment has distinct traffic patterns/congestion locations and times and a different mix of traffic; therefore, an extensive effort was made to collect high-resolution traffic data.

a) Field Visit

A field visit was carried out as part of the data collection efforts. The purpose was to gain firsthand knowledge and experience of the traffic conditions in the study area during the AM and PM peak periods. The following information was gathered from the field and applied to the traffic modeling efforts:

- Traffic patterns/Congestion locations/Bottlenecks
- Operations on mainlanes and frontage roads
- Geometry and lane assignment verifications at intersections
- Queue lengths
- Signage
  - No RTOR
  - Speed limits
  - Flashing yellow indications
  - Truck limitations
  - School zones
  - Restricted movements
- Signal timing and phasing confirmation

b) Intersections/Turning Movements Counts (TMC)

Using TxDOT's Traffic Count Database System (TCDS), HDR acquired the majority of data needed for the analysis of the mainlanes, ramps, and frontage roads. The City of El Paso's online database provided the majority of the TMCs for the cross streets. The count years from the City's database ranged from 2014 to 2016 and were grown to the existing year. Supplemental traffic data was collected by HDR's subconsultant GRV IES to fill in data gaps as needed. The collected traffic volume data was balance and utilized in the traffic projection efforts discussed below. Also, origin-destination (O-D) data obtained from Streetlight Data helped in the alternatives analysis to determine travelers' destinations.

c) Travel Demand Model

HDR coordinated with El Paso's Metropolitan Planning Organization (MPO) to acquire the latest travel demand model (TDM). The TDM is used to forecast the demand and behavior for a transportation facility for a specific future time frame. Conceptually, the TDM has a four-step approach comprising of the following:

1. Trip Generation

Trip generation determines the origin and destination of trips in a specific zone. Socio-economic factors, land use data, and household demographics are used to determine the number of trips produced and attracted to a Traffic Analysis Zone (TAZ). Trip purposes are used to describe these trips. Typical trip purposes include home-based work, home-based school, home-based shopping, home-based other, and non-home based. These trip purposes define what the origin and destination are of each trip.

2. Trip Distribution

Trip distribution determines where trips go once exiting a TAZ. A matrix of origin and destinations for each zone and trip purpose is created to identify the attractiveness of a zone based on the number of trips produced in the zone, the number of trips attracted to the zone, and travel time.

3. Mode Choice

Mode choice describes the method of transportation used between a trip's origin and destination. This step can be simple or complex, depending on the amount of transit in the study area. In the TDM, mode choice is performed by going through multiple iterations of the trip distribution and assignment as a part of a feedback loop. Mode choice determines which modes of transportation are used, and the mode split, which is the percentage of people using a specific type of transportation.

4. Trip Assignment

Finally, trip assignment determines which route is taken to get from origin to destination. There are different methods of performing this step, such as using minimum travel time to determine which route a traveler is most likely going to take. The model then yields traffic volumes for the roads in the network.

The El Paso Metropolitan Planning Organization (MPO) provided HDR two TDMs for the El Paso metropolitan area to use and run for data collection. The first, named the Horizon model, has scenarios for the years 2007, 2010, 2020, 2030, and 2042 to use and extract data. The Horizon TDM uses TxDOT trip generation and trip distribution programs that run on TransCAD TDM software. The model follows the four-step TDM. The Horizon Model Interface allows users to configure the following options:

- Model Setup
- Run Skim
- Reporting
- Network Update
- Assignment

The year 2020 and 2042 were run with the purpose of 2020 being the design year and 2042 being the future year. The output of the Horizon TDM was mapped for the total traffic, total truck traffic, and volume/capacity ratio.

The second model is an updated TDM by Cambridge Schematics. This model is currently pending review of the Federal Highway Administration but includes more in-depth transit data. HDR used this model to update existing information given from the previous model. The new model includes the year 2012 and has a more significant transit network.

d) Texas Statewide Analysis Model Version 3 (Sam-V3)

HDR was given one TDM for the state of Texas created by Alliance Transportation Group, Inc. for TxDOT. The Texas Statewide Analysis Model Version 3 (SAM-V3) model includes scenarios for the years 2010, 2020, 2030, and 2042. The SAM model is based on the four-step model and is a multimodal TDM that focuses on forecasting traffic volumes for passenger and freight transportation, rail ridership, freight rail tonnage, and train and rail projections. The interface includes the following model steps:

- Network Update
- Freight Trip Generation
- Freight Trip Distribution
- Freight Mode Choice
- Optional Assignment
- Trip Generation
- Trip Distribution
- Mode Choice
- Assignment
- Reports

HDR ran the SAM-V3 model for the years 2020 and 2042 to gather additional information about freight assignment along the IH 10 corridor.

1.4 Peak Hour Determination and Traffic Volume Balancing

The peak periods of 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM were used to determine the peak hours for the morning and evening. Mainlane count locations, along with exit and entrance ramp count locations, were used to determine the peak hours for each segment. The peak hours were determined to be:

- Segment 1:
  - 7:00 AM to 8:00 AM
  - 5:00 PM to 6:00 PM
- Segment 2
  - 8:00 AM to 9:00 AM
  - 5:00 PM to 6:00 PM
- Segment 3:
  - 7:30 AM to 8:30 AM
  - 5:00 PM to 6:00 PM
- Segment 4:
  - 7:00 AM to 8:00 AM
  - 5:00 PM to 6:00 PM

Irregularities between mainlane, ramp, and intersection count locations were removed by balancing traffic between those locations. These peak hours were used to develop the base year 2017 traffic and design year 2042 traffic projections. The counts also took into account adjacent or other traffic studies for balancing purposes.

2. Traffic Projections Methodology

This section outlines the methodology used to develop growth rates for traffic volume projections for the Base Year (2022) and Design Year (2042) for each study segment of IH 10.

2.1 Growth Rate Determination

The following datasets were reviewed to help develop and recommend the growth rate:

- Historical traffic count information obtained from the Texas Department of Transportation (TxDOT) Statewide Traffic Analysis and Reporting System (STARS) (Ref. 1)
- Socio-economic data from Horizon Travel Demand Model (TDM) provided by El Paso MPO and TxDOT

a) TxDOT STARS Database

The volumes along the IH 10 corridor available on the TxDOT STARS system were collected from the available 21 data locations. The historical volume data at these locations were used to calculate a linear growth rate for the years 1999 to 2016 and 2012 to 2016. Table 4 summarizes the growth rates obtained from the historical data:

Table 4: Growth Rates from TxDOT STARS

Sub-Segment	Linear Growth Rate	
	1999-2016	2012-2016
Valley Chili-Vinton	1.46%	1.22%
Vinton-SH16	NA	3.20%
SH16-Artcraft	2.08%	3.88%
Redd-Mesa	2.88%	6.32%
Mesa-Sunland	2.90%	2.16%
Sunland-ECB	1.76%	3.58%
Section 1 Average	2.22%	3.40%
ECB-Schuster	2.00%	4.62%
Schuster-Santa Fe	1.70%	3.85%
Cotton-Piedras	1.05%	2.74%
Piedras-US54	0.12%	1.29%
US54-Paisano	-0.54%	-1.10%
Section 2 Average	0.87%	2.28%
Paisano-Geronimo	-1.06%	-0.45%
Airway-Hawkins	-2.20%	-7.96%
Hunter-Yarbrough	-1.59%	-7.07%
Yarbrough-Lomaland	-0.80%	-3.01%
Lee Trevino-Zaragoza	-2.50%	-4.30%
Zaragoza-375	1.24%	-2.76%
Section 3 Average	-1.15%	-4.26%
Eastlake-Horizon	-2.50%	-0.65%
Horizon-Darrington	2.17%	1.31%
Darrington-San Felipe	1.88%	1.67%
San Felipe-Turnillo	1.63%	3.41%
Section 4 Average	0.79%	1.44%
Average	0.58%	0.57%

The average linear growth rate is 0.58 percent from 1999 to 2016. The resultant average growth rate observed is low, mainly due to the negative growth rates in the various sections of Segments 2, 3, and 4 along the IH 10 corridor.

b) Horizon – Travel demand Model:

HDR reviewed the socio-economic data from Horizon TDM provided by TxDOT and Local MPO. This forecast of population and employment serves as the basis for the model's forecast of traffic volumes. There are 154 TAZs adjacent to the IH 10 corridor, and the employment and population data for the years 2017, 2020, 2030, and 2040 for these TAZs were extracted from the model. This data was then used to calculate the linear growth rate for population and employment along different sections on IH10 corridor.

Table 5 and Table 6 show the growth rates (GR) between the years 2007 to 2040 for population and employment:

Table 5: Employment Growth Rates – Horizon model

Sections	Employment							
	2007-2010	2010-2012	2012-2014	2014-2017	2017-2020	2020-2030	2030-2040	Linear GR
Seg 1	1.4%	0.5%	2.1%	1.5%	1.6%	1.7%	1.2%	1.81%
Seg 2	-4.6%	0.4%	1.4%	0.9%	1.7%	1.7%	1.8%	1.27%
Seg 3	-3.7%	0.4%	1.1%	0.8%	1.3%	0.7%	0.6%	0.56%
Seg 4	4.6%	0.4%	0.9%	0.7%	2.2%	2.9%	2.1%	2.88%
							Average	1.63%

Table 6: Population Growth Rates – Horizon model

Sections	Population							
	2007-2010	2010-2012	2012-2014	2014-2017	2017-2020	2020-2030	2030-2040	Linear GR
Seg 1	2.1%	0.8%	1.6%	1.7%	1.7%	0.9%	0.8%	1.39%
Seg 2	1.0%	0.4%	0.8%	1.0%	0.8%	3.0%	2.6%	2.51%
Seg 3	1.2%	0.4%	0.5%	0.5%	0.4%	0.2%	0.1%	0.31%
Seg 4	1.1%	3.0%	2.0%	2.5%	1.0%	0.9%	0.9%	1.51%
							Average:	1.43%

The average growth rate along the IH 10 corridor for employment is 1.63 percent, and for the population, it is slightly lower at 1.43 percent.

c) Growth Rate Recommendations:

Based on the information herein and for feasibility, HDR recommends, following the TPP methodology, a corridor-wide conservative growth rate of two (2) percent to forecast traffic for the 20 years from 2017 to 2037, and a corridor-wide conservative growth rate of one and a half (1.5) percent for the 15 years from 2037 to 2052, as shown in Table 7. A single growth rate is to be used for all sections along the IH 10 Corridor to be consistent and maintain continuity of traffic flow/analysis.

Table 7: Recommended Growth Rates

Analysis Period	Linear Growth Rate
2017 to 2037	2.0%
2037 to 2052	1.5%

2.2 Heavy Vehicle Percentage

Knowing the percentage of heavy vehicles in a corridor is essential. Heavy vehicles adversely affect traffic in two ways (Ref. 2):

- They are larger than passenger cars, so they occupy more roadway space and create more significant time headways between vehicles.
- They have more reduced operating capabilities than passenger cars, particularly concerning acceleration, deceleration, and the ability to maintain speed on upgrades.

Heavy vehicles cause queuing, slow the speed of traffic, and reduce capacity by taking up more space. These factors negatively affect the LOS of roadway segments. Table 8 provides a summary of heavy vehicle percentages that were collected during the supplemental traffic count for each segment and peak period.

Table 8: Percent Heavy Vehicles by Segment

Peak Period	Segment 1		Segment 2		Segment 3		Segment 4	
	AM	PM	AM	PM	AM	PM	AM	PM
Heavy Vehicle %	8%	11%	6%	6%	8%	8%	24%	25%
	11%	11%	3%	3%	6%	7%	13%	19%

2.3 Adaptive Lane Development and Analysis

a) Background Research

Freight movement is a critical component of the Texas economy. Unfortunately, traffic congestion and delay on Texas highways significantly drives up cost. One much-studied but less-implemented potential solution to relieve congestion on freeways is to provide truck-accessible adaptive lanes. In addition to giving trucks more reliable travel times, these facilities may improve capacity on the general-purpose lanes, provided that the adaptive lanes are exclusively for trucks. Also, increase safety benefits for all travelers may result in separating trucks from passenger vehicles. However, many current adaptive facilities cannot convert to truck-only lanes due to design standard criteria and, therefore, need integration into long-range planning objectives.

As part of the Reimagine IH 10 Feasibility study, HDR looked at implementing adaptive lanes in the proposed alternatives. The presence of much industrial activity in El Paso led to the idea of analyzing the adaptive lanes for truck access. This section explores the newest research performed on other proposed truck lanes in the United States and provides a recommendation to TxDOT El Paso District regarding the implementation of an adaptive lane.

b) Benefits of Truck-Only Lanes

A 2010 report from the National Cooperative Freight Research Program (NCHRP) (Ref. 4) summarized the benefits of a truck-only lane as it applies not only to trucks but to passenger vehicles as well. Table 9 provides this summary.

Table 9: Potential Benefits of CMV-Only Lanes

Category	Benefit	Group Benefiting	Description
Operational Efficiency	Higher Travel Speeds Less Delay Improved Level of Service [1]	General Purpose (GP)[2] Lane Users CMV-Only Lane Users	Vehicle separation allows all vehicles to travel at their designated speeds without conflict. Slower commercial vehicles are not present in right (slow) travel lanes. Less weaving. Improved operational efficiency.
Safety	Enhanced Safety	General Purpose Lane Users CMV-Only Lane Users	Fewer, less severe crashes as a result of vehicle separation (and minimal car-truck interaction).
Economic	Enhanced Travel Options	CMV-Only Lane Users	Increased trip reliability and reduced transportation costs of fuel consumption due to severe congestion or delay caused by truck- car accidents.
	Improved Freight Productivity	CMV-Only Lane Users	The productivity of freight movement in and around major metropolitan areas and along long- haul intercity corridors is an essential factor in ensuring local, regional, and national economic competitiveness.
Environmental	Reduced Vehicle Emissions	General Purpose Lane Users CMV-Only Lane Users	Stop-and-go traffic conditions improve as congestion is decreased on general-purpose lanes, and air pollution emissions from slowed or stalled cars and trucks will be reduced.

Notes:

1. Level of Service (LOS) is a designation used to assess the state of performance of transportation systems. Usually, LOS categories are defined by the letters A, B, C, D, E, and F; wherein A stands for the best state of performance of the system while F stands for the worst. LOS categories are typically defined based on the performance objectives of a system, such as mobility (in which case, level of congestion measured in terms of volume-capacity (V/C) ratio, for example, is used to define LOS categories), or safety.

2. The mixed-flow lanes (lanes carrying both auto and truck traffic) of a highway are also referred to as general-purpose (GP) lanes.

The report includes an extensive literature review of studies from around the country and research from available data related to truck traffic on freeways. The report indicated that proposed locations of truck-only lanes have the following characteristics:

1. Congested corridors with high truck volumes and significant contribution of truck traffic to congestion (e.g., I-710 and SR 60 in Southern California)
2. Major through-truck routes that go through metropolitan areas and have high truck volumes and congestion (e.g., the Mid-City Freight way in Chicago and I-5 in Seattle)
3. Congested corridors providing access to major ports or intermodal facilities (e.g., I-710 in Southern California, Miami Tunnel, and Savannah, Georgia)

Table 10 summarizes the findings from various studies of urban corridors.

Table 10: Summary Comparison of Performance Evaluation Results, Urban Corridors

Travel Time Savings		Reliability		Safety		Source
Mixed-Flow Lanes (%)	Truck-Only Lanes (%)	Mixed-Flow Lanes (%)	Truck-Only Lanes (%)	Mixed-Flow Lanes (%)	Truck-Only Lanes (%)	
14	16	47	59	26	36	*I-710 Major Corridor Study*
29	23	85	82	6	27	*I-15 Comprehensive Corridor Study*
–	17	–	39	–	15	Georgia *Statewide Truck Lane Needs Identification Study*
	9	–	–	–	–	PSRC FAST corridor study

The conclusion of the report separates the findings into three categories:

1. Mobility/congestion relief:
   For truck-only lanes to be effective, trucks have to contribute significantly to peak-hour congestion and have high-utilization during peak-hours. Below certain ADT thresholds, truck-only lanes are not economically favorable. The thresholds from NCHRP Report 649 are summarized below:
   - Bidirectional daily total traffic volume on the corridor should be at least 15,000 per lane.
   - Bidirectional daily total truck volume on the corridor should be at least 20,000 trucks per day.
   - Bidirectional daily total truck volume should exceed 20,000 trucks for a minimum distance of 10 mi along the corridor, or the corridor should provide access to major freight generators at the termini.
   - The corridor on which truck-only lanes are to be implemented should have at least two general-purpose lanes in each direction. Also, truck-only lanes should have at least two lanes in each direction.
2. Safety/Reliability:
   Data from performance evaluation consistently indicates that truck-only lanes have higher safety benefits than mixed-flow lane alternatives. However, estimates of the safety benefits did not incorporate differences in capacities between truck-only and mixed-flow lanes nor safety improvements from truck-auto separation, which makes it challenging to understand the actual safety benefits of truck lanes.
3. Port and Intermodal Terminal Access:
   Studies show that new truck routes near industrial areas and intermodal terminals are an attractive alternative to trucks during congested hours and prevent them from using city streets according to O-D patterns. Connections to intermodal terminals tend to exhibit node-to-node travel patterns, which allows designers to limit access and reduce cost.

c) Analysis Scenarios

Three different adaptive lane scenarios were evaluated, which are:

- Truck-only adaptive lane
- Passenger-vehicle-only adaptive lane
- Mixed-flow adaptive lane

d) Proposed Route and T-intersection

Figure 7 shows a map of the major freight demand points along the corridor. Based on these demand points and the locations with substantial industrial activity, an adaptive lane may be appropriate from Artcraft Rd/Redd Rd in Segment 1 to the Loop 375 Interchange in Segment 3. This adaptive lane would have an access point at Robert E Lee (REL) Rd that gives trucks direct access to the airport and the industrial area on Hawkins Blvd. Potential passenger vehicle traffic assumes the same access points for analysis.

e) Streetlight Data

The bulk of the analysis is based on origin-destination data provided by Streetlight Data which can be viewed on Table 11.

Table 11: Sample of Streetlight Data

Device Type	Commercial
Vehicle Weight	Heavy
Origin Zone ID	1001
Destination Zone ID	1014
Ramp Name	10131014 - EB Redd Entrance
Day Type	Average Weekday (T-Th)
Day Part	Midday (10 am - 3 pm)
O-D Traffic (StL Index)	27,511
Origin Zone Traffic (StL Index)	37,774
Destination Zone Traffic (StL Index)	43,755

The three most important pieces of information for each data point are the O-D traffic index, the Origin Zone traffic index, and the Destination Zone traffic index. Per Streetlight's website, the indices measured represent relative activity, or normalized volume, which includes data collected from 2014 to 2017 and does not indicate actual volume. In other words, the Origin Zone Traffic index represents relative activity measured at the Origin Zone of a data point; the Destination Zone Traffic index represents relative activity measured at the Destination Zone of a data point, and the O-D Traffic index represents the relative traffic flow that passed from the Origin Zone to the Destination Zone of each data point. Therefore, an O-D traffic index represents relative activity at a specific O-D gate that is associated with that data point. The O-D traffic index represents all the traffic that traveled from the origin gate to the destination gate. The way to read the above data point is as follows:

On an average weekday, between 10 AM and 3 PM, the normalized volume of heavy commercial vehicles that travel through gate 1001 is 37,774; the normalized volume that travels through gate 1014, which is right after the Redd Rd entrance, is 43,755; and the normalized volume that travels from gate 1001 to gate 1014 is 27,511.

Based on proposed access points, the adaptive lane would run from gate 1014 to gate 1058 in the eastbound direction and from gate 2017 to gate 2061 in the westbound direction.

f) Analysis

The first step is to determine the peak hour for trucks; usually, this peak hour is offset from regular peak hours. HDR hired GRV IES to take traffic counts at a specific section of each segment, which was used to determine the present truck peak hours as well as the peak hour truck volumes along the corridor. The existing hourly volumes were projected to the Year 2042 volumes based on a two percent linear growth rate from 2017 to 2037 and a 1.5 percent linear growth rate from 2037 to 2042.

$$100 \times (1 + 0.02 \times 20 + 0.015 \times 5) = 147.5 = 148\ trucks\ in\ 2042.$$

Table 12 summarizes the peak hours and the projected truck volumes according to the recorded segment snapshots.

Table 12: Projected Peak Hour Truck Volumes by Segment

	Segment Snapshots	Peak Hour	Peak Hour Volume	Projected Peak Hour Volume (2042)
Eastbound	Seg 1 (Artcraft to Redd)	11:00 AM to 12:00 PM	368	543
	Seg 2 (Cotton to Piedras)	1:30 PM to 2:30 PM	533	787
	Seg 3 (Hawkins to Viscount)	1:45 PM to 2:45 PM	573	846
	Seg 4 (Horizon to Darrington)	12:45 PM to 1:45 PM	343	506
Westbound	Seg 1 (Artcraft to Redd)	11:45 AM to 12:45 PM	450	664
	Seg 2 (Cotton to Piedras)	1:00 PM to 2:00 PM	367	542
	Seg 3 (Hawkins to Viscount)	1:00 PM to 2:00 PM	544	803
	Seg 4 (Horizon to Darrington)	12:30 PM to 1:30 PM	295	436

Streetlight data is collected according to the following timeslots:

- All Day (12 am to 12 am)
- Peak AM (6 am to 10 am)
- Peak PM (3 pm to 7 pm)
- Early AM (12 am to 6 am)
- Midday (10 am to 3 pm)
- Late PM (7 pm to 12 am)

The peak hours for each segment all fall under the midday category, which is an expected outcome. With this parameter confirmed, the origin-destination data for heavy commercial vehicles was obtained from gate 1014 to each gate along the corridor until gate 1058 in the eastbound direction. After obtaining the data, the O-D indices were plotted against their respective entrances and exits to check for anomalies in the data set, as shown in Figure 7.

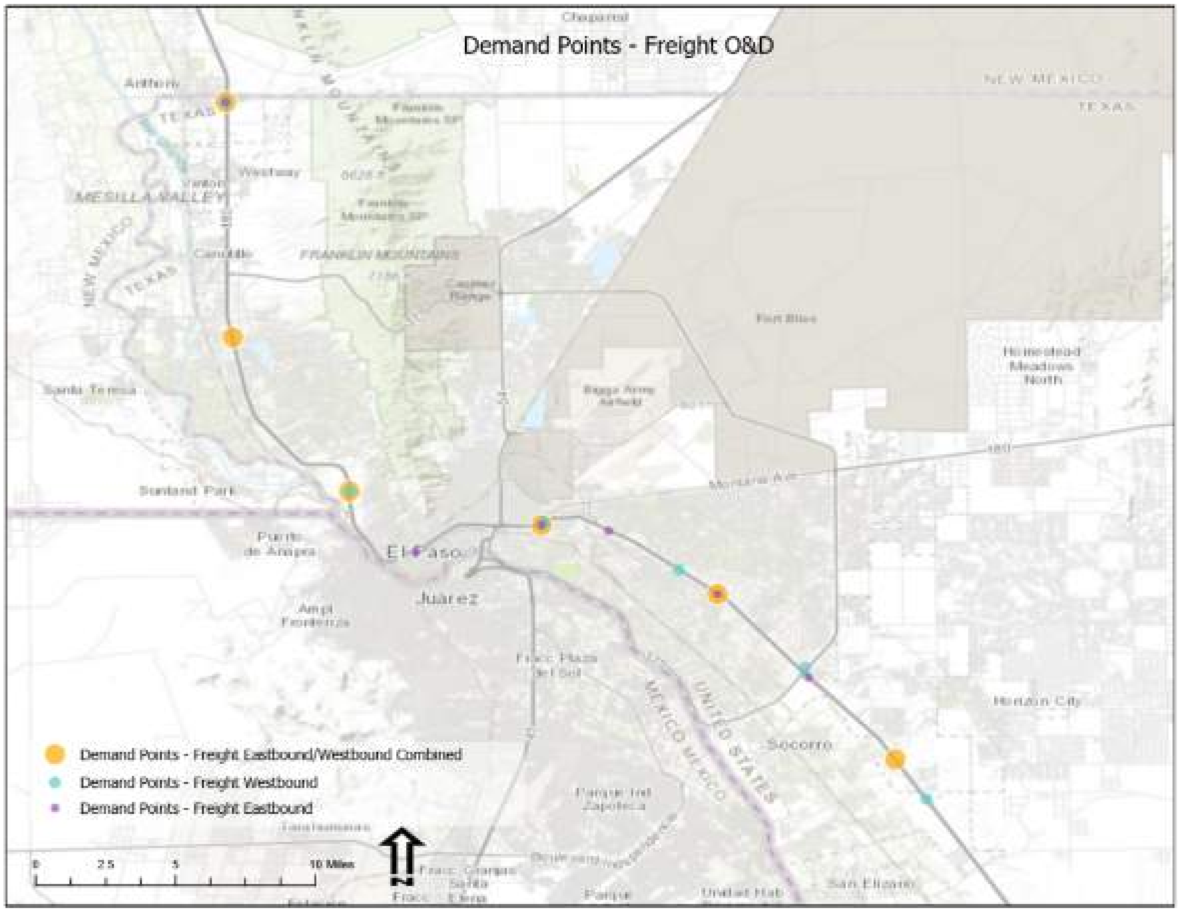


Figure 7: Origin Destination Gate Locations

The graph of the O-D indices shows a reasonable continuous decline as trucks exit along the way. Theoretically, the graph should show a significant decline at each major ingress/egress point without much spiking or increases in indices throughout the corridor. In other words, since O-D indices all take gate 1014 as their origin, there should be no additional trips generated from the entrances between the endpoints. However, the data collection system is identifying the new trucks that enter as the same trucks that exited, which produces the dips shown. This assumption will be the basis for the analysis below.

To find out how much truck traffic can be transferred onto the adaptive lanes and thereby reduce traffic on the general-purpose lanes, we need to analyze truck traffic from each access point to each of the other ones. Since there are three access points for the entire length covered by the adaptive lanes, three travel paths were analyzed: Artcraft Rd to REL Rd, REL Rd to Loop 375, and Artcraft Rd to Loop 375.

With the filters mentioned above already in place, an additional filter was added that displays the O-D data from one gate to the rest of the gates along the corridor. For the eastbound direction, since the current proposed adaptive lane entrance and exit is right before Thorn Avenue and right after Zaragoza Drive, respectively, entry and exit points were placed at gates 1014 and 1058.

Using this data, the O-D Index for the eastbound direction is 28,140. Even though this is a normalized number and not the actual volume, this number can be divided by the origin index at gate 1014 to get a percentage of trucks that may use the adaptive lane to travel from Artcraft Rd to Loop 375. Assuming that 100 percent of eligible trucks will use the adaptive lane, 64 percent of truck traffic from the Artcraft Rd area will take the adaptive lane. Following the same logic for the westbound direction, 67 percent of trucks that enter near the Loop 375 entrance will take the adaptive lane all the way north to the Artcraft Rd exit.

Since there is an access point at REL Rd, the relative ingress/egress volumes near that location, which are trucks coming from and going to the airport and other industrial areas near Hawkins Blvd, were determined. This determination was done by first taking the difference between the O-D indices at relevant exits. For the eastbound direction, these exits include Trowbridge Dr, Geronimo Dr, Hawkins Blvd, and Hunter Dr, and the resulting sum of the indices at these exits is 12,619. Dividing this number by the origin index, the percentage of trucks that access the entrance of Artcraft Rd and uses the exit at REL Rd is approximately 29 percent.

Following the same logic for the westbound direction determined that 17 percent of trucks enter near Loop 375 and exit near REL Rd.

Ingress volumes were found by resetting the O-D filter parameters to determine how many trucks begin at each gate and travel to the same ending destination. Using the same approach as above, the indices for those accessing adaptive lanes were found to be 13,224 and 5,996, which in turn is 17 percent and 14 percent for the eastbound and westbound directions, respectively.

Actual Volume Calculations

The obtained percentages can be multiplied by the projected peak hour traffic volumes near the origin to get actual truck volumes. Conveniently, the point of capture of the available traffic count in Segment 1 is between Artcraft Rd and Redd Rd, which is where the eastbound adaptive lane entrance is located. For the westbound direction, traffic volumes were not available near Loop 375; however, since the origin index at Loop 375 is similar to the origin index at Artcraft Rd, the relative activity at the two locations are assumed to be the same. Multiplying each percentage by the projected volume gives the projected truck volumes traveling to and from each access point, and a factor of three is used to convert truck volume to equivalent vehicle volume. Table 13 summarizes the results.

Table 13: Projected Volumes on Proposed Truck-Only Adaptive Lanes

	Route	Origin	Destination	O-D Index	Origin Index	Percentage	Projected Volume
EB	Artcraft to Loop 375	1014	1058	28140	43755	64%	350
EB	Artcraft to REL	1014	1041-1042, 1045-1048	12619	43755	29%	157
EB	REL to Loop 375	1042, 1043, 1046, 1048	1058	15057	43755	34%	187
WB	Loop 375 to Artcraft	2017	2061	28307	42559	67%	362
WB	Loop 375 to REL	2017	2027, 2029, 2032, 2034	7169	42559	17%	92
WB	REL to Artcraft	2029-2035	2061	7253	42559	17%	93

		Projected Volumes	Equivalent Vehicle Volume
EB	Artcraft to REL	507	1521
EB	REL to Loop 375	537	1611
WB	Loop 375 to REL	454	1362
WB	REL to Artcraft	455	1365

Finally, a similar process was followed for the two other scenarios. **Table 14** provides a comparison of all scenarios.

Table 14: Summary of Potential Adaptive Lane Volumes by Scenarios

Scenario	Direction of Travel	Travel Segment	Projected Equivalent Volume		
			Morning Peak	Midday Peak	Evening Peak
Passenger Vehicles Only	EB	Artcraft to REL	1074	993	1385
Passenger Vehicles Only	EB	REL to Loop 375	1422	1242	2011
Passenger Vehicles Only	WB	Loop 375 to REL	1726	1240	1634
Passenger Vehicles Only	WB	REL to Artcraft	1066	808	1304
Trucks With Passenger Vehicles	EB	Artcraft to REL	1830	2514	2429
Trucks With Passenger Vehicles	EB	REL to Loop 375	2178	2853	3103
Trucks With Passenger Vehicles	WB	Loop 375 to REL	2371	2602	2321
Trucks With Passenger Vehicles	WB	REL to Artcraft	1666	2173	1991
Truck Only	EB	Artcraft to REL	756	1521	1044
Truck Only	EB	REL to Loop 375	756	1611	1092
Truck Only	WB	Loop 375 to REL	645	1362	687
Truck Only	WB	REL to Artcraft	600	1365	687

g) Assumptions

- The index for the end-to-end travel volume was divided by the origin index at the beginning of each respective travel direction to obtain a percentage. The indices calculated from middle gates were divided by the endpoint origin indices so that the percentages would have a common denominator
- The analysis assumes that 100 percent of trucks are eligible to use the adaptive lanes. However, many factors, including drivers' preferences and government-issued parameters (for example, weight limits), may limit drivers from using the facility.
- Additionally, the projected volumes used to calculate peak hour volume includes buses as a commercial vehicle. School buses are highly unlikely to use the adaptive lanes, as the restricted access points would hinder them. For these two reasons, the actual utility of the truck-only lanes may be lower than expected.
- When calculating the difference between indices, engineering judgment was used to determine whether to include or exclude specific values in the actual calculations. For example, when calculating the O-D index for the westbound direction from Loop 375 to REL Rd in the morning, using the following data in Table 15 was used.

Table 15: Origin and Destination Index

Origin ID	Destination ID	Ramp Name	O-D Index
2017	2026	20252026 - WB McRae Entrance	14350
2017	2027	20262027 - WB Hawkins Exit	12648
2017	2028	20272028 - WB Viscount Entrance	12772
2017	2029	20282029 - WB Airway Exit	9934
2017	2030	20292030 - WB Hawkins Entrance	9933
2017	2031	20302031 - WB Airway Entrance	9935
2017	2032	20312032 - WB Geronimo Exit	8699
2017	2033	20322033 - WB Geronimo Entrance	8827
2017	2034	20332034 - WB Paisano Exit	7882

- It is sufficient to calculate the difference between the first and the last indices to capture the decrease in number at the exits. It makes sense that the O-D index should not be increasing at the entrances, and in general, this can be confirmed in the above numbers. What little change we do observe is discarded as noise in the data and not counted in calculations.
- Where the westbound origin index is similar to the eastbound origin index, the projected volume at the eastbound origin (between Artcraft Rd and Redd Rd) is also used to get the westbound projected volume. The assumption is that if the indices are similar, then the relative activity at the two points must be similar as well. Thus, any measurement at the eastbound origin can be used for the westbound origin, since there is no direct traffic count that measured the Loop 375 access point. If the indices are not close (more than 10 percent),

then a percentage based on the difference between the indices is also applied in addition to the calculated percentages to get the projected volume.

h) Summary and Conclusion

Assuming a single freeway lane carries 2,200 vehicles per hour per lane (vphpl), the truck-only lane appears underutilized, even at the highest peak hour. The projected percentage of trucks in Segments 2 and 3 is seven percent and nine percent, which are presented in Table 16. The truck percentages are less than half of the example presented in the NCHRP Report 649. According to the NCHRP Report 649, there are certain thresholds for designing truck-only lanes, below these threshold adaptive lanes may not be more beneficial than general or mixed-flow lanes. This could explain the apparent underutilization of the proposed truck-lanes. Furthermore, as mentioned earlier, the numbers obtained from the calculations represent eligible trips, but many factors such as driver preferences and government-imposed regulations may limit the actual number of trucks that use the adaptive lane.

Table 16: Projected Average Daily Traffic (ADT) and Average Daily Truck Traffic (ADTT)

Segments	EB		WB		Bidirectional		Percentages
	Projected ADT	Projected ADTT	Projected ADT	Projected ADTT	Projected ADT	Projected ADTT	
Seg 1	61049	8018	62390	9265	123439	17283	14%
Seg 2	151294	11011	127171	7592	278465	18603	7%
Seg 3	131823	11517	117827	11013	249650	22530	9%
Seg 4	24731	7324	23981	6415	48712	13739	28%

The growth rate is another critical factor in the projected volume of trucks. The analysis assumed uniform growth rates for both autos and trucks. However, estimates from the Federal Highway Administration’s Freight Analysis Framework dictate the annual growth rate of trucks to be 3.3 percent (Ref 5). This could have a significant impact on projected volumes.

Additionally, the truck peak hour is confirmed to be offset from general traffic peak hours, which means the truck-only lane may not bring congestion relief to other travelers. Since the standard peak hour is not corresponding with truck peak hours, having a truck-only lane may take away an additional capacity during peak hours and worsen congestion.

A possibility is to make the adaptive lane a mixed-flow lane; however, many drivers will not want to share a lane with heavy vehicles due to mobility and safety concerns (Ref. 5). Therefore, at least two mixed-flow lanes should be implemented in each direction. This recommendation matches the NCHRP Report 649 guidelines as well as the calculated data, which shows high potential combined volume during the midday peak hour. However, the feasibility of such a task may be limited by ROW constraints. Further research, including varying the projected volumes through differing growth rates as well as meeting with local truckers’ associations, would be beneficial in determining accurate travel patterns for El Paso in 2042 and thereby a feasible solution.

3. Traffic Analysis Methodology

The traffic analysis comprised of using a microsimulation model and a deterministic model (Synchro and HCS). These models calculate and extract the measures of effectiveness (MOE) for the entire corridor study.

3.1 Measures of Effectiveness

MOEs were used to compare the Existing, No Build against the Build alternatives and captured the impacts of the proposed improvements. Multiple model runs were generated to test whether or not the Build alternative improved over the No Build alternative.

Once the models ran, the following MOEs were evaluated:

- Segments travel time, speeds, and density
    - Mainlane Segments: A mainlane segment's definition as a portion of the mainlanes that connect between two ramp junctions.
    - Ramp Merge/Diverge Junctions: The mainlane volume and ramp volume are the controlling features in a ramp junction analysis. According to the *Highway Capacity Manual 6* (HCM) (Ref. 6), the influence area of a ramp extends 1,500 feet downstream/upstream of an entrance/exit ramp.
    - Weaving Segments: A weaving segment is defined by the HCM (Ref. 6) as an auxiliary lane that connects an entrance ramp and a downstream exit ramp. The weaving area occurs between the entrance and exit ramps as two or more traffic paths traveling in the same general direction cross each other without the aid of traffic control devices.
    - Network Travel Time– Network travel time identifies the total amount of time, including moving time, delay time, and stopped time, that it takes for all vehicles to travel through the study area network.
- Intersection delay/LOS - LOS is a qualitative measure of operating conditions at a location and is directly related to vehicle control delay at intersections. LOS has a letter designation ranging from A to F (free flow to heavily congested), with LOS D as the limit of acceptable operation. Utilizing procedures in HCM and the MOEs reported by Vissim, LOS will be determined for intersections within the study corridor.
- Average network travel time/speed - Average speed is measured in miles per hour and identifies the average speed of all vehicles in the network. Average speed is a useful measure of effectiveness to assess the impact of network changes on alternative models.
- Network latent demand/throughput - The number of vehicles unable to access the overall network during the simulation represents latent demand. Network input links will have their length extended in the model to capture existing latent demand. Under future conditions, this value will be used to compare the overall network performance of alternatives. Specific locations where this occurs will be noted and discussed in the operational analysis.

3.2 Microsimulation: VISSIM Model Development Methodology

One of the most important analytical tools of traffic engineering is a microscopic simulation. A transportation system simulation employing a simulation model allows the prediction of the effects of modified lane configurations, traffic control, and any changes made in the transportation system on the system's operational performance. Operational performance is measured in terms of measures of effectiveness (MOEs), which include:

- Average Vehicle Speed
- Delays
- Vehicle Miles Of Travel
- Vehicle Stops
- Vehicle Hours Of Travel
- Fuel Consumption

These MOEs provide useful insight in the selection of future alternative improvements to handle issues related to traffic such as congestion, delay, and queues.

The IH 10 study corridor was modeled using the microscopic simulation model VISSIM (version 7.00). VISSIM (a German acronym which translated means "traffic in towns – simulation") has two main components: a traffic simulator and a signal state generator. The traffic simulator is a microscopic traffic flow simulation model, which includes a car following and a lane change logic model. The signal state generator is the signal control software that uses detector information from the traffic simulator and updates the status of the traffic signals on a discrete-time step basis (as small as one-tenth of a second).

VISSIM is classified as a microscopic simulation model because it models vehicles and other components as individual units and updates them every second. After defining the street geometry, traffic control, and vehicular volumes, VISSIM outputs many MOEs, such as average delay, queue length, and speed, which can then be used as a basis for comparison of alternatives. VISSIM also has the capability of modeling various modes of transit, such as buses, trains, and rail. VISSIM has a user-friendly 3D animation tool that can be used to show the existing and future transportation network in 3D animation form. The significant features of the VISSIM model are identified as follows:

- Link types and connectors
- Load factor (number of passengers/vehicle)
- Priority rules (right of way designations)
- Pre-time/actuated signal control
- Fleet components (bus, truck, car)
- Automobile routing and turning movement
- Stop and yield signs;
- Data collection

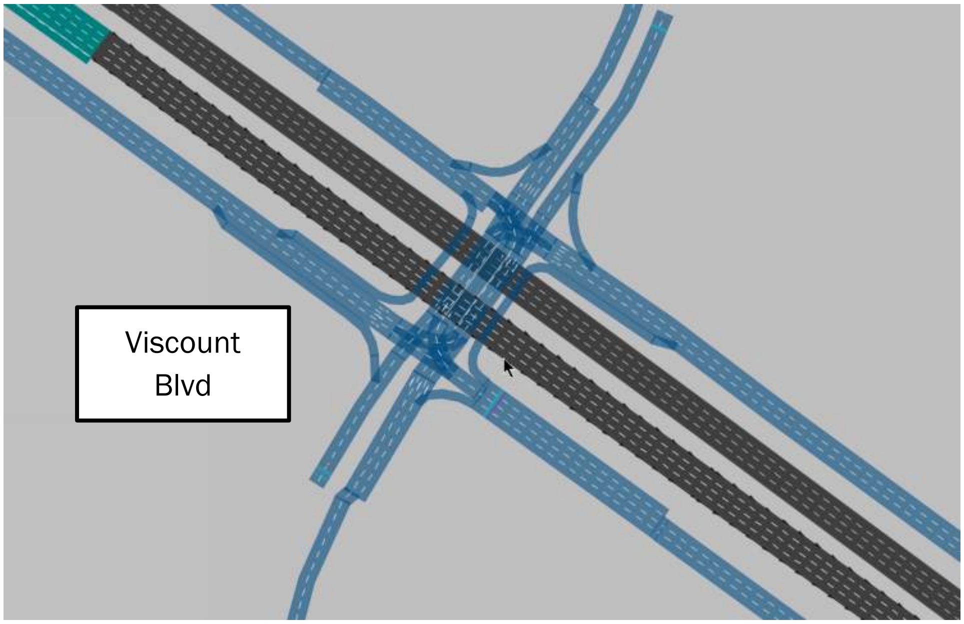
3.3 Base/Existing Model

Because of the complexity of Segment 2 and Segment 3HDR developed two VISSIM models. Segment 2 consists of nine interchanges and part of the central business district that straddles the IH 10 corridor. Segment 3 consists of 12 interchanges. Field observations and aerial photographs were used to obtain accurate geometrics. The major component inputs for the network VISSIM model included the following:

a) Roadway Geometry

The first step in defining a network is describing the network geometry. VISSIM uses the concept of links and connectors to establish the roadway network. Links are one-directional segments of streets or freeways, and connectors are usually the intersection of two or more links. In the case of a two-way street, each roadway block would consist of two one-directional links, as shown in Figure 8.

(A) Typical VISSIM *Intersection*



(B) Typical VISSIM Intersection Frame

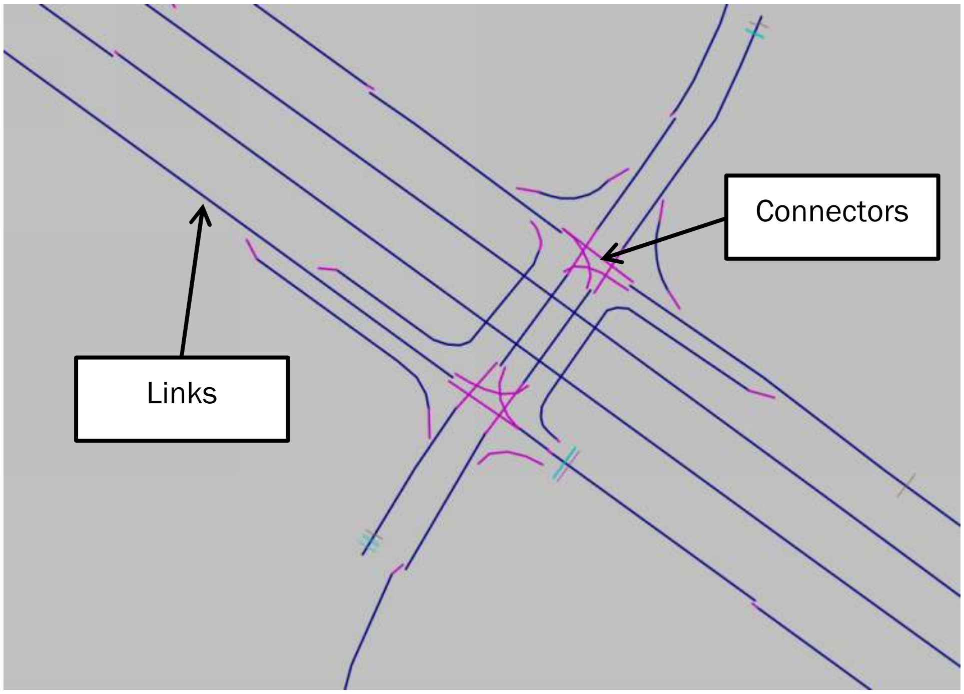


Figure 8: Intersection Link to Connector Diagram

b) Speed limits

The speed limits obtained from the field visit for the mainlanes were put in VISSIM as desired speed decisions. Additional reduced speed areas were configured for the turning traffic to attain lower turning speeds. The speed distributions were changed to match the S curve with the 85th percentile speed as the speed limit for the purpose of calibration. Figure 9 shows a default example speed distribution used in the VISSIM models. These speed distributions were adjusted to match the travel time runs and field conditions. In addition, the direct connectors were coded with reduced speed areas to depict the posted speed limit and driving behavior observed in the field.

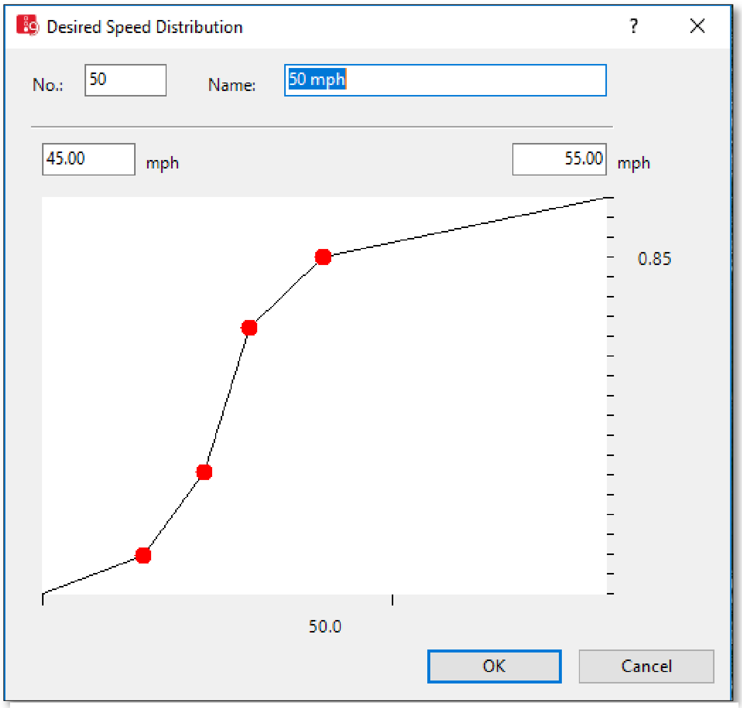


Figure 9: Speed Distribution S-Curve

c) Traffic volumes

Entry volumes were coded as input when building the model, and output volumes were used to calibrate the model to ensure the appropriate distribution of traffic through the simulated network. When coding the model, turning movement input describes how traffic is distributed to departure links. When a simulation is run, traffic volumes enter the network through entry links and are distributed through the network according to routing decisions assigned to each intersection approach.

d) Heavy vehicle percentage

The vehicle classifications were added to the vehicle input for each of the links. The vehicles were classified based on the heavy vehicle percentages to predefined classes in VISSIM: Cars and Heavy Goods Vehicles (HGVs) based on the traffic counts.

e) Signal timings

Existing conditions analysis involved coding basic interval timing (BIT), signal timing splits, and offsets in VISSIM. The traffic signal information obtained from the cities was coded in Synchro for accuracy and then imported into the VISSIM models to simulate the operation of existing signalized intersections.

f) Model Calibration

After the network was coded, all the existing data was incorporated to compile existing conditions for AM peak and PM models. These models were then calibrated based on the methodology contained in the Federal Highway Administration's (FHWA) *Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software*. Calibration is an essential step in the development of the base model. If the model is incorrectly calibrated, it may lead to misleading results. The following steps were followed in calibrating the base model:

1. The global parameters that affect driving behavior, such as headway time and look ahead and look back distances, were changed for different link types such as mainlanes, ramps, frontage roads, and cross streets.
2. The link specific factors, such as lane change distances, were refined to represent the field observations accurately.
3. Travel time runs, which were conducted in a field review, were compared to the VISSIM travel times to check if the model is accurately calibrated.
4. Visual confirmation of existing field conditions, especially observed vehicle queue lengths, was conducted using *VISSIM's* animation output.
5. GEH values were calculated as per the FHWA reference. GEH is a statistical formula used in model calibration to compare two sets of volumes. GEH statistic is a form of the Chi-squared statistic that incorporates both relative and absolute errors (Ref. 3). To accurately model existing traffic volumes, it was verified that more than 85 percent of the links have a GEH statistic of less than five.

g) Existing Conditions

Aerials and as-builts were used to help build the existing models for Segment 2 and Segment 3. These models were calibrated to replicate existing conditions and used to develop the base year 2017 and projected year 2042.

3.4 Deterministic Model

a) Highway Capacity Methodology Analysis

An operational analysis was performed using *Highway Capacity Software (HCS) 7*, which is based on the procedures outlined in the *Highway Capacity Manual (HCM) 6 (Ref 2).* The analysis included determining the level of service (LOS) for main lane sections, ramp junctions, and weaving areas. LOS is a measure of effectiveness used to evaluate traffic operations based on density where LOS A represents the least congested operational conditions, and LOS F is considered the most congested operational conditions. The HCS analysis was performed on all Segments mentioned in the introduction. The HCS MOEs are presented in Table 17, Table 18, and Table 19. Analysis for both the westbound and eastbound directions for all segments was conducted for the AM and PM Peak Hour. All the segments were measured and categorized into basic, weaving and overlap segments based on the methodology in HCM. Factors such as Heavy vehicles, Acceleration lengths, deceleration lengths, peak hour factors were inputted to each model.

Table 17: LOS Criteria for Basic Freeway Segments

LOS	Density (pc/mi/ln)
A	≤11
B	>11–18
C	>18–26
D	>26–35
E	>35–45
F	Demand exceeds Capacity
	>45

Source: HCM 6 12-15, Page 12-19

Table 18: LOS Criteria for Weaving Segments

Density (pc/mi/ln)		
LOS	Freeway Weaving Segments	Weaving Segments on Multilane Highways or C-D Roadways
A	0–10	0–12
B	>10–20	>12–24
C	>20–28	>24–32
D	>28–35	>32–36
E	>35	>36
F	Demand exceeds capacity	

Source: HCM 6 Exhibit 13-6, Page 13-10

Table 19: LOS Criteria for Freeway Merge and Diverge Segments

LOS	Density (pc/mi/ln)	Description
A	≤10	Unrestricted operations
B	>10–20	Merging and diverging maneuvers noticeable to drivers
C	>20–28	Influence area speeds begin to decline
D	>28–35	Influence area turbulence becomes intrusive
E	>35	Turbulence felt by virtually all drivers
F	Demand exceeds capacity	Ramp and freeway queues form

Source: HCM 6 Exhibit 14-3, Page 14-7

b) Synchro Analysis

Utilizing procedures in the HCM and the measures of effectiveness (MOE) reported by SYNCHRO 9 traffic simulation software, LOS was determined for all intersections within the project limits. Intersection LOS is a qualitative measure of operating conditions and is directly related to average vehicle delay. LOS is reported using the letter designations from A to F, as shown in Table 20.

Table 20: Intersection LOS Thresholds and Definitions

LOS	Control Delay (sec/veh)		
	Signalized Interchange	Unsignalized Interchange	Description
A	≤ 10.0	≤ 10.0	Very low vehicle delays, short cycle length/exceptionally favorable signal progression.
B	10.1 to 20.0	10.1 to 15.0	Low vehicle delays, short cycle length/highly favorable signal progression, more vehicular stops than LOS A.
C	20.1 to 35.0	15.1 to 25.0	Favorable signal progression/moderate cycle length, potential cycle failures, significant number of vehicular stops.
D	35.1 to 55.0	25.1 to 35.0	Ineffective signal progression/long cycle length, many vehicular stops, noticeable cycle failures.
E	55.1 to 80.0	35.1 to 50.0	Ineffective signal progression, long cycle length, frequent cycle failures.
F	> 80.0	> 50.0	Poor signal progression, long cycle length, cycle failures during most cycles.

Source: *HCM 6* Exhibit 19-18, Page 19-16 – Signalized Intersection & Exhibit 20-2, Page 20-6

4. Segment 1

4.1 Existing Condition Analysis

Existing condition analysis provided the base models to obtain an understanding of the current operations. Segment 1 analysis used HCS for mainlane analysis and Synchro for intersection operations to determine the current deficiencies along the corridor.

a) Segment 1 Existing Mainlane Level of Service Analysis

The existing condition analysis for eastbound Segment 1 showed the majority of segments operating at LOS D or better. The study showed that the worst peak period was the AM peak, with five freeway segments operating at LOS E or worse, which accounts for 13 percent of the segments, while 87 percent of the segments operate at LOS D or better. The majority of the failing segments were near the BHW project. Table 21 provides the details of the demand, density, and letter LOS.

Table 21: Segment 1 EB Existing Mainlane LOS Analysis

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
IH 10 North->Antonio Ex.	Basic	2	860	6.5	A	1,280	10.0	A
Antonio Ex.	Diverge	2	860	11.3	B	1,280	15.8	B
Antonio Ex.->Antonio Ent	Basic	2	710	5.4	A	1,060	8.3	A
Antonio Ent.-	Merge	2	1,200	15.0	B	1,470	17.8	B
Antonio Ent.->Valley Chili Ex.	Overlap	2	1,200	10.8	B	1,470	13.6	B
Valley Chili Ex.	Diverge	2	1,200	15.1	B	1,470	18.1	B
Valley Chili Ex.->Valley Chili Ent	Basic	2	1,170	8.9	A	1,450	11.3	B
Valley Chili Ent	Merge	2	1,250	15.0	B	1,590	18.4	B
Valley Chili Ent->Vinton Ex.	Basic	2	1,250	9.5	A	1,590	12.4	B
Vinton Ex.	Diverge	2	1,250	15.1	B	1,590	18.9	B
Vinton Ex. ->Vinton Ent.	Basic	2	1,130	8.6	A	1,410	11.0	A
Vinton Ent.-	Merge	2	1,550	16.6	B	1,790	19.1	B
Vinton Ent.->SH 16 Ex.	Basic	2	1,550	11.7	B	1,790	13.9	B
SH 16 Ex.	Diverge	2	1,550	18.5	B	1,790	21.3	C
SH 16 Ex. ->SH 16 Ent.	Basic	2	1,050	8.0	A	1,390	10.8	A
SH 16 Ent. ->Loop 375 Ent.	Merge	2	1,480	16.3	B	1,840	19.9	B
Loop 375 DC Ent. ->Loop 375 Ent.	Merge	2	1,870	18.2	B	2,420	23.5	C
Loop 375 DC Ent.->Artcraft Ex.	Basic	2	1,870	14.2	B	2,420	19.3	C
Artcraft Ex.->Artcraft Ex.	Diverge	2	1,870	21.2	C	2,420	27.2	C
Artcraft Ex. ->Artcraft Ent.	Basic	2	1,500	11.4	B	1,980	15.5	B
Artcraft Ent.->Redd Ex.	Weaving	3	2,700	25.1	C	3,040	28.5	D
Redd Ex. ->Redd Ent.	Basic	2	2,270	21.5	C	2,640	25.7	C

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Redd Ent	Merge	2	3,400	32.0	D	3,360	38.0	F
Redd Ent.->Mesa Ex.	Basic	2	3,400	33.3	D	3,360	34.1	D
Mesa Ex.	Diverge	2	3,400	36.1	F	3,360	36.8	F
Mesa Ex. ->Mesa Ent.	Basic	2	2,870	27.2	D	2,650	25.8	C
Mesa Ent	Merge	4	3,620	17.1	B	3,540	17.2	B
Mesa Ent. -> Resler Ent.	Basic	3	3,620	22.9	C	3,540	23.0	C
Resler Ent.	Merge	3	4,810	31.8	D	4,450	30.0	D
Resler Ent.->Sunland Park Ext	Overlap	3	4,810	33.2	D	4,450	32.2	D
Sunland Park Ext	Diverge	3	4,810	33.2	D	4,450	32.2	D
Sunland Park Ext->Sunland Park Ent	Basic	3	3,840	24.2	C	2,940	19.1	C
Sunland Park Ent	Merge	3	4,280	29.7	D	3,260	22.8	C
Sunland Park Ent	Merge	3	5,260	37.8	F	4,200	30.1	D
Sunland Park DC Ent->US 85 DC Ent	Basic	3	5,260	34.8	D	4,200	27.3	D
US 85 DC Ent	Merge	3	5,460	39.3	F	4,230	30.2	D
US 85 DC Ent->Executive Center Ex	Basic	3	5,460	36.9	E	4,230	27.4	D
Executive Center Ex	Diverge	3	5,460	37.2	F	4,230	30.2	D
Executive Center Ex	Basic	3	5,190	34.1	D	4,040	26.2	D

The existing condition analysis for westbound Segment 1 showed the majority of segments operating at LOS D or better. The study showed that the worst peak period was the PM peak, with six segments operating at LOS E or worse, which accounts for 18 percent of the segments, while 82 percent of the segments operate at LOS D or better. The majority of the failing segments were near the BHW interchange. Table 22 provides the details of the demand, density, and letter LOS.

Table 22: Segment 1 WB Existing Mainlane LOS Analysis

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Executive Center Ex->Executive Center Ent	Basic	3	3,490	24.7	C	4,510	28.8	D
Executive Center Ent	Merge	3	3,740	29.3	D	4,970	35.7	F
Executive Center Ent->Sunland Park Exit	Basic	3	3,740	26.5	D	4,970	32.4	D
Sunland Park Exit	Diverge	3	3,740	28.4	D	4,970	34.2	D
Sunland Park Exit->US 85 DC Ent	Basic	3	2,630	18.6	C	3,740	23.8	C
US 85 DC Ent	Merge	3	3,060	23.4	C	4,450	31.3	D
US 85 DC Ent->Sunland Park Ent	Basic	3	3,060	21.7	C	4,450	28.4	D

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Sunland Park Ent	Merge	3	3,730	29.2	D	5,700	42.8	F
Sunland Park Ent->Resler Dr DC Ext	Overlap	3	3,730	29.2	D	5,700	42.8	F
Resler Dr DC Ext	Diverge	3	3,730	30.0	D	5,700	40.1	F
Resler Dr DC Ext->Mesa St Ext	Basic	3	3,240	23.0	C	4,500	62.4	F
Mesa St Ext	Diverge	2	3,240	40.6	F	4,500	43.1	F
Mesa St Ext->Mesa St Ent	Basic	2	2,560	27.2	D	3,080	22.2	C
Mesa St Ent	Merge	2	2,980	36.3	F	3,850	33.3	D
Redd St Ext	Diverge	2	2,980	35.8	F	3,850	33.7	D
Redd St Ext->Redd St Ent	Basic	2	2,330	24.8	C	2,700	18.5	C
Redd St Ent->Paseo del Norte Ext	Weaving	3	2,750	21.3	C	3,190	17.1	B
Paseo del Norte Ext->Paseo del Norte Ent	Basic	2	1,810	15.4	B	2,070	10.0	A
Paseo del Norte Ent	Merge	2	2,180	24.5	C	2,400	17.8	B
Paseo del Norte Ent->Loop 375 DC Ext	Overlap	2	2,180	21.9	C	2,400	14.7	B
Loop 375 DC Ext	Diverge	2	2,180	26.8	C	2,400	18.6	B
Loop 375 DC Ext	Diverge	2	1,910	23.9	C	2,100	15.7	B
HWY 16 Ext->HWY 16 Ent	Basic	2	1,610	13.7	B	1,670	7.0	A
HWY 16 Ent	Merge	2	1,820	21.3	C	2,040	14.6	B
HWY 16 Ent->SH 16 Entrance	Basic	2	1,820	15.5	B	2,040	9.8	A
SH 16 Entrance	Diverge	2	1,820	22.9	C	2,040	16.0	B
Westway Exit->Westway Exit	Basic	2	1,450	12.3	B	1,610	6.5	A
Westway Exit	Merge	2	1,600	18.9	B	1,740	11.7	B
Westway Entrance->Antonio Exit	Basic	2	1,600	13.6	B	1,740	7.5	A
Antonio Exit	Diverge	2	1,600	20.5	C	1,740	12.1	B
Antonio Exit->Antonio Entrance	Basic	2	1,320	11.2	B	1,210	3.5	A
Antonio Entrance	Merge	2	1,560	15.3	B	1,460	6.1	A
Antonio Entrance->IH 10 North	Basic	2	1,560	13.3	B	1,460	5.4	A

b) Segment 1 Existing Intersection Level of Service Analysis

The existing condition analysis for the intersections along Segment 1 shows the majority of them operate at LOS D or better. The study determined that both AM, and PM peak hours had the same number of poor operating intersections. These intersections are shown in Table 23 and are highlighted in red.

Table 23: Segment 1 - Existing Intersection LOS

Segment 1 Intersections	Control Type	Existing 2017 AM		Existing 2017 PM	
		Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
IH 10 EB Frontage Road & Antonio	Signal Control	B	18.7	B	17.1
IH 10 WB Frontage Road & Antonio	Signal Control	B	19.7	C	26.6
IH 10 EB Frontage Road & Vinton/Westway	Signal Control	A	9.4	B	12.0
IH 10 WB Frontage Road & Vinton/Westway	Signal Control	B	13.7	B	13.2
IH 10 EB Frontage Road & Loop 375	Signal Control	C	21.7	B	16.0
IH 10 WB Frontage Road & Loop 376	Signal Control	B	16.7	C	23.1
IH 10 EB Frontage Road & Artcraft/Paseo del Norte	Signal Control	F	235.7	D	50.7
IH 10 WB Frontage Road & Artcraft/Paseo del Norte	Signal Control	C	21.9	E	55.7
IH 10 EB Frontage Road & Redd	Signal Control	C	30.5	D	42.4
IH 10 WB Frontage Road & Redd	Signal Control	D	35.5	D	44.8
IH 10 EB Frontage Road & Thorn	Signal Control	B	15.0	C	28.6
IH 10 WB Frontage Road & Thorn	Signal Control	C	24.0	B	15.9
IH 10 EB Frontage Road & N Mesa*	Signal Control	B	11.5	B	11.2
IH 10 WB Frontage Road & N Mesa*	Signal Control	B	13.4	C	20.7
IH 10 EB Frontage Road & Sunland Park*	Signal Control	E	64.0	F	122.6
IH 10 WB Frontage Road & Sunland Park*	Signal Control	D	44.8	F	87.5

4.2 No Build Operational Analysis

No build analysis is essential for the evaluation of the condition for the future year, which forms the basis for comparison and selection of the preferred alternatives. The 2042 No Build models were used as a comparison tool to MOE of the build alternatives. The No Build models assumed committed projects in the study, which are the Border Highway West and Mesa Park Projects.

a) Segment 1 No Build Mainlane Level of Service Analysis

The Year 2042 No Build condition analysis for eastbound Segment 1 determined that there will be fewer segments operating at LOS D or better. The study showed that the worst peak period was the PM peak, with ten segments operating at LOS E or worse, which accounts for 33 percent of the segments, while 67 percent of the segments operate at LOS D or better. The majority of the failing segments were near the BHW interchange; however, **Table 24** shows that the failing segments are spreading out away from BHW towards Mesa and Executive Center Boulevard. With no improvement to capacity, likely, congestion and delay will severely increase over the next 20 years. The No Build analysis incorporated committed projects along Segment 1.

Table 24: Segment 1 EB 2042 No Build Mainlane LOS Analysis

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
IH 10 West->Antonio Ext.	Basic	2	1,270	9.7	A	1,900	15.0	B
Antonio Ext.	Diverge	2	1,270	15.4	B	1,900	22.2	C
Antonio Ext. ->Antonio Ent.	Basic	2	1,050	8.0	A	1,570	12.4	B
Antonio Ent.	Merge	2	1,780	20.2	C	2,180	24.3	C
Antonio Ent.->Valley Chili Ext.	Overlap	2	1,780	16.3	B	2,180	20.5	C
Valley Chili Ext.	Diverge	2	1,780	20.9	C	2,180	25.5	C
Valley Chili Ext.->Valley Chili Ent	Basic	2	1,730	13.3	B	2,140	17.0	B
Valley Chili Ent	Merge	2	1,850	20.5	C	2,350	25.5	C
Valley Chili Ent->Vinton Ext.	Basic	2	1,850	14.2	B	2,350	18.9	C
Vinton Ext.	Diverge	2	1,850	21.2	C	2,350	26.8	C
Vinton Ext. ->Vinton Ent.	Basic	2	1,670	12.8	B	2,080	16.5	B
Vinton Ent.	Merge	2	2,290	23.2	C	2,640	27.0	C
Vinton Ent.->SH 16 Ext.	Basic	2	2,290	17.8	B	2,640	21.8	C
SH 16 Ext.	Diverge	2	2,290	26.0	C	2,640	30.1	D
SH 16 Ext. ->SH 16 Ent.	Basic	2	1,550	11.9	B	2,050	16.2	B
SH 16 Ent.	Merge	2	2,190	22.6	C	2,720	28.0	D
Loop 375 DC Ent.	Merge	2	2,770	26.3	C	3,580	36.7	F
Loop 375 DC Ent.->Artcraft Ext.	Basic	2	2,770	22.4	C	3,580	34.5	D
Artcraft Ext.->Artcraft Ext.	Diverge	2	2,770	30.3	D	3,580	39.2	F
Artcraft Ext. ->Artcraft Ent.	Basic	2	2,220	17.2	B	2,930	24.5	C
Artcraft Ent.->Redd Ext.	Weaving	3	4,000	45.0	F	4,500	60.0	F

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Redd Ext. ->Redd Ent.	Basic	2	3,360	26.8	D	3,910	79.4	F
Redd Ent.	Merge	2	5,030	47.6	F	4,980	42.8	F
Redd Ent.->Mesa Ext.	Basic	2	5,030	44.8	E	4,980	39.2	E
Mesa Ext.	Diverge	2	5,030	43.1	F	4,980	40.7	F
Mesa Ext. ->Mesa Ent.	Basic	2	4,250	31.4	D	3,930	59.5	F
Mesa Ent.->Sunland Park Ext.	Weaving	4	5,360	45.0	F	5,250	45.0	F
Sunland Park Ext. ->Sunland Park Ent.	Basic	3	3,920	18.4	C	3,010	3.6	A
Sunland Park Ent.->Mesa Park Ext.	Weaving	5	8,080	45.0	F	6,260	45.0	F
Mesa Park Ext.->Executive Center Ent	Basic	4	7,680	15.8	B	5,980	16.3	B

HCS analysis was done in HCS7 Facilities Module

No Build Analysis considers geometrical improvements from other committed projects shown in the table

The Year 2042 No Build condition analysis for eastbound Segment 1 determined that there will be fewer segments operating at LOS D or better. The study showed that the worst peak period was the PM peak, with nine segments operating at LOS E or worse. This accounts for 32 percent of the segments, while 68 percent of the segments operate at LOS D or better. The majority of the failing segments were near the BHW interchange; however, Table 25 shows that the failing segments are spreading out away from BHW towards Mesa and Executive Center Boulevard. With no improvement to capacity, likely, congestion and delay will severely increase over the next 20 years. The No Build analysis incorporated committed projects along Segment 1.

Table 25: Segment 1 WB 2042 No Build Mainlane LOS Analysis

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Executive Center Ext. ->Mesa Park Ent.	Basic	4	5,180	25.5	C	6,690	34.4	D
Mesa Park Ent	Merge	4	5,540	30.1	D	7,360	41.8	F
Mesa Park Ent.->Sunland Park Ext.	Basic	4	5,540	27.3	D	7,360	40.2	E
Sunland Park Ext	Diverge	5	5,540	19.8	B	7,360	45.0	F
Sunland Park Ext.->Sunland Park Ent	Basic	3	3,170	19.6	C	3,760	63.3	F
Sunland Park Ent->Mesa Ext.	Weaving	4	4,800	45.0	F	6,660	45.0	F
Mesa Ext.->Mesa Ent	Basic	2	3,790	78.1	F	4,560	4.1	A
Mesa Ent	Merge	2	4,410	42.5	F	5,700	16.7	B
Mesa Ent->Redd Ext.	Overlap	2	4,410	42.5	E	5,700	19.6	C
Redd Ext	Diverge	2	4,410	40.6	F	5,700	20.5	C
Redd Ext.->Redd Ent	Basic	2	3,450	26.3	D	3,990	0.0	A

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Redd Ent->Paseo del Norte Ext.	Weaving	3	4,070	25.5	C	4,720	45.0	F
Paseo del Norte Ext.->Paseo del Norte Ent	Basic	2	2,680	15.0	B	3,060	26.6	D
Paseo del Norte Ent	Merge	2	3,230	25.3	C	3,550	36.6	F
Paseo del Norte Ent->Loop 375 DC Ext.	Overlap	2	3,230	22.8	C	3,550	36.6	E
Loop 375 DC Ext	Diverge	2	3,230	27.8	C	3,550	39.0	F
Loop 375 DC Ext.	Diverge	2	2,830	23.7	C	3,110	34.0	D
SH 16 Ext. ->SH 16 Ent.	Basic	2	2,390	12.7	B	2,470	20.1	C
SH 16 Ent	Merge	2	2,700	20.8	C	3,020	30.9	D
SH 16 Ent.->Westway Ext.	Basic	2	2,700	15.1	B	3,020	26.1	D
Westway Ext	Diverge	2	2,700	22.4	C	3,020	33.6	D
Westway Ext. ->Westway Ent.	Basic	2	2,150	10.8	A	2,390	19.3	C
Westway Ent	Merge	2	2,370	17.5	B	2,580	26.7	C
Westway Ent.->Antonio Ext.	Basic	2	2,370	12.5	B	2,580	21.2	C
Antonio Ext	Diverge	2	2,370	19.0	B	2,580	29.1	D
Antonio Ext. ->Antonio Ent.	Basic	2	1,960	9.3	A	1,800	14.2	B
Antonio Ent	Merge	2	2,310	13.8	B	2,160	19.6	B
Antonio Ent.->IH 10 West	Basic	2	2,310	12.0	B	2,160	17.2	B

HCS analysis was done in HCS7 Facilities Module

No Build Analysis considers geometrical improvements from other committed projects shown in the table

b) Segment 1 No Build Intersection Level of Service Analysis

The Year 2042 No Build condition analysis for the intersections along Segment 1 determined a significant reduction in operating conditions. The study showed that the PM peak hour has seven intersections with reduced LOS. These intersections are shown in Table 26 and are highlighted in red. The No Build analysis considers geometrical improvements from other committed projects.

Table 26: Segment 1 2042 No Build Intersection LOS

Segment 1 Intersections	Control Type	AM Peak		PM Peak	
		Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
IH 10 EB Frontage Road & Antonio	Signal Control	C	31.5	D	49.2
IH 10 WB Frontage Road & Antonio	Signal Control	C	28.6	E	66.8

Segment 1 Intersections	Control Type	AM Peak		PM Peak	
		Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
IH 10 EB Frontage Road & Vinton/Westway	Signal Control	C	20.7	B	13.1
IH 10 WB Frontage Road & Vinton/Westway	Signal Control	B	14.4	B	15.5
IH 10 EB Frontage Road & Loop 375	Signal Control	C	27.7	C	23.1
IH 10 WB Frontage Road & Loop 376	Signal Control	B	17.5	C	27.5
IH 10 EB Frontage Road & Artcraft/Paseo del Norte	Signal Control	F	441.2	F	123.4
IH 10 WB Frontage Road & Artcraft/Paseo del Norte	Signal Control	D	50.4	F	118.2
IH 10 EB Frontage Road & Redd	Signal Control	E	74.7	F	126.3
IH 10 WB Frontage Road & Redd	Signal Control	F	114.5	F	129.4
IH 10 EB Frontage Road & Thorn	Signal Control	B	17.0	C	30.4
IH 10 WB Frontage Road & Thorn	Signal Control	D	51.8	B	19.8
IH 10 EB Frontage Road & N Mesa*	Signal Control	A	9.0	B	15.3
IH 10 WB Frontage Road & N Mesa*	Signal Control	B	16.4	C	27.7
IH 10 EB Frontage Road & Sunland Park*	Signal Control	C	23.0	E	69.1
IH 10 WB Frontage Road & Sunland Park*	Signal Control	C	29.0	F	100.8

* No Build analysis considers geometrical improvements from other committed projects.

4.3 Recommended Alternative Analysis

The build alternatives for Segment 1 included Alternative 2 (Texas-New Mexico State Border to Redd Road) and Alternative 3 (Redd Road to Executive Center Boulevard) (Ref 6). Both alternatives include changes in ramping, auxiliary lanes, and additional capacity in some areas. Full lane widths (12’) are provided along with continuous frontage roads and desirable border width (20’) for sidewalks and utilities. Alternative 2 provides 15’ wide inside shoulders, which improve safety, allow for more effective incident management, and may be used as a peak period or special purpose lanes in the future. Alternative 3 provides full shoulder widths (10’). The inside most lane in each direction of travel is separated from general-purpose lanes by a two-foot buffer and serves as an adaptive lane. These adaptive lanes could be designated for special uses to benefit trucks or transit and remove these larger vehicles from mainlane traffic. Refer to Section 4 of the Feasibility Report for a detailed description of the Recommended Alternative.

a) Segment 1 Build Mainlane Level of Service Analysis

The Year 2042 Build condition analysis for eastbound Segment 1 determined that the majority of segments improved from an unacceptable LOS E or worse to LOS D or better. The study showed that the worst peak period was the PM peak, with only three segments operating at LOS E or worse. This accounts for 11 percent of the segments, while 89 percent of the segments operate at LOS D or better. The proposed alternative provided the capacity needed to improve traffic flow for the major of the segment and improve the conditions near the BHW area. Table 27 provides details regarding demand, density, and letter LOS.

Table 27: Segment 1 EB 2042 Build Mainlane LOS

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
IH 10 EB to Antonio OFR	Basic	3	1,270	6.9	A	1,900	10.7	A
Antonio OFR	Diverge	3	1,270	12.5	B	1,900	17.2	B
Valley Chili OFR	Diverge	3	1,050	10.1	B	1,570	13.9	B
Valley Chili OFR to Lane Add	Basic	3	1,000	5.5	A	1,530	8.6	A
Lane Add to Antonio ONR	Basic	4	1,000	4.1	A	1,530	6.4	A
Antonio ONR to Vinton OFR	Weaving	5	1,730	59.7	A	2,140	59.4	A
Vinton OFR to Valley Chili ONR	Basic	4	1,550	6.4	A	1,870	7.9	A
Valley Chili ONR to Future Corridor OFR	Weaving	5	1,670	63.0	A	2,080	62.4	A
Future Corridor OFR to Vinton ONR	Basic	4	1,300	5.3	A	1,780	7.5	A
Vinton ONR to Loop 375 OFR	Weaving	5	1,610	57.9	A	2,060	57.3	A
Loop 375 OFR to Future Corridor ONR	Basic	4	690	2.8	A	1,110	4.7	A

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Future Corridor ONR	Merge	4	1,000	5.9	A	1,390	7.4	A
Future Corridor ONR to Loop 375 DC ONR	Basic	4	1,000	4.1	A	1,390	5.9	A
Loop 375 DC ONR	Merge	4	1,580	9.3	A	2,250	13.4	B
Loop 375 DC ONR to SH 16 ONR	Basic	4	1,580	6.5	A	2,250	9.5	A
SH 16 ONR to Redd OFR	Weaving	5	2,220	57.5	A	2,920	56.5	B
Redd OFR to Artcraft ONR	Basic	4	1,580	6.5	A	2,330	9.8	A
Artcraft ONR to Thorn OFR	Weaving	5	3,360	11.4	F	3,900	12.2	F
Thorn OFR to Lane Drop	Basic	4	2,580	8.0	A	2,850	8.3	A
Lane Drop to Thorn ONR	Basic	3	2,580	10.7	A	2,850	11	B
Thorn ONR	Merge	3	4,250	24.6	C	3,920	20	B
Thorn ONR to N Mesa ONR	Basic	3	4,250	20.0	C	3,920	17	B
N Mesa ONR to Sunland Park OFR	Weaving	5	5,360	51.4	C	5,240	15.3	F
Sunland Park OFR to US 85 OFR	Basic	4	4,770	17.0	B	3,840	10.6	A
US 85 OFR	Diverge	4	4,770	18.3	C	3,840	11.6	B
US 85 OFR to Sunland Park CD ONR	Basic	3	3,920	17.4	B	3,000	9.4	A
Sunland Park CD ONR	Weaving	5	8,080	10.7	F	6,250	10.9	F
Mesa Park OFR to Executive Center ONR	Basic	4	7,680	13.0	B	5,970	14	B

The Year 2042 Build condition analysis for westbound Segment 1 determined that the majority of segments improved from an unacceptable LOS E or worse to LOS D or better. The study showed that the worst peak period was the PM peak, with only six segments operating at LOS E or worse. This accounts for 18 percent of the segments, while 82 percent of the segments operate at LOS D or better. The proposed alternative provided the capacity needed to improve traffic flow for the major of the segment and improve the conditions near the BHW area. Table 28 provides details regarding demand, density, and letter LOS.

Table 28: Segment 1 WB 2042 Build Mainlane LOS

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Executive Center OFR to Mesa Park ONR	Basic	4	5,180	22.2	C	6,690	31.3	D
Mesa Park ONR	Merge	4	5,540	26.8	C	7,360	36.5	E
Mesa Park ONR to Sunland Park OFR	Basic	4	5,540	24.1	C	7,360	36.8	E

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Sunland Park OFR	Diverge	5	5,540	45.0	E	7,360	45	E
Sunland Park OFR to US 85 ONR	Basic	3	3,170	17.8	B	3,760	21	C
US 85 ONR	Merge	4	3,750	17.0	B	4,710	47.5	F
US 85 ONR to Sunland Park ONR	Basic	4	3,750	15.8	B	4,710	104.8	F
Sunland Park ONR to N Mesa OFR	Weaving	5	4,800	24.5	F	6,660	10.7	F
N Mesa OFR to Thorn OFR	Basic	4	3,790	15.7	B	4,560	4.3	A
Thorn OFR	Diverge	4	3,790	16.9	B	4,560	8.9	A
Thorn OFR to Lane Add	Basic	3	2,830	15.5	B	2,850	0	A
Lane Add to Thorn ONR	Basic	4	2,830	11.7	B	2,850	0	A
Thorn ONR	Merge	5	3,450	9.9	A	3,990	4.3	A
Artcraft OFR	Diverge	5	3,450	12.7	B	3,990	6.9	A
Artcraft OFR to Redd ONR	Basic	4	2,060	8.4	A	2,330	0	A
Redd ONR	Merge	5	2,680	7.7	A	3,060	2.7	A
Redd ONR to Loop 375 OFR	Basic	5	2,680	8.8	A	3,060	2.5	A
Loop 375 OFR	Diverge	5	2,680	9.2	A	3,060	2.8	A
Loop 375 OFR to Loop 375 OFR DC	Basic	4	2,240	9.2	A	2,420	0.4	A
Loop 375 OFR DC	Diverge	4	2,240	14.4	B	2,420	6.9	A
Loop 375 OFR DC to Future Corridor OFR	Basic	4	1,840	7.5	A	1,980	0	A
Future Corridor OFR	Diverge	4	1,840	11.9	B	1,980	5.7	A
Future Corridor OFR to Loop 375 ONR	Basic	4	1,560	6.3	A	1,660	0	A
Loop 375 ONR to Vinton OFR	Weaving	5	2,110	60.3	A	2,150	60.6	A
Vinton OFR to Future Corridor ONR	Basic	4	1,830	7.4	A	1,830	0.7	A
Future Corridor ONR to Valley Chili OFR	Weaving	5	2,150	62.4	A	2,390	60.2	A
Valley Chili OFR to Vinton ONR	Basic	4	1,940	7.9	A	2,000	1.4	A
Vinton ONR to Antonio OFR	Weaving	5	2,050	64.3	A	2,100	61.6	A
Antonio OFR to Lane Drop	Basic	4	1,840	7.5	A	1,710	0.2	A
Lane Drop to Valley Chili ONR	Basic	3	1,840	10.0	A	1,710	0.3	A
Valley Chili ONR	Merge	3	1,950	11.6	B	1,810	2	A
Valley Chili ONR to Antonio ONR	Basic	3	1,950	10.6	A	1,810	0.8	A

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Antonio ONR	Merge	3	2,300	14.3	B	2,170	4.8	A
Antonio ONR to IH 10 WB	Basic	3	2,300	12.6	B	2,170	2.9	A

b) Segment 1 Build Intersection Level of Service Analysis

The Year 2042 Build condition analysis for the intersections along Segment 1 determined a significant improvement in LOS over the No Build analysis. The study showed that the PM peak hour has three intersections with poor LOS. These intersections are shown in Table 29 and are highlighted in red. The recommended improvements are also located in the table below.

Table 29: Segment 1 2042 Build Intersection LOS Analysis

Segment 1 Intersections	Improvements	Control Type	AM Peak		PM Peak	
			LOS	Delay (Sec/veh)	LOS	Delay (Sec/veh)
IH 10 EB Frontage Road & Antonio	Added Capacity, Added Turn Bay	Signal Control	B	17.5	C	26.8
IH 10 WB Frontage Road & Antonio	Added Capacity	Signal Control	B	16.2	C	27.5
IH 10 EB Frontage Road & Vinton/Westway		Signal Control	C	20.7	B	12.9
IH 10 WB Frontage Road & Vinton/Westway		Signal Control	B	14.2	B	14.9
IH 10 EB Frontage Road & Loop 375		Signal Control	C	27.7	C	23.0
IH 10 WB Frontage Road & Loop 376		Signal Control	B	16.7	C	26.8
IH 10 EB Frontage Road & Artcraft/Paseo del Norte	Converted to Single Point Urban (SPUI)	Signal Control	C	32.8	D	47.6
IH 10 WB Frontage Road & Artcraft/Paseo del Norte		Signal Control	D	50.4	F	118.2
IH 10 EB Frontage Road & Redd	Added Capacity	Signal Control	C	34.6	D	36.6
IH 10 WB Frontage Road & Redd	Added Capacity	Signal Control	D	45.9	D	45.9
IH 10 EB Frontage Road & Thorn		Signal Control	B	18.9	C	28.0
IH 10 WB Frontage Road & Thorn		Signal Control	C	27.8	B	15.5
IH 10 EB Frontage Road & N Mesa*		Signal Control	C	25.9	B	15.1

Segment 1 Intersections	Improvements	Control Type	AM Peak		PM Peak	
			LOS	Delay (Sec/veh)	LOS	Delay (Sec/veh)
IH 10 WB Frontage Road & N Mesa*		Signal Control	B	18.7	C	27.7
IH 10 EB Frontage Road & Sunland Park*	Added Capacity	Signal Control	D	43.3	E	75.9
IH 10 WB Frontage Road & Sunland Park*	Added Capacity	Signal Control	D	35.1	E	69.0

4.4 Findings

a) Segment 1 Build Mainlane Level of Service Analysis Summary

Based on the analysis, there is a significant improvement in LOS between the No Build alternative and the Build alternative. below provides a summary of the comparison between each alternative. The figure shows a reduction of the number of segments in the LOS E and F column between the No Build and Build alternatives for both AM and PM peak hours.

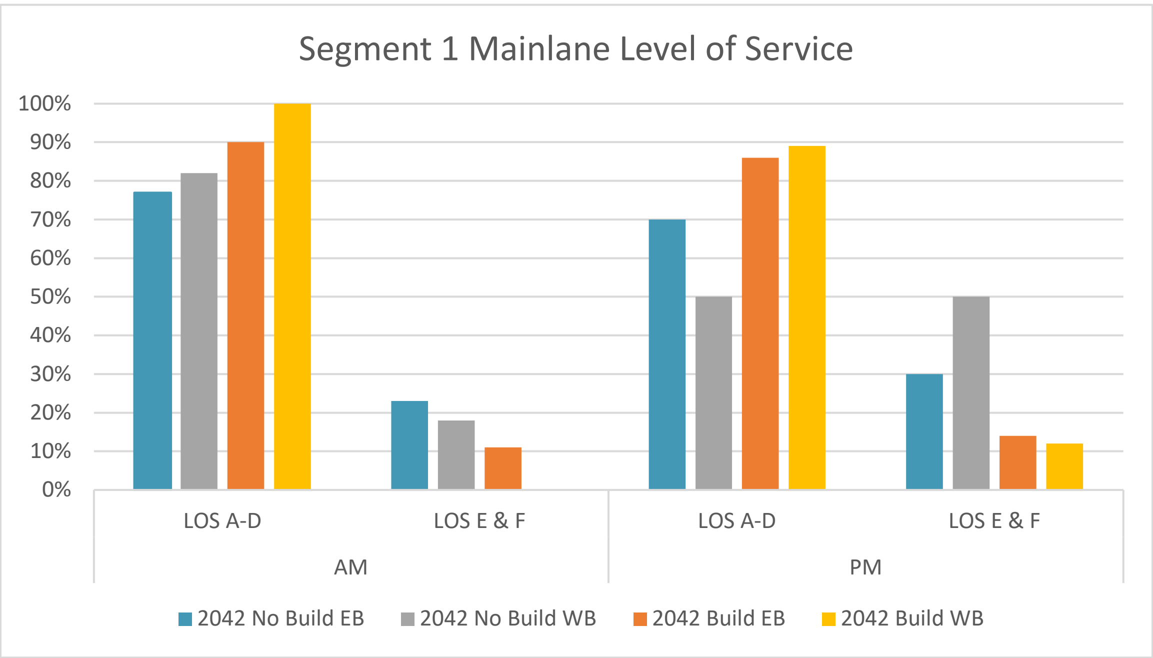


Figure 10: Segment 1 Mainlane Level of Service Summary

b) Segment 1 Intersection Level of Service Analysis Summary

Based on the analysis, there is a significant improvement between the No Build alternative and the Build alternative. below provides a summary of the comparison between each alternative. The figure shows a reduction of the number of segments in the LOS E&F column between the No Build and Build alternatives for both AM and PM peak hours.

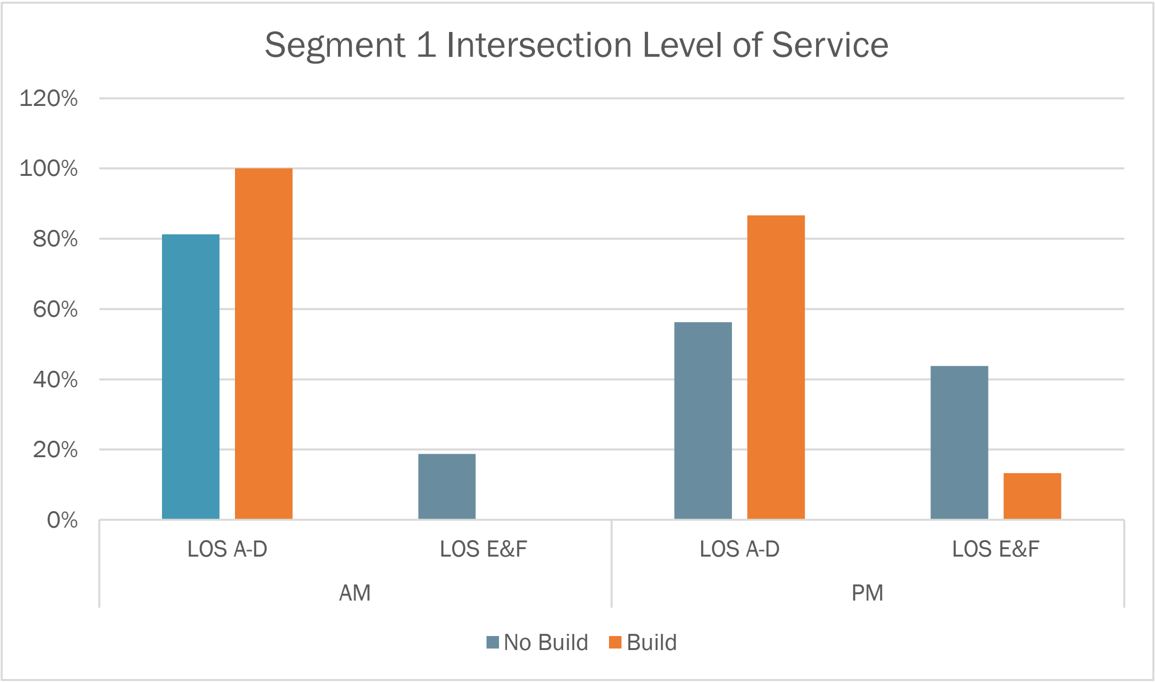


Figure 11: Segment 1 Intersection Level of Service Summary

5. Segment 2

5.1 Existing Condition Analysis

Existing condition analysis provided the baseline analysis to obtain an understanding of the current operations. Segment 2 analysis used VISSIM to determine the current deficiencies along the corridor.

a) Segment 2 Existing Mainlane Level of Service Analysis

The existing condition analysis for eastbound Segment 2 showed the majority of segments operating at LOS D or better. The study showed that the worst peak period was the PM peak, with five segments operating at LOS E or worse. This accounts for 15 percent of the segments, while 85 percent of the segments operate at LOS D or better. The majority of the failing segments were near Cotton St and US 54 because the weaving and ramp volume are over the maximum capacity for these types of freeway segments. Table 30 provides the details of the demand, density, and letter LOS.

Table 30: 2017 Segment 2 EB Existing Mainlane LOS Analysis– VISSIM Analysis

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Segment 1 -> Executive Ext.	Basic	3	5,299	39.5	E	4,220	24.6	C
Executive Ext.	Ramp	1	264	30.7	D	192	19.9	B
Executive Ext. -> Executive Ent.	Basic	3	5,009	37.4	E	4,018	23.4	C
Executive Ent.	Ramp	1	759	27.8	C	835	19.7	B
Executive Ent. -> Schuster Ext.	Merge	4	5,687	35.5	E	4,844	21.2	C
Schuster Ext.	Ramp	1	558	56.5	F	392	30.7	D
Schuster Ext. -> Schuster Ent.	Basic	4	5,056	22.6	C	4,442	19.4	C
Schuster Ent.	Ramp	1	197	6.1	A	475	14.7	B
Schuster Ent. -> Porfirio Diaz Ext.	Merge	5	5,256	20.3	C	4,920	20.0	B
Schuster Ent. -> Porfirio Diaz Ext.	Basic	4	5,253	23.5	C	4,913	22.0	C
Porfirio Diaz Ext.	Ramp	1	86	3.5	A	96	3.9	A
Porfirio Diaz Ext. -> Porfirio Diaz Ent.	Basic	4	5,143	22.8	C	4,793	20.9	C
Porfirio Diaz Ent.	Ramp	1	316	8.4	A	542	14.4	B
Porfirio Diaz Ent. -> Santa Fe Ext.	Merge	5	5,451	21.4	C	5,322	20.0	C
Porfirio Diaz Ent. -> Santa Fe Ext.	Basic	4	5,459	31.5	D	5,330	26.5	D
Santa Fe Ext.	Ramp	2	1,042	10.7	B	424	3.9	A

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Santa Fe Ext. -> Kansas Ent.	Basic	3	4,426	26.6	D	4,919	29.8	D
Kansas Ent.	Ramp	1	820	20.0	B	1,489	42.0	E
Kansas Ent. -> Campbell Ent.	Basic	4	5,232	23.4	C	6,390	31.4	D
Campbell Ent.	Ramp	2	300	3.7	A	1,282	15.9	B
Campbell Ent. -> Dallas Ext.	Merge	6	5,488	16.0	B	7,608	25.7	C
Campbell Ent. -> Dallas Ext.	Basic	5	5,555	19.4	C	7,665	32.2	D
Dallas Ext.	Ramp	1	309	11.6	B	192	6.9	A
Dallas Ext. -> Cotton Ent.	Basic	5	5,224	18.1	C	7,401	34.0	D
Cotton Ent.	Ramp	1	564	20.5	C	1,221	56.0	F
Cotton Ent. -> Piedras Ext.	Weaving	6	5,776	16.9	B	8,516	45.5	F
Piedras Ext.	Ramp	1	379	7.5	A	497	11.0	B
Piedras Ext. -> 478 Ext.	Basic	6	5,390	15.5	B	7,833	65.1	F
478 Ext.	Ramp	1	211	3.9	A	477	11.0	B
478 Ext. -> 54 Ext.	Weaving	5	5,182	21.3	C	7,186	77.9	F
54 Ext.	Ramp	2	1,234	13.1	B	1,896	21.4	C
54 Ext. -> 478 Ent.	Basic	3	3,939	23.4	C	5,254	32.9	D
478 Ent.	Ramp	1	478	11.5	B	606	14.9	B
478 Ent. -> Segment 3	Weaving	4	4,410	19.9	C	5,847	32.8	D

The existing condition analysis for westbound Segment 2 showed the majority of segments operating at LOS D or better. The study showed that the worst peak period was the AM peak, with four segments operating at LOS E or worse. This accounts for 11 percent of the segments, while 89 percent of the segments operate at LOS D or better. The majority of the failing segments were near Cotton St and US 54. **Table 31** provides the details of the demand, density, and letter LOS.

Table 31: 2017 Segment 2 WB Existing Mainlane LOS Analysis – VISSIM Analysis

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Segment 3 -> 54 Ent.	Basic	4	6,043	27.2	D	4,873	21.8	C
54 Ent.	Ramp	1	636	27.0	C	378	15.6	B
54 Ent. -> 478 Ext.	Weaving	5	7,016	26.8	D	5,623	20.4	C
478 Ext.	Ramp	1	364	6.8	A	496	9.2	A
478 Ext. -> 54 Ent.	Basic	4	6,594	29.9	D	5,072	22.2	C
54 Ent.	Ramp	2	2,120	32.3	D	1,255	18.5	B
54 Ent. -> Piedras Ext.	Weaving	6	8,726	34.4	D	6,340	19.2	C

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Piedras Ext.	Ramp	1	561	12.9	B	464	9.7	A
Piedras Ext. -> 478 Ent.	Basic	5	8,151	30.8	D	5,873	20.5	C
478 Ent.	Ramp	1	194	4.6	A	214	5.1	A
478 Ent. -> Cotton Ext.	Weaving	6	8,283	26.2	D	6,050	17.6	B
Cotton Ext.	Ramp	1	1,176	31.2	D	625	15.3	B
Cotton Ext. -> Piedras Ent.	Basic	5	7,150	25.4	C	5,459	18.8	C
Piedras Ent.	Ramp	1	367	8.9	A	358	8.5	A
Piedras Ent. -> Dallas Ent.	Merge	6	7,444	21.9	C	5,763	16.7	B
Piedras Ent. -> Dallas Ent.	Basic	5	7,486	27.5	D	5,800	20.1	C
Dallas Ent.	Ramp	1	219	5.3	A	336	8.1	A
Dallas Ent. -> Campbell Ext.	Merge	6	7,663	28.8	D	6,119	17.9	B
Dallas Ent. -> Campbell Ext.	Basic	5	7,648	45.1	F	6,122	22.7	C
Campbell Ext.	Ramp	2	1,618	17.4	B	955	8.8	A
Campbell Ext. -> Kansas Ext.	Basic	4	5,938	50.0	F	5,109	28.7	D
Kansas Ext.	Ramp	2	754	61.5	F	575	24.8	C
Kansas Ext. -> Santa Fe Ent.	Basic	3	5,200	31.9	D	4,577	27.4	D
Santa Fe Ent.	Ramp	1	503	13.2	B	1,034	27.7	C
Santa Fe Ent. -> Porfirio Diaz Ext.	Weaving	4	5,677	25.4	C	5,588	25.1	C
Porfirio Diaz Ext.	Ramp	1	351	8.7	A	166	3.7	A
Porfirio Diaz Ext. -> Schuster Ext.	Basic	4	5,337	23.6	C	5,435	23.9	C
Porfirio Diaz Ext. -> Schuster Ext.	Basic	5	5,217	20.7	C	5,356	19.7	C
Schuster Ext.	Ramp	2	1,209	11.4	B	415	3.7	A
Schuster Ext. -> Schuster Ent.	Basic	4	4,097	17.8	B	5,014	22.0	C
Schuster Ent.	Ramp	1	186	4.9	A	313	8.3	A
Schuster Ent. -> Executive Ext.	Merge	5	4,287	14.9	B	5,331	19.0	B
Schuster Ent. -> Executive Ext.	Basic	4	4,243	21.1	C	5,279	36.9	E
Executive Ext.	Ramp	1	783	43.7	F	993	80.6	F
Executive Ext. -> Executive Ent.	Basic	3	3,352	19.5	C	4,143	24.7	C
Executive Ent.	Ramp	1	190	5.1	A	387	10.4	B
Executive Ent. -> Segment 2	Basic	4	3,526	15.5	B	4,510	20.3	C
Executive Ent. -> Segment 2	Basic	3	3,534	20.7	C	4,521	27.1	D

b) Segment 2 Existing Intersection Level of Service Analysis

The existing condition analysis for the intersections along Segment 2 determined the majority of intersections operating at LOS D or better. The study showed that the worst peak period was the PM peak, with five intersections operating at LOS E or worse. These intersections are shown in Table 32 and are highlighted in red.

Table 32: Segment 2 Existing Intersection LOS for Year 2017

Intersection	Control Type	AM		PM	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
Santa Fe & Yandell Dr	Signalized	14.9	B	16.2	B
Santa Fe & Wyoming	Signalized	16.0	B	12.3	B
Santa Fe & Missouri	Signalized	10.4	B	8.9	A
Santa Fe & Franklin	Signalized	14.8	B	15.9	B
Yandell & El Paso St	Signalized	5.6	A	7.0	A
Wyoming & El Paso	Signalized	13.2	B	17.8	B
Oregon & Montana	Signalized	5.2	A	8.1	A
Oregon & Yandell	Signalized	7.4	A	18.0	B
Oregon & Wyoming	Signalized	7.3	A	10.2	B
Oregon & Missouri	Signalized	10.2	B	10.5	B
Oregon & Franklin	Signalized	13.0	B	17.8	B
Mesa & Rio Grande	Signalized	9.0	A	17.1	B
Mesa & Montana	Signalized	5.7	A	12.6	B
Mesa & Yandell	Signalized	5.4	A	17.7	B
Mesa & Wyoming	Signalized	17.2	B	30.9	C
Mesa & Missouri	Signalized	8.2	A	6.4	A
Mesa & Franklin	Signalized	8.3	A	9.9	A
Stanton & Rio Grande	Signalized	14.0	B	15.9	B
Stanton & Montana	Signalized	24.2	C	26.0	C
Stanton & Yandell	Signalized	6.2	A	8.7	A
Stanton & Wyoming	Signalized	5.5	A	18.5	B
Stanton & Missouri	Signalized	6.5	A	8.3	A
Stanton & Franklin	Signalized	16.2	B	12.6	B
Kansas & Rio Grande	Signalized	9.7	A	10.1	B
Kansas & Montana	Signalized	9.5	A	9.8	A
Kansas & Yandell	Signalized	65.7	E	39.7	D
Kansas & Wyoming	Signalized	12.9	B	15.2	B
Kansas & Missouri	Signalized	5.2	A	9.0	A
Kansas & Franklin	Signalized	14.9	B	11.9	B

Intersection	Control Type	AM		PM	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
Campbell & Rio Grande	Signalized	3.2	A	2.2	A
Campbell & Montana	Signalized	10.8	B	13.8	B
Campbell & Yandell	Signalized	12.4	B	16.3	B
Campbell & Missouri	Signalized	18.9	B	9.9	A
Campbell & Franklin	Signalized	12.5	B	13.9	B
ECB WBFR	Signalized	28.6	C	92.9	F
Raynolds WBFR	Signalized	16.2	B	36.2	D
Raynolds EBFR	Signalized	21.7	C	113.1	F
Copia WBFR	Signalized	17.7	B	18.6	B
Copia EBFR	Signalized	20.0	B	23.6	C
Raynor WBFR	Signalized	11.2	B	17.8	B
Raynor EBFR	Signalized	20.5	C	15.4	B
Piedras WBFR	Signalized	11.6	B	20.5	C
Piedras EBFR	Signalized	22.6	C	12.1	B
Cotton WBFR	Signalized	10.6	B	32.0	C
Cotton EBFR	Signalized	12.6	B	29.0	C
Dallas WBFR	Signalized	13.4	B	11.9	B
Porfirio Diaz WBFR	Unsignalized	9.5	A	80.7	F
Porfirio Diaz EBFR	Unsignalized	26.6	C	19.0	B
Schuster WBFR	Signalized	34.2	C	21.7	C
Schuster EBFR	Signalized	106.4	F	22.5	C
ECB EBFR	Signalized	26.3	C	18.9	B

5.2 No Build Operational Analysis

The 2042 No Build models were used as a comparison tool to measure the effectiveness of the build alternatives. The No Build models assumed committed projects in the analysis.

a) Segment 2 No Build Mainlane Level of Service Analysis

The Year 2042 No Build condition analysis for eastbound Segment 2 showed that the majority of segments operate at LOS E or worse. The study showed that the worst peak period was the PM peak, with 25 segments operating at LOS E or worse. This accounts for 76 percent of the segments, while only 24 percent of the segments operate at LOS D or better. With no improvement along the entire segment of capacity congestion and delay will increase over the next 20 years. **Table 33** provides the details of the demand, density, and letter LOS.

Table 33: Segment 2 EB 2042 No Build Mainlane – VISSIM Analysis

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Segment 1 -> Executive Ext.	Basic	4	7,455	51.1	F	4,683	79.6	F
Executive Ent.	Ramp	1	809	19.9	B	773	99.4	F
Executive Ent. -> Schuster Ext.	Merge	5	8,100	55.5	F	5,034	96.1	F
Executive Ent. -> Schuster Ext.	Basic	4	7,894	67.9	F	4,615	107.5	F
Schuster Ext.	Ramp	1	804	56.5	F	346	29.3	D
Schuster Ext. -> Schuster Ent.	Basic	4	6,911	74.7	F	3,789	120.5	F
Schuster Ent.	Ramp	1	311	10.1	B	510	124.3	F
Schuster Ent. -> Porfirio Diaz Ext.	Merge	5	7,194	72.8	F	4,188	125.8	F
Schuster Ent. -> Porfirio Diaz Ext.	Basic	4	7,153	79.2	F	4,114	120.7	F
Porfirio Diaz Ext.	Ramp	1	125	5.4	A	77	3.4	A
Porfirio Diaz Ext. -> Porfirio Diaz Ent.	Basic	4	6,944	64.3	F	3,903	113.2	F
Porfirio Diaz Ent.	Ramp	1	446	10.8	B	522	57.1	F
Porfirio Diaz Ent. -> Santa Fe Ext.	Merge	5	7,354	50.9	F	4,348	115.5	F
Porfirio Diaz Ent. -> Santa Fe Ext.	Basic	4	7,346	62.3	F	4,311	116.8	F
Santa Fe Ext.	Ramp	2	1,413	15.5	B	344	3.8	A
Santa Fe Ext. -> Kansas Ent.	Basic	3	5,919	37.5	E	3,819	119.3	F
Kansas Ent.	Ramp	1	1,107	33.9	D	926	126.2	F

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Kansas Ent. -> Campbell Ent.	Basic	4	6,991	33.7	D	4,598	124.2	F
Campbell Ent.	Ramp	2	412	5.4	A	1,306	59.9	F
Campbell Ent. -> Dallas Ext.	Merge	6	7,335	23.6	C	5,792	120.8	F
Campbell Ent. -> Dallas Ext.	Basic	5	7,377	31.6	D	5,746	127.7	F
Dallas Ext.	Ramp	1	410	16.4	B	132	5.4	A
Dallas Ext. -> Cotton Ent.	Basic	5	6,821	37.9	E	5,419	129.8	F
Cotton Ent.	Ramp	1	785	24.0	C	1,044	65.5	F
Cotton Ent. -> Piedras Ext.	Weaving	6	7,414	50.7	F	6,316	135.2	F
Piedras Ext.	Ramp	1	485	9.9	A	378	8.9	A
Piedras Ext. -> 478 Ext.	Basic	6	6,688	59.9	F	5,862	107.8	F
478 Ext.	Ramp	1	267	5.1	A	373	7.4	A
478 Ext. -> 54 Ext.	Weaving	5	6,241	67.1	F	5,456	105.1	F
54 Ext.	Ramp	2	1,512	15.9	B	1,453	15.5	B
54 Ext. -> 478 Ent.	Basic	3	4,605	88.4	F	3,991	119.6	F
478 Ent.	Ramp	1	660	15.1	B	761	18.4	B
478 Ent. -> Segment 3	Weaving	4	5,171	78.9	F	4,734	99.7	F

The Year 2042 No Build condition analysis for westbound Segment 2 showed the majority of segments operating at LOS E or worse. The study showed that the worst peak period was the PM peak, with 18 segments operating at LOS E or worse. This accounts for 53 percent of the segments, while only 47 percent of the segments operate at LOS D or better. With no improvement to capacity, likely, congestion and delay will severely increase over the next 20 years. Table 34 provides the details of the demand, density, and letter LOS.

Table 34: Segment 2 WB 2042 No Build Mainlane – VISSIM Analysis

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Segment 3 -> 54 Ent.	Basic	4	5,974	100.6	F	4,802	52.4	F
54 Ent.	Ramp	1	945	38.4	E	537	36.7	E
54 Ent. -> 478 Ext.	Weaving	5	7,092	87.5	F	5,400	54.1	F
478 Ext.	Ramp	1	366	9.6	A	463	10.3	B
478 Ext. -> 54 Ent.	Basic	4	6,646	77.3	F	4,730	60.3	F
54 Ent.	Ramp	2	2,393	116.8	F	1,537	61.5	F
54 Ent. -> Piedras Ext.	Weaving	6	8,986	86.3	F	6,009	65.4	F
Piedras Ext.	Ramp	1	576	13.6	B	408	8.2	A
Piedras Ext. -> 478 Ent.	Basic	5	8,361	68.0	F	5,372	73.6	F
478 Ent.	Ramp	1	231	5.1	A	239	13.7	B
478 Ent. -> Cotton Ext.	Weaving	6	8,477	79.4	F	5,357	76.8	F
Cotton Ext.	Ramp	1	1,197	28.4	D	499	10.8	B
Cotton Ext. -> Piedras Ent.	Basic	5	7,188	103.2	F	4,634	90.0	F
Piedras Ent.	Ramp	1	483	11.6	B	335	76.5	F
Piedras Ent. -> Dallas Ent.	Merge	6	7,503	98.7	F	4,706	96.3	F
Piedras Ent. -> Dallas Ent.	Basic	5	7,486	100.7	F	4,441	104.4	F
Dallas Ent.	Ramp	1	293	6.6	A	293	53.5	F
Dallas Ent. -> Campbell Ext.	Merge	6	7,740	77.8	F	4,435	109.7	F
Dallas Ent. -> Campbell Ext.	Basic	5	7,760	78.9	F	4,327	113.3	F
Campbell Ext.	Ramp	2	1,647	16.6	B	542	76.4	F
Campbell Ext. -> Kansas Ext.	Basic	4	6,048	75.2	F	3,638	100.8	F
Kansas Ext.	Ramp	2	776	58.0	F	321	113.4	F
Kansas Ext. -> Santa Fe Ent.	Basic	3	5,323	33.4	D	3,299	20.0	C
Santa Fe Ent.	Ramp	1	659	17.0	B	816	21.3	C
Santa Fe Ent. -> Porfirio Diaz Ext.	Weaving	4	5,961	26.7	C	4,137	18.3	B
Porfirio Diaz Ext.	Ramp	1	373	11.6	B	118	2.7	A
Porfirio Diaz Ext. -> Schuster Ext.	Basic	4	5,601	24.9	C	4,051	17.7	B
Schuster Ext.	Ramp	2	1,266	11.8	B	312	2.8	A
Schuster Ext. -> Schuster Ent.	Basic	4	4,308	18.7	C	3,774	16.5	B
Schuster Ent.	Ramp	1	261	5.7	A	345	7.6	A

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Schuster Ent. -> Executive Ext.	Merge	5	4,586	16.0	B	4,162	14.8	B
Schuster Ent. -> Executive Ext.	Basic	4	4,594	20.0	C	4,211	18.6	C
Executive Ext.	Ramp	1	972	19.2	B	926	23.9	C
Executive Ext. -> Executive Ent.	Basic	4	3,628	15.6	B	3,355	14.5	B

b) Segment 2 No Build Intersection Level of Service Analysis

The Year 2042 No Build condition analysis for the intersections along Segment 2 determined a significant decline in LOS. The PM peak hour has 19 intersections with poor LOS. These intersections are shown in Table 35 and are highlighted in red. The No Build analysis considers geometrical improvements from other committed projects.

Table 35: Segment 2 No Build Intersection LOS for Year 2042

Intersection	Control Type	AM Peak		PM Peak	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
Santa Fe & Yandell Dr	Signalized	15.0	B	20.0	B
Santa Fe & Wyoming	Signalized	18.6	B	23.8	C
Santa Fe & Missouri	Signalized	11.4	B	25.7	C
Santa Fe & Franklin	Signalized	14.0	B	51.5	D
Yandell & El Paso St	Signalized	6.5	A	9.3	A
Wyoming & El Paso	Signalized	13.5	B	16.6	B
Oregon & Montana	Signalized	5.8	A	29.3	C
Oregon & Yandell	Signalized	7.9	A	22.8	C
Oregon & Wyoming	Signalized	8.1	A	25.2	C
Oregon & Missouri	Signalized	12.6	B	24.1	C
Oregon & Franklin	Signalized	13.3	B	46.1	D
Mesa & Rio Grande	Signalized	9.9	A	120.6	F
Mesa & Montana	Signalized	7.1	A	60.5	E
Mesa & Yandell	Signalized	7.7	A	43.8	D
Mesa & Wyoming	Signalized	19.7	B	86.4	F
Mesa & Missouri	Signalized	10.2	B	25.7	C
Mesa & Franklin	Signalized	8.7	A	62.9	E
Stanton & Rio Grande	Signalized	14.3	B	32.5	C
Stanton & Montana	Signalized	27.4	C	53.7	D
Stanton & Yandell	Signalized	7.0	A	13.0	B
Stanton & Wyoming	Signalized	7.8	A	98.7	F

Intersection	Control Type	AM Peak		PM Peak	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
Stanton & Missouri	Signalized	7.6	A	117.4	F
Stanton & Franklin	Signalized	16.2	B	203.9	F
Kansas & Rio Grande	Signalized	10.4	B	218.9	F
Kansas & Montana	Signalized	10.4	B	111.6	F
Kansas & Yandell	Signalized	59.5	E	226.4	F
Kansas & Wyoming	Signalized	14.5	B	105.9	F
Kansas & Missouri	Signalized	10.1	B	48.2	D
Kansas & Franklin	Signalized	15.6	B	17.7	B
Campbell & Rio Grande	Signalized	3.6	A	3.3	A
Campbell & Montana	Signalized	11.6	B	48.6	D
Campbell & Yandell	Signalized	14.3	B	215.6	F
Campbell & Missouri	Signalized	21.6	C	178.1	F
Campbell & Franklin	Signalized	13.3	B	120.9	F
ECB WBFR	Signalized	28.4	C	20.5	C
Raynolds WBFR	Signalized	35.7	D	48.1	D
Raynolds EBFR	Signalized	53.2	D	29.0	C
Copia WBFR	Signalized	47.1	D	29.5	C
Copia EBFR	Signalized	14.6	B	12.0	B
Raynor WBFR	Signalized	11.0	B	13.6	B
Raynor EBFR	Signalized	24.1	C	20.9	C
Piedras WBFR	Signalized	9.7	A	12.3	B
Piedras EBFR	Signalized	37.9	D	99.5	F
Cotton WBFR	Signalized	11.8	B	37.6	D
Cotton EBFR	Signalized	12.2	B	12.1	B
Dallas WBFR	Signalized	21.9	C	84.1	F
Porfirio Diaz WBFR	Unsignalized	14.5	B	21.8	C
Porfirio Diaz EBFR	Unsignalized	23.4	C	108.1	F
Schuster WBFR	Signalized	29.1	C	56.7	E
Schuster EBFR	Signalized	95.0	F	89.0	F
ECB EBFR	Signalized	24.5	C	54.7	D

5.3 Recommended Alternative Analysis

The studied alternative for Segment 2 was Alternative 3. Alternative 3 includes changes in ramping, auxiliary lanes, and additional capacity in some areas (Ref 6). Full lane widths (12’) and shoulder widths (10’) are provided along with continuous frontage roads and desirable border width (20’) for sidewalks and utilities. The inside most lane in each direction of travel is separated from general-purpose lanes by a two-foot buffer and serves as an adaptive lane. These adaptive lanes could be designated for special uses to benefit trucks or transit and remove these larger vehicles from mainlane traffic. Refer to Section 4 of the Feasibility Report for a detailed description of the Recommended Alternative.

a) Segment 2 Build VISSIM Mainlane Level of Service Analysis

By increasing capacity and improving the ramp configurations either with ramp reversals or ramp consolidation on Segment 2, the Year 2042 Build condition analysis for eastbound Segment 2 shows the majority of segments improved from an unacceptable LOS E or worse to LOS D or better. The study showed that the worst peak period was the AM peak, with only three segments operating at LOS E or worse. This accounts for nine percent of the segments, while 91 percent of the segments operate at LOS D or better. The proposed alternative provided the capacity needed to improve traffic flow for the major of the segment and improve the conditions near the BHW area. Table 36 provides details regarding demand, density, and letter LOS.

Table 36: Segment 2 EB 2042 Build Mainlane LOS

Segment Names	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Segment 1 -> Executive Ext.	Basic	4	7,513	33.7	D	5,799	25.1	C
Executive Ext. -> Executive Ent.	Basic	4	7,479	33.6	D	5,774	25.3	C
Executive Ent.	Ramp	1	1,571	40.7	E	1,551	40.2	E
Executive Ent. -> Schuster Ext.	Merge	5	9,067	32.8	D	7,339	26.1	C
Executive Ent. -> Schuster Ext.	Basic	5	9,038	32.6	D	7,321	25.8	C
Executive Ent. -> Schuster Ext.	Diverge	6	8,982	31.7	D	7,291	22.3	C
Schuster Ext.	Ramp	1	942	18.5	B	620	12.0	B
Schuster Ext. -> Franklin Ext.	Basic	5	8,045	30.2	D	6,680	23.9	C
Schuster Ext. -> Franklin Ext.	Basic	5	8,019	36.7	E	6,669	24.2	C
Franklin Ext.	Ramp	1	1,846	47.5	F	842	19.4	B
Franklin Ext. -> Franklin Ent.	Basic	4	6,111	28.2	D	5,803	25.9	C
Franklin Ext. -> Franklin Ent.	Basic	4	6,103	27.1	D	5,801	25.7	C

Segment Names	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Franklin Ent.	Ramp	1	847	22.6	C	1,224	32.3	D
Franklin Ent. -> Cotton Ext.	Merge	5	6,933	25.8	C	7,005	26.7	D
Franklin Ent. -> Cotton Ext.	Basic	4	6,950	32.3	D	7,018	32.6	D
Franklin Ent. -> Cotton Ext.	Basic	5	6,921	28.5	D	6,988	28.9	D
Cotton Ext.	Ramp	1	1,043	22.4	C	977	20.9	C
Cotton Ext. -> Campbell Ent.	Basic	4	5,874	26.3	D	6,000	26.9	D
Campbell Ent.	Ramp	3	1,167	9.3	A	3,311	26.9	C
Campbell Ent. -> Cotton Ent.	Merge	7	6,959	17.8	B	9,200	24.0	C
Campbell Ent. -> Cotton Ent.	Merge	6	7,037	23.6	C	9,315	27.7	D
Campbell Ent. -> Cotton Ent.	Basic	6	7,049	20.6	C	9,339	27.5	D
Campbell Ent. -> Cotton Ent.	Basic	6	7,031	20.4	C	9,311	27.5	D
Cotton Ent.	Ramp	2	801	9.6	A	1,617	20.7	C
Cotton Ent. -> 478 Ext.	Weaving	8	7,849	17.1	B	10,946	25.8	C
Cotton Ent. -> 478 Ext.	Basic	7	7,813	19.9	C	10,889	38.8	E
478 Ext.	Ramp	1	7,518	6.1	A	686	14.4	B
478 Ext. -> 54 Ext.	Basic	7	7,518	19.2	C	10,211	30.2	D
54 Ext.	Ramp	3	1,863	12.3	B	2,770	18.8	B
54 Ext. -> 54 FR Ext.	Basic	5	5,644	20.2	C	7,423	28.4	D
54 FR Ext.	Ramp	1	711	14.9	B	845	17.9	B
54 FR Ext. -> Segment 3	Basic	4	4,925	21.9	C	6,571	30.8	D
54 FR Ext. -> Segment 3	Basic	4	4,942	21.8	C	6,592	29.7	D
54 FR Ext. -> Segment 3	Diverge	5	4,913	17.6	B	6,560	25.5	C

By increasing capacity and improving the ramp configurations on Segment 2, the Year 2042 Build condition analysis for westbound Segment 2 determined that the segments improved from an unacceptable LOS E or worse to LOS D or better. The study showed that the worst peak period was the PM peak, with only 13 segments operating at LOS E or worse. This accounts for 42 percent of the segments, while 58 percent of the segments operate at LOS D or better. This was a modest improvement in LOS; however, the Findings section that follows shows an overall improvement in Segment 2. The proposed alternative provided the capacity needed to improve traffic flow for the majority of the segment and improve conditions near the BHW area. Table 37 provides details regarding demand, density, and letter LOS.

Table 37: Segment 2 WB 2042 Build Mainlane LOS

Segment Names	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Segment 3 -> 54 FR Ent.	Basic	4	6,141	67.8	F	5,101	22.4	C
Segment 3 -> 54 FR Ent.	Basic	3	5,913	74.6	F	5,087	30.6	D
54 FR Ent.	Ramp	1	1,556	77.0	F	1,939	46.5	F
54 FR Ent. -> 54 Ent.	Weaving	4	7,293	84.5	F	6,998	33.5	D
54 Ent.	Ramp	2	2,685	86.8	F	1,860	23.5	C
54 Ent. -> Cotton Ext.	Weaving	6	9,740	90.5	F	8,834	28.7	D
54 Ent. -> Cotton Ext.	Weaving	7	9,574	93.8	F	8,799	28.9	D
Cotton Ext.	Ramp	1	1,339	30.0	D	954	20.4	C
Cotton Ext. -> Piedras Ent.	Basic	6	8,045	92.3	F	7,784	28.4	D
Piedras Ent.	Ramp	1	729	74.9	F	830	24.1	C
Piedras Ent. -> Campbell Ext.	Weaving	7	8,619	100.4	F	8,593	27.8	C
Piedras Ent. -> Campbell Ext.	Weaving	6	8,433	83.5	F	8,538	36.7	E
Campbell Ext.	Ramp	3	2,833	95.8	F	2,345	25.4	C
Campbell Ext. -> Cotton Ent.	Basic	4	5,477	26.6	D	6,133	30.2	D
Cotton Ent.	Ramp	1	354	8.5	A	458	11.1	B
Cotton Ent. -> Schuster Ext.	Basic	5	5,834	22.0	C	6,579	25.7	C
Cotton Ent. -> Schuster Ext.	Basic	4	5,846	27.7	D	6,582	32.2	D
Cotton Ent. -> Schuster Ext.	Basic	4	5,837	28.7	D	6,563	32.4	D
Cotton Ent. -> Schuster Ext.	Basic	4	5,851	29.5	D	6,572	32.8	D
Cotton Ent. -> Schuster Ext.	Diverge	5	5,838	25.6	C	6,543	27.9	D
Schuster Ext.	Ramp	2	1,585	45.9	F	860	8.7	A
Schuster Ext. -> Schuster Ent.	Basic	4	4,274	19.5	C	5,689	27.3	D
Schuster Ext. -> Schuster Ent.	Basic	4	4,285	19.6	C	5,670	27.3	D
Schuster Ent.	Ramp	2	589	6.9	A	1,862	23.8	C
Schuster Ent. -> Executive Ext.	Merge	6	4,865	14.6	B	7,508	24.0	C
Schuster Ent. -> Executive Ext.	Basic	5	4,849	17.6	B	7,467	31.2	D
Schuster Ent. -> Executive Ext.	Basic	5	4,817	18.8	C	7,400	45.0	E
Executive Ext.	Ramp	1	905	18.3	B	1,397	34.9	D
Executive Ext. -> Segment 1	Basic	5	3,948	14.2	B	6,058	23.7	C
Executive Ext. -> Segment 1	Basic	4	3,945	17.7	B	6,044	28.7	D
Executive Ext. -> Segment 1	Basic	4	3,953	17.8	B	6,057	28.7	D

b) Segment 2 Build VISSIM Intersection Level of Service Analysis

The Year 2042 Build condition analysis for the intersections along Segment 2 shows a significant improvement in LOS over the No Build analysis. The study showed two intersections with poor LOS in the AM peak hour and four intersections with poor LOS in the PM peak hour. These intersections are shown in Table 38 and are highlighted in red.

Table 38: Segment 2 2042 Build Alternative Intersection LOS

Intersection	Improvements	Control Type	AM Peak		PM Peak	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS
Santa Fe & Yandell Dr		Signalized	11.2	B	16.8	B
Santa Fe & Wyoming		Signalized	25.3	C	29.5	C
Santa Fe & Missouri		Signalized	11.5	B	31.4	C
Santa Fe & Franklin		Signalized	11.5	B	37.5	D
Oregon & Montana		Signalized	9.2	A	9.8	A
Oregon & Missouri		Signalized	6.5	A	21.8	C
Oregon & Franklin		Signalized	12.3	B	20.7	C
Mesa & Rio Grande		Signalized	11.5	B	25.1	C
Mesa & Montana		Signalized	18.6	B	23.5	C
Mesa & Yandell		Signalized	27.7	C	45.5	D
Mesa & Wyoming		Signalized	30.0	C	50.6	D
Mesa & Missouri		Signalized	13.2	B	42.9	D
Mesa & Franklin		Signalized	15.6	B	84.2	F
Stanton & Rio Grande		Signalized	9.8	A	11.2	B
Stanton & Montana		Signalized	23.7	C	21.4	C
Stanton & Missouri		Signalized	11.2	B	53.2	D
Stanton & Franklin		Signalized	45.6	D	66.2	E
Kansas & Rio Grande		Signalized	12.0	B	10.3	B
Kansas & Montana		Signalized	10.8	B	11.0	B
Kansas & Missouri		Signalized	19.8	B	16.1	B
Kansas & Franklin		Signalized	30.0	C	18.3	B
Campbell & Rio Grande		Signalized	10.8	B	14.8	B
Campbell & Montana		Signalized	48.9	D	42.8	D
Campbell & Yandell		Signalized	74.8	E	55.2	E
Campbell & Missouri		Signalized	52.1	D	56.6	E
Campbell & Franklin		Signalized	76.8	E	43.6	D
ECB WBFR	Added Capacity	Signalized	44.7	D	36.7	D
ECB EBFR	Added Capacity	Signalized	42.7	D	34.2	C

Intersection	Improvements	Control Type	AM Peak		PM Peak	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS
Raynolds WBFR		Signalized	31.1	C	21.8	C
Raynolds EBFR		Signalized	23.3	C	35.4	D
Copia WBFR	Added Capacity	Signalized	40.1	D	22.5	C
Copia EBFR	Added Capacity	Signalized	25.0	C	49.4	D
Raynor WBFR		Signalized	15.6	B	19.0	B
Raynor EBFR		Signalized	18.5	B	14.5	B
Piedras WBFR		Signalized	13.1	B	9.5	A
Piedras EBFR		Signalized	10.3	B	11.0	B
Cotton WBFR	Added Capacity	Signalized	27.3	C	39.5	D
Cotton EBFR		Signalized	19.7	B	40.7	D
Schuster WBFR	Added Capacity	Signalized	65.1	E	33.4	C
Schuster EBFR		Signalized	14.0	B	19.5	B

5.4 Findings

Based on the analysis, there is an improvement in LOS between the No Build alternative and the Build alternative for the AM peak hour based on Vissim analysis. Table 39 below provides a summary of the comparison between each alternative. The table shows that overall, the Build alternative cost to the user decreases from the No Build alternative while serving more vehicles.

Table 39: Segment 2 AM Peak Hour Measures of Effectiveness Comparison

MOE	AM Peak Hour		
	Existing AM	No Build 2042 AM	Build 2042 AM
Total travel time (veh-hr)	2652.27	5499.36	5499.34
Total Delay time (veh-hr)	699	3161	2663
Calculated Total Delay time (veh-hr)	639	2647	2247
Average Delay time per vehicle (sec/veh)	81	275	210
Average speed (mph)	41	23	27
Number of vehicles served	28330	34703	38549
Travel Time (min/veh)	5.62	9.51	8.56
Annual Delay Hours	524,000	2,371,000	1,998,000
Annual Delay ($)	$ 9,520,000	$43,060,000	$36,280,000
VMT	107,153.70	127,001.44	147,836.31

Annual delay dollars based on 250 Working days/ 3 hours of peak traffic in each AM & PM peak / $18.19 per hour based on TTI's 2015 Urban Mobility Scorecard

Based on the analysis, there is an improvement in LOS between the No Build alternative and the Build alternative for the PM peak hour. Table 40 below provides a summary of the comparison between each alternative. The table shows that overall, the Build alternative cost to the user decreases from the No Build alternative while serving more vehicles.

Table 40: Segment 2 PM Peak Hour Measures of Effectiveness Comparison

MOE	PM Peak Hour		
	Existing PM	No Build 2042 PM	Build 2042 PM
Total travel time (veh-hr)	2982	7875	4901
Total Delay time (veh-hr)	974	6103	1785
Calculated Total Delay time (veh-hr)	872	4319	1574
Average Delay time per vehicle (sec/veh)	107	570	135
Average speed (mph)	37	12	33
Number of vehicles served	29307	27282	42008
Travel Time (min/veh)	6.11	17.32	7.00
Annual Delay Hours	731,000	4,578,000	1,339,000
Annual Delay ($)	$13,270,000	$83,140,000	$24,320,000
VMT	109307.6	95023.0	160463.6

Notes: Annual delay dollars based on 250 Working days/ 3 hours of peak traffic in each AM & PM peak / $18.19 per hour based on TTI's 2015 Urban Mobility Scorecard

6. Segment 3

6.1 Existing Condition Analysis

Existing condition analysis provided the baseline analysis to obtain an understanding of the current operations. Segment 3 analysis used HCS and Synchro and VISSIM to determine the current deficiencies along the corridor.

a) Segment 3 Existing Mainlane Level of Service Analysis

The existing condition analysis for eastbound Segment 3 showed the majority of segments operating at LOS D or better. The study showed that the worst peak period was the PM peak, with seven segments operating at LOS E or worse. This accounts for 13 percent of the segments, while 87 percent of the segments operate at LOS D or better. The majority of the failing segments were between US 54, and Trowbridge Dr because either the ramp volume is over the capacity, or a combination of the ramp or basic freeway segment volume push the volume over capacity. Table 41 provides the details of the demand, density, and letter LOS.

Table 41: Segment 3 EB Existing Mainlane LOS Analysis

Segment Names	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Segment 2 -> US 54 Ent.	Basic	3	4,677	27.8	D	6,565	42.9	E
US 54 Ent.	Ramp	2	1,939	17.4	B	1,600	14.2	B
US 54 Ent. -> Chelsea Ext.	Weaving	5	6,603	25.3	C	8,142	34.5	D
Chelsea Ext.	Ramp	1	433	8.5	A	776	16.2	B
Chelsea Ext. ->Raynolds Ent.	Basic	4	6,173	28.9	D	7,350	38.3	E
Raynolds Ent.	Ramp	1	397	10.6	B	446	27.9	C
Raynolds Ent. -> Trowbridge Ext.	Merge	5	6,534	31.9	D	7,755	48.8	F
Raynolds Ent. -> Trowbridge Ext.	Weaving	4	6,549	32.0	D	7,776	41.7	E
Trowbridge Ext.	Ramp	1	580	12.5	B	440	8.8	A
Viscount Ext. -> Hawkins Ent.	Basic	4	5,950	27.2	D	7,311	35.0	E
Geronimo Ext.	Ramp	1	864	16.7	B	710	13.5	B
Geronimo Ext. -> Trowbridge Ent.	Weaving	4	5,103	22.5	C	6,603	31.9	D
Trowbridge Ent.	Ramp	1	1,029	26.2	C	713	17.9	B
Trowbridge Ent. -> Geronimo Ent.	Merge	5	6,124	29.6	D	7,319	41.3	E
Trowbridge Ent. -> Geronimo Ent.	Basic	4	6,115	27.9	D	7,296	34.3	D
Geronimo Ent.	Ramp	1	353	8.2	A	698	16.5	B
Geronimo Ent. -> Airway Ext.	Weaving	5	6,468	22.9	C	7,974	28.9	D

Segment Names	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Airway Ext.	Ramp	1	702	13.7	B	891	18.3	B
Airway Ext. -> Airway Ent.	Basic	4	5,203	23.3	C	6,390	30.7	D
Hawkins Ext.	Ramp	1	946	18.6	B	1,179	24.8	C
Airway Ent.	Ramp	1	481	11.7	B	619	15.5	B
Airway Ent. -> Viscount Ext.	Merge	5	5,259	20.1	C	6,468	31.6	D
Airway Ent. -> Viscount Ext.	Basic	4	5,255	23.8	C	6,454	31.9	D
Viscount Ext.	Ramp	1	512	9.3	A	955	18.3	B
Viscount Ext. -> Hawkins Ent.	Basic	4	4,757	20.8	C	5,491	25.4	C
Hawkins Ent.	Ramp	1	582	14.2	B	651	17.9	B
Hawkins Ent. -> McRae Ext.	Merge	5	5,329	22.2	C	6,102	32.0	D
Hawkins Ent. -> McRae Ent.	Basic	4	4,917	22.5	C	5,410	30.8	D
McRae Ext.	Ramp	1	656	12.7	B	1,091	41.9	E
McRae Ent.	Ramp	1	517	14.2	B	691	19.1	B
McRae Ent. -> Yarbrough Ext.	Merge	5	5,038	22.3	C	5,529	26.7	C
McRae Ent. -> Yarbrough Ext.	Basic	4	5,157	24.4	C	5,647	26.9	D
Yarbrough Ext.	Ramp	1	656	13.7	B	570	17.1	B
Yarbrough Ext. -> Yarbrough Ent.	Basic	4	4,507	19.8	C	5,073	22.3	C
Yarbrough Ent.	Ramp	1	435	10.4	B	620	15.1	B
Yarbrough Ent. -> Lomaland Ext.	Weaving	5	4,934	17.1	B	5,676	19.9	B
Lomaland Ext.	Ramp	1	768	14.4	B	638	11.9	B
Lomaland Ext. -> Lee Trevino Ent.	Basic	4	3,408	15.1	B	4,377	19.8	C
Lee Trevino Ext.	Ramp	1	1,238	27.2	C	1,074	24.0	C
Lee Trevino Ent.	Ramp	1	414	10.1	B	750	19.0	B
Lee Trevino Ent. -> Zaragoza Ext.	Merge	5	3,246	11.9	B	4,581	19.2	B
Lee Trevino Ent. -> Zaragoza Ext.	Basic	4	3,325	14.4	B	4,684	20.9	C
Zaragoza Ext.	Ramp	1	988	19.5	B	1,212	24.2	C
Zaragoza Ext. -> Zaragoza Ent.	Basic	3	2,334	13.3	B	3,484	20.4	C
Zaragoza Ent.	Ramp	1	109	2.6	A	215	5.1	A
Zaragoza Ent. -> 375 Ramp Ext.	Weaving	4	2,441	10.4	B	3,686	16.1	B
375 Ramp Ext.	Ramp	2	646	5.5	A	974	8.4	A
375 Ramp Ext. -> 375 FR Ext.	Basic	3	1,784	10.2	A	2,708	16.0	B
375 FR Ext.	Ramp	1	268	5.1	A	397	7.6	A

Segment Names	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
375 FR Ext. -> 375 Ramp Ent.	Basic	2	1,512	13.0	B	2,301	20.6	C
375 Ramp Ent.	Ramp	1	440	10.6	B	829	21.5	C
Segment 4 Ext. -> 375 Ramp Ent.	Merge	3	1,943	12.5	B	3,106	25.8	C
Segment 4 Ext. -> 375 Ramp Ent.	Basic	2	1,944	17.1	B	3,123	28.8	D

The existing condition analysis for westbound Segment 3 showed the majority of segments operating at LOS D or better. The study showed that the worst peak period was the AM peak, with four segments operating at LOS E or worse. This accounts for seven percent of the segments, while 93 percent of the segments operate at LOS D or better. The majority of the failing segments were near the Yarbrough Dr. Interchange. Table 42 provides the details of the demand, density, and letter LOS.

Table 42: Segment 3 WB Existing Mainlane LOS Analysis

Segment Names	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Segment 4 -> 375 Ramp Ext.	Basic	2	4,103	38.4	E	3,035	27.1	D
Segment 4 -> 375 Ramp Ext.	Weaving	3	4,100	24.8	C	3,032	17.7	B
375 Ramp Ext.	Ramp	2	966	8.2	A	1,198	10.3	B
375 Ramp Ext. -> Segment 4 Ent.	Basic	2	3,131	28.5	D	1,835	16.1	B
Segment 4 Ent.	Ramp	1	729	14.9	B	581	11.9	B
Segment 4 Ent. -> 375 Ramp Ent.	Weaving	3	3,858	23.6	C	2,413	14.2	B
375 Ramp Ent.	Ramp	1	377	6.7	A	257	4.5	A
375 Ramp Ent. -> George Dieter Ext.	Basic	2	3,474	32.1	D	2,150	19.2	C
375 Ramp Ent. -> George Dieter Ext.	Basic	2	993	9.5	A	1,435	13.9	B
375 Ramp Ent. -> George Dieter Ext.	Weaving	4	4,458	19.7	B	3,579	15.8	B
George Dieter Ext.	Ramp	1	637	11.9	B	818	15.7	B
George Dieter Ext. -> 375 FR Ent.	Basic	3	3,812	22.4	C	2,757	15.9	B
375 FR Ent.	Ramp	1	468	11.1	B	499	11.8	B
375 FR Ent. -> George Dieter Ent.	Merge	4	4,268	19.1	C	3,247	14.2	B
375 FR Ent. -> George Dieter Ent.	Basic	3	4,274	25.6	C	3,248	18.9	C
George Dieter Ent.	Ramp	1	730	15.1	B	994	20.8	C
George Dieter Ent. -> Pendale Ent.	Merge	4	3,949	17.5	B	3,603	15.6	B
Lee Trevino Ext.	Ramp	1	1,439	29.9	D	874	17.0	B
Pendale Ent.	Ramp	1	488	11.9	B	566	14.0	B

Segment Names	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Pendale Ent. -> Lee Trevino Ent.	Basic	4	4,012	17.5	B	3,907	17.1	B
Lee Trevino Ent.	Ramp	1	820	20.2	C	980	24.2	C
Lee Trevino Ent. -> Lomaland Ent.	Merge	5	4,825	17.1	B	4,877	17.4	B
Lee Trevino Ent. -> Lomaland Ent.	Basic	4	4,826	21.1	C	4,880	21.4	C
Lomaland Ent.	Ramp	1	660	15.9	B	736	17.7	B
Lomaland Ent. -> Yarbrough Ext.	Weaving	5	5,498	19.2	B	5,618	19.6	B
Yarbrough Ext.	Ramp	1	511	9.7	A	768	14.8	B
Yarbrough Ext. -> Yarbrough Ent.	Basic	4	4,974	22.2	C	4,837	21.1	C
Yarbrough Ent.	Ramp	1	1,142	70.4	F	876	32.6	D
Yarbrough Ent. -> McRae Ext.	Basic	4	6,068	31.0	D	5,688	27.1	D
McRae Ext.	Ramp	1	629	16.3	B	521	9.8	A
McRae Ext. -> McRae Ent.	Basic	4	5,435	24.3	C	5,175	22.7	C
McRae Ent.	Ramp	1	1,034	69.8	F	657	21.0	C
McRae Ent. -> Hawkins Ext.	Basic	4	6,431	31.0	D	5,812	27.7	D
Hawkins Ext.	Ramp	1	623	12.0	B	916	18.5	B
Hawkins Ext. -> Viscount Ent.	Basic	4	5,804	25.7	C	4,906	21.5	C
Viscount Ent.	Ramp	1	642	16.5	B	504	12.1	B
Viscount Ent. -> Airway Ext.	Basic	4	6,416	30.9	D	5,372	24.7	C
Airway Ext.	Ramp	1	750	14.8	B	649	12.5	B
Airway Ext. -> Hawkins Ent.	Basic	4	5,668	25.2	C	4,718	20.7	C
Hawkins Ent.	Ramp	1	816	18.9	B	1,107	27.5	C
Hawkins Ent. -> Airway Ent.	Basic	4	6,466	29.7	D	5,810	26.5	D
Airway Ent.	Ramp	1	692	16.3	B	742	17.7	B
Airway Ent. -> Geronimo Ext.	Weaving	5	7,148	25.5	C	6,543	23.1	C
Geronimo Ext.	Ramp	1	855	17.1	B	939	19.3	B
Geronimo Ext. -> Geronimo Ent.	Basic	4	6,281	28.3	D	5,580	24.7	C
Geronimo Ent.	Ramp	1	585	16.0	B	816	24.1	C
Geronimo Ent. -> Paisano Ext.	Basic	4	6,827	33.2	D	6,381	30.4	D
Paisano Ext.	Ramp	1	570	12.6	B	379	7.7	A
Paisano Ext. -> Trowbridge Ent.	Basic	4	6,250	28.1	D	5,983	26.7	D
Trowbridge Ent.	Ramp	1	384	9.6	A	565	15.4	B
Paisano Ent.	Ramp	1	607	16.4	B	620	16.3	B
Paisano Ent. -> Raynolds Ext.	Basic	4	7,166	39.9	E	7,115	38.3	E
Raynolds Ext.	Ramp	1	432	9.0	A	309	6.2	A
Raynolds Ext. -> Segment 2	Basic	4	6,786	30.6	D	6,851	30.9	D

b) Segment 3 Existing Intersection Level of Service Analysis

In Segment 3, one out of the 29 interchanges operated at LOS E or worse in the AM Peak, and two out of the 29 interchanges operated at LOS E or worse in the PM peak. These intersections are shown in Table 43 and are highlighted in red.

Table 43: Segment 3 Existing Intersection LOS

Intersection	Control Type	AM Peak		PM Peak	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
Raynolds St SB & WB Frontage Road	Signalized	39.6	D	20.4	C
Raynolds St SB & EB Frontage Road	Signalized	13.5	B	23.6	C
Chelsea St SB & WB Frontage Road	Signalized	15.2	B	15.7	B
Chelsea St SB & EB Frontage Road	Signalized	27.3	C	30.9	C
E Paisano Dr SB & WB Frontage Road	Signalized	21.6	C	17.7	B
E Paisano Dr SB & EB Frontage Road	Signalized	24.8	C	25.2	C
Trowbridge Dr SB & WB Frontage Road	Signalized	22.6	C	24.8	C
Trowbridge Dr SB & EB Frontage Road	Signalized	65.8	E	58.3	E
Geronimo Dr SB & WB Frontage Road	Signalized	19.0	B	26.3	C
Geronimo Dr SB & EB Frontage Road	Signalized	27.7	C	24.1	C
REL Rd SB & WB Frontage Road	Signalized	6.4	A	6.2	A
Airway Blvd SB & WB Frontage Road	Signalized	13.1	B	19.7	B
Airway Blvd SB & EB Frontage Road	Signalized	19.3	B	20.7	C
Hawkins Blvd SB & WB Frontage Road	Signalized	18.1	B	28.6	C
Hawkins Blvd SB & EB Frontage Road	Signalized	20.9	C	21.0	C
Viscount Blvd SB & WB Frontage Road	Signalized	21.8	C	21.2	C
Viscount Blvd SB & EB Frontage Road	Signalized	20.8	C	26.1	C
McRae Blvd SB & WB Frontage Road	Signalized	29.1	C	42.3	D
McRae Blvd SB & EB Frontage Road	Signalized	36.0	D	44.2	D
Sumac Dr SB & WB Frontage Road	Signalized	28.8	C	29.2	C
Sumac Dr SB & EB Frontage Road	Signalized	25.1	C	28.2	C
N Yarbrough Dr SB & WB Frontage Road	Signalized	32.4	C	30.4	C
N Yarbrough Dr SB & EB Frontage Road	Signalized	48.8	D	76.0	E
Lomaland Dr SB & WB Frontage Road	Signalized	18.4	B	18.8	B
Lomaland Dr SB & EB Frontage Road	Signalized	29.4	C	30.9	C
N Lee Trevino Dr SB & WB Frontage Road	Signalized	20.4	C	37.0	D
N Lee Trevino Dr SB & EB Frontage Road	Signalized	26.9	C	23.6	C
George Dieter Dr SB & WB Frontage Road	Signalized	17.8	B	18.1	B
George Dieter Dr SB & EB Frontage Road	Signalized	23.2	C	27.5	C

Notes:

1. VISSIM does not directly compute the HCM level of service.

2. The Delay for the link segments is the average of 3 simulation runs in VISSIM.

3. The Delay obtained from VISSIM is compared to the following tables to obtain LOS
Signalized Intersections - Exhibit 18-4 LOS Criteria (Page 18-6, HCM 2010)

6.2 No Build Operational Analysis

The 2042 No Build models were used as a comparison tool to measure the effectiveness of the build alternatives. The No Build models assumed committed projects in the analysis.

a) Segment 3 No Build Mainlane Level of Service Analysis

The Year 2042 No Build condition analysis for eastbound Segment 3 showed that the majority of segments operate at LOS E or worse. The study showed that the worst peak period was the PM peak, with 34 segments operating at LOS E or worse. This accounts for 64 percent of the segments, while 36 percent of the segments operate at LOS D or better. The majority of Segment 3 failed during this period. Table 44 provides the details of the demand, density, and letter LOS.

Table 44: Segment 3 EB No Build Mainlane LOS Analysis

Segment Names	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Segment 2 -> US 54 Ent.	Basic	3	5,521	85.7	F	5,670	83.7	F
US 54 Ent.	Ramp	2	2,398	94.8	F	2,194	55.3	F
US 54 Ent. -> Chelsea Ext.	Weaving	5	7,717	78.5	F	7,538	78.5	F
Chelsea Ext.	Ramp	1	490	12.0	B	761	20.1	C
Chelsea Ext. ->Raynolds Ent.	Basic	4	7,189	64.7	F	6,705	68.5	F
Raynolds Ent.	Ramp	1	565	28.5	D	589	53.6	F
Raynolds Ent. -> Trowbridge Ext.	Merge	5	7,710	71.2	F	7,195	78.1	F
Raynolds Ent. -> Trowbridge Ext.	Weaving	4	7,729	61.5	F	7,146	65.6	F
Trowbridge Ext.	Ramp	1	643	33.0	D	392	15.4	B
Trowbridge Ext. -> Geronimo Ext.	Weaving	4	7,069	34.9	D	6,619	61.4	F
Geronimo Ext.	Ramp	1	1,016	19.9	B	600	14.7	B
Geronimo Ext. -> Trowbridge Ent.	Weaving	4	6,071	29.7	D	5,866	66.2	F
Trowbridge Ent.	Ramp	1	1,170	68.1	F	721	64.4	F
Trowbridge Ent. -> Geronimo Ent.	Merge	5	7,237	64.3	F	6,453	87.4	F
Trowbridge Ent. -> Geronimo Ent.	Basic	4	7,226	38.0	E	6,271	76.0	F
Geronimo Ent.	Ramp	1	471	13.2	B	735	57.5	F
Geronimo Ent. -> Airway Ext.	Weaving	5	7,656	40.0	E	6,707	76.4	F
Airway Ext.	Ramp	1	801	71.0	F	642	14.2	B
Airway Ext. -> Airway Ent.	Basic	4	6,195	29.4	D	5,218	81.2	F
Hawkins Ext.	Ramp	1	1,097	23.0	C	850	51.0	F

Segment Names	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Airway Ent.	Ramp	1	601	17.4	B	479	102.5	F
Airway Ent. -> Viscount Ext.	Merge	5	6,221	28.0	C	5,019	94.5	F
Airway Ent. -> Viscount Ext.	Basic	4	6,257	32.8	D	5,015	89.6	F
Viscount Ext.	Ramp	1	596	17.3	B	542	80.8	F
Viscount Ext. -> Hawkins Ent.	Basic	4	5,634	33.4	D	4,337	87.6	F
Hawkins Ent.	Ramp	1	731	47.6	F	399	150.1	F
Hawkins Ent. -> McRae Ext.	Merge	5	6,215	53.0	F	4,574	104.6	F
Hawkins Ent. -> McRae Ent.	Basic	4	5,776	35.5	E	4,123	67.8	F
McRae Ext.	Ramp	1	727	47.3	F	760	111.9	F
McRae Ent.	Ramp	1	587	26.6	C	532	109.1	F
McRae Ent. -> Yarbrough Ext.	Merge	5	5,910	37.7	E	4,286	75.3	F
McRae Ent. -> Yarbrough Ext.	Basic	4	5,993	41.2	E	4,363	74.9	F
Yarbrough Ext.	Ramp	1	764	31.3	D	455	44.3	F
Yarbrough Ext. -> Yarbrough Ent.	Basic	4	5,218	32.6	D	3,930	78.8	F
Yarbrough Ent.	Ramp	1	338	8.6	A	568	92.9	F
Yarbrough Ent. -> Lomaland Ext.	Weaving	5	5,448	40.7	E	4,419	107.3	F
Lomaland Ext.	Ramp	1	856	27.7	C	403	21.1	C
Lomaland Ext. -> Lee Trevino Ent.	Basic	4	3,651	33.1	D	3,451	46.9	F
Lee Trevino Ext.	Ramp	1	1,257	96.4	F	805	130.9	F
Lee Trevino Ent.	Ramp	1	464	11.4	B	822	21.2	C
Lee Trevino Ent. -> Zaragoza Ext.	Merge	5	3,480	13.0	B	3,831	15.7	B
Lee Trevino Ent. -> Zaragoza Ext.	Basic	4	3,612	16.2	B	3,974	17.5	B
Zaragoza Ext.	Ramp	1	1,065	25.3	C	943	18.8	B
Zaragoza Ext. -> Zaragoza Ent.	Basic	3	2,580	14.9	B	3,050	17.8	B
Zaragoza Ent.	Ramp	1	132	3.1	A	258	6.1	A
Zaragoza Ent. -> 375 Ramp Ext.	Weaving	5	2,723	9.2	A	3,316	11.3	B
375 Ramp Ext.	Ramp	3	711	4.0	A	913	5.2	A
375 Ramp Ext. -> 375 FR Ext.	Basic	4	2,018	8.5	A	2,407	10.2	A
375 FR Ext.	Ramp	1	302	5.7	A	337	6.4	A
375 FR Ext. -> Exit to End	Basic	4	1,720	7.2	A	2,069	8.7	A
Segment 4 Ext.	Ramp	1	203	3.5	A	234	4.0	A

Segment Names	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Segment 4 Ext. -> 375 Ramp Ent.	Basic	4	1,521	6.3	A	1,839	7.7	A
375 Ramp Ent.	Ramp	2	730	9.1	A	1,362	17.9	B

The Year 2042 No Build condition analysis for westbound Segment 3 showed that the majority of segments operate at LOS E or worse. The study showed that the worst peak period was the AM peak, with 29 segments operating at LOS E or worse. This accounts for 53 percent of the segments, while 47 percent of the segments operate at LOS D or better. The majority of Segment 3 failed during this time period. Table 45 provides the details of the demand, density, and letter LOS.

Table 45: Segment 3 WB No Build Mainlane LOS Analysis

Segment Names	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Segment 4 -> 375 Ramp Ext.	Basic	5	5,978	20.7	C	4,491	15.4	B
Segment 4 -> 375 Ramp Ext.	Weaving	5	5,963	21.0	C	4,484	16.1	B
375 Ramp Ext.	Ramp	2	1,386	12.2	B	1,755	15.6	B
375 Ramp Ext. -> Segment 4 Ent.	Basic	4	4,567	23.0	C	2,721	11.7	B
Segment 4 Ent.	Ramp	1	1,016	98.3	F	859	18.0	B
Segment 4 Ent. -> 375 Ramp Ent.	Weaving	4	5,551	27.4	C	3,573	15.9	B
375 Ramp Ent.	Ramp	1	565	10.5	B	370	6.8	A
375 Ramp Ent. -> George Dieter Ext.	Basic	4	4,964	25.0	C	3,197	13.8	B
375 Ramp Ent. -> George Dieter Ext.	Basic	3	1,279	8.5	A	1,903	12.4	B
375 Ramp Ent. -> George Dieter Ext.	Weaving	7	6,129	21.8	C	5,051	12.6	B
George Dieter Ext.	Ramp	1	913	17.5	B	1,189	23.4	C
George Dieter Ext. -> 375 FR Ent.	Basic	5	5,115	40.5	E	3,907	13.5	B
375 FR Ent.	Ramp	1	649	34.8	D	743	17.9	B
375 FR Ent. -> George Dieter Ent.	Merge	4	5,573	59.8	F	4,633	20.7	C
375 FR Ent. -> George Dieter Ent.	Basic	3	5,504	61.1	F	4,634	27.8	D
George Dieter Ent.	Ramp	1	890	40.4	E	1,230	26.0	C
George Dieter Ent. -> Pendale Ent.	Merge	4	4,999	31.5	D	4,977	22.3	C
Lee Trevino Ext.	Ramp	1	1,769	55.0	F	1,228	24.7	C
Pendale Ent.	Ramp	1	557	19.6	B	741	25.1	C
Pendale Ent. -> Lee Trevino Ent.	Basic	4	5,011	34.4	D	5,310	29.8	D
Lee Trevino Ent.	Ramp	1	824	83.8	F	1,075	65.6	F
Lee Trevino Ent. -> Lomaland Ent.	Merge	5	5,741	55.5	F	6,314	45.9	F

Segment Names	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Lee Trevino Ent. -> Lomaland Ent.	Basic	4	5,663	58.7	F	6,253	49.4	F
Lomaland Ent.	Ramp	1	563	113.7	F	834	83.3	F
Lomaland Ent. -> Yarbrough Ext.	Weaving	5	6,095	73.8	F	6,991	57.9	F
Yarbrough Ext.	Ramp	1	353	135.8	F	866	91.4	F
Yarbrough Ext. -> Yarbrough Ent.	Basic	4	5,656	53.7	F	6,047	36.0	E
Yarbrough Ent.	Ramp	1	691	145.2	F	871	88.6	F
Yarbrough Ent. -> McRae Ext.	Basic	4	6,342	68.1	F	6,884	47.1	F
McRae Ext.	Ramp	1	738	99.6	F	694	38.1	E
McRae Ext. -> McRae Ent.	Basic	4	5,638	26.8	D	6,201	36.6	E
McRae Ent.	Ramp	1	1,155	92.1	F	656	34.0	D
McRae Ent. -> Hawkins Ext.	Basic	4	6,808	33.1	D	6,832	39.3	E
Hawkins Ext.	Ramp	1	15	14.6	B	24	24.3	C
Hawkins Ext. -> Viscount Ent.	Basic	4	5,016	53.2	F	3,899	16.9	B
Viscount Ent.	Ramp	1	404	10.9	B	216	5.7	A
Viscount Ent.	Ramp	1	393	9.6	A	269	8.3	A
Viscount Ent. -> Airway Ext.	Basic	5	6,887	28.9	D	6,175	43.7	E
Airway Ext.	Ramp	1	827	21.4	C	788	60.0	F
Airway Ext. -> Hawkins Ent.	Basic	4	6,079	31.0	D	5,373	26.5	D
Hawkins Ent.	Ramp	1	1,046	51.2	F	1,262	84.4	F
Hawkins Ent. -> Airway Ent.	Basic	4	7,118	46.7	F	6,605	34.1	D
Airway Ent.	Ramp	1	948	24.6	C	923	31.3	D
Airway Ent. -> Geronimo Ext.	Weaving	5	8,021	54.0	F	7,483	37.0	E
Geronimo Ext.	Ramp	1	931	21.5	C	1,007	76.0	F
Geronimo Ext. -> Geronimo Ent.	Basic	4	6,989	66.3	F	6,434	35.1	E
Geronimo Ent.	Ramp	1	756	47.4	F	948	89.8	F
Geronimo Ent. -> Paisano Ext.	Basic	4	7,687	69.7	F	7,390	60.1	F
Paisano Ext.	Ramp	1	636	36.3	E	432	10.0	B
Paisano Ext. -> Trowbridge Ent.	Basic	4	7,043	79.9	F	6,953	70.2	F
Trowbridge Ent.	Ramp	1	472	14.4	B	657	49.3	F
Paisano Ent.	Ramp	1	843	43.9	F	872	41.3	E
Paisano Ent. -> Raynolds Ext.	Basic	4	8,259	55.9	F	8,407	53.8	F
Raynolds Ext.	Ramp	1	498	10.8	B	362	7.4	A
Raynolds Ext. -> Segment 2	Basic	4	7,837	36.0	E	8,103	37.4	E

b) Segment 3 No Build Intersection Level of Service Analysis

The Year 2042 No Build condition analysis for the intersections along Segment 3 determined a significant decline in LOS. The PM peak hour has 17 intersections with poor LOS. These intersections are shown in **Table 46** and are highlighted in red. The No Build analysis considers geometrical improvements from other committed projects.

Table 46: Segment 3 2042 No Build Intersection LOS

Intersection	Control Type	AM		PM	
		Delay(s/veh)	LOS	Delay(s/veh)	LOS
Raynolds St SB & WB Frontage Road	Signalized	54.4	D	19.2	B
Raynolds St SB & EB Frontage Road	Signalized	49.5	D	50.5	D
Chelsea St SB & WB Frontage Road	Signalized	19.8	B	19.2	B
Chelsea St SB & EB Frontage Road	Signalized	48.9	D	50.8	D
E Paisano Dr SB & WB Frontage Road	Signalized	41.2	D	23.2	C
E Paisano Dr SB & EB Frontage Road	Signalized	24.2	C	33.6	C
Trowbridge Dr SB & WB Frontage Road	Signalized	131.5	F	107.1	F
Trowbridge Dr SB & EB Frontage Road	Signalized	163.7	F	107.2	F
Geronimo Dr SB & WB Frontage Road	Signalized	31.0	C	65.2	E
Geronimo Dr SB & EB Frontage Road	Signalized	39.0	D	66.6	E
REL Rd SB & WB Frontage Road	Signalized	12.1	B	16.8	B
Airway Blvd SB & WB Frontage Road	Signalized	60.7	E	95.2	F
Airway Blvd SB & EB Frontage Road	Signalized	63.7	E	21.4	C
Hawkins Blvd SB & WB Frontage Road	Signalized	20.3	C	37.9	D
Hawkins Blvd SB & EB Frontage Road	Signalized	20.2	C	54.7	D
Viscount Blvd SB & WB Frontage Road	Signalized	32.5	C	98.5	F
Viscount Blvd SB & EB Frontage Road	Signalized	26.4	C	142.5	F
McRae Blvd SB & WB Frontage Road	Signalized	118.0	F	151.9	F
McRae Blvd SB & EB Frontage Road	Signalized	113.3	F	217.5	F
Sumac Dr SB & WB Frontage Road	Signalized	38.6	D	49.8	D
Sumac Dr SB & EB Frontage Road	Signalized	55.2	E	134.9	F
N Yarbrough Dr SB & WB Frontage Road	Signalized	379.9	F	166.6	F
N Yarbrough Dr SB & EB Frontage Road	Signalized	172.8	F	137.0	F
Lomaland Dr SB & WB Frontage Road	Signalized	64.7	E	57.3	E
Lomaland Dr SB & EB Frontage Road	Signalized	97.8	F	105.7	F
N Lee Trevino Dr SB & WB Frontage Road	Signalized	58.1	E	84.0	F
N Lee Trevino Dr SB & EB Frontage Road	Signalized	74.6	E	93.2	F
George Dieter Dr SB & WB Frontage Road	Signalized	40.6	D	34.8	C
George Dieter Dr SB & EB Frontage Road	Signalized	165.0	F	126.5	F

Notes:

1. VISSIM does not directly compute the HCM level of service.

2. The Delay for the link segments is the average of 3 simulation runs in VISSIM.

3. The Delay obtained from VISSIM is compared to the following tables to obtain LOS

Signalized Intersections - Exhibit 18-4 LOS Criteria (Page 18-6, HCM 2010)

6.3 Recommended Alternative Analysis

The studied alternative for Segment 3 was Alternative 3. Alternative 3 includes changes in ramping, auxiliary lanes, and additional capacity in some areas (Ref 6). Full lane widths (12') and shoulder widths (10') are provided along with continuous frontage roads and desirable border width (20') for sidewalks and utilities. The inside most lane in each direction of travel is separated from general-purpose lanes by a two-foot buffer and serves as an adaptive lane. These adaptive lanes could be designated for special uses to benefit trucks or transit and remove these larger vehicles from mainlane traffic. Refer to Section 4 of the Feasibility Report for a detailed description of the Recommended Alternative.

a) Segment 3 Build VISSIM Mainlane Level of Service Analysis

By increasing capacity and improving the ramp configurations on Segment 2, the Year 2042 Build condition analysis for eastbound Segment 3 showed an increase of segments operating at LOS D or better. The study showed that the worst peak period was the PM peak, with 10 segments operating at LOS E or worse. This accounts for 21 percent of the segments, while 79 percent of the segments operate at LOS D or better. The proposed alternative provided the capacity needed to improve traffic flow for the major of the segment and improve the conditions for the majority of Segment 3. Table 47 provides details regarding demand, density, and letter LOS.

Table 47: Segment 3 EB 2042 Build Mainlane LOS

Segment Names	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Segment 2 -> Raynolds Ent.	Basic	4	4,559	19.4	C	6,886	32.2	D
Raynolds Ent.	Ramp	2	2,362	20.3	C	2,314	21.8	C
Raynolds Ent. -> Paisano Ent.	Merge	6	6,920	19.6	B	9,139	31.6	D
Raynolds Ent. -> Paisano Ent.	Basic	6	6,869	19.6	C	8,970	38.3	E
Paisano Ent.	Ramp	1	1,246	29.4	D	1,000	30.2	D
Paisano Ent. -> Robert Lee Ext.	Merge	7	8,159	20.3	C	9,888	44.6	F
Paisano Ent. -> Robert Lee Ext.	Basic	6	8,189	24.2	C	9,781	52.6	F
Paisano Ent. -> Robert Lee Ext.	Basic	7	8,176	21.5	C	9,627	60.4	F
Airway Ext.	Ramp	1	1,047	22.7	C	1,245	27.5	C
Airway Ext. -> Geronimo Ent.	Basic	6	7,112	20.5	C	8,117	76.6	F
Geronimo Ent.	Ramp	1	1,100	24.6	C	1,266	47.9	F
Geronimo Ent. -> Hawkins Ext.	Merge	7	8,152	20.6	C	9,043	76.7	F
Geronimo Ent. -> Hawkins Ext.	Basic	6	8,082	23.8	C	8,936	61.8	F
Hawkins Ext.	Ramp	3	2,998	18.4	B	4,059	61.5	F
Hawkins Ext. -> Airway Ent.	Basic	4	5,172	22.4	C	4,825	21.4	C
Airway Ent.	Ramp	1	451	8.8	A	749	14.8	B

Segment Names	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Airway Ent. -> Hawkins Ent.	Merge	5	5,604	19.7	B	5,562	19.6	B
Airway Ent. -> Hawkins Ent.	Basic	4	5,610	24.7	C	5,580	24.5	C
Hawkins Ent.	Ramp	1	797	17.7	B	807	17.9	B
Hawkins Ent. -> Viscount Ent.	Merge	5	6,392	22.7	C	6,374	22.7	C
Hawkins Ent. -> Viscount Ent.	Basic	4	6,395	28.7	D	6,389	28.7	D
Viscount Ent.	Ramp	1	265	5.7	A	433	9.5	A
Viscount Ent. -> Yarbrough Ext.	Weaving	5	6,623	24.2	C	6,821	24.0	C
Viscount Ent. -> Yarbrough Ext.	Weaving	6	6,517	22.6	C	6,779	20.3	C
Yarbrough Ext.	Ramp	1	933	20.5	C	765	18.7	B
Yarbrough Ext. -> Lomaland Ext.	Basic	5	5,492	30.2	D	6,037	22.2	C
Lomaland Ext.	Ramp	1	878	19.5	B	787	17.1	B
Lomaland Ext. -> Yarbrough Ent.	Basic	4	4,472	30.0	D	5,258	23.5	C
Yarbrough Ent.	Ramp	1	820	53.0	F	1,264	27.4	C
Yarbrough Ent. -> Lee Trevino Ext.	Basic	6	5,073	63.1	F	6,491	18.9	B
Lee Trevino Ext.	Ramp	1	866	122.5	F	1,084	29.1	D
Lee Trevino Ext. -> Pendale Ext.	Basic	5	4,162	15.6	B	5,424	19.6	C
Pendale Ext.	Ramp	1	1,330	35.1	E	1,537	35.1	E
Pendale Ext. -> Pendale Ent.	Basic	4	2,815	11.9	B	3,890	16.7	B
Pendale Ent.	Ramp	1	587	13.2	B	1,290	29.9	D
Pendale Ent. -> 375 Ramp Ext.	Merge	5	3,406	11.6	B	5,170	18.0	B
Pendale Ent. -> 375 Ramp Ext.	Basic	4	3,409	14.6	B	5,172	23.0	C
375 Ramp Ext.	Ramp	2	1,305	13.5	B	1,694	17.9	B
375 Ramp Ext. -> Zaragoza Ent.	Basic	3	2,093	11.8	B	3,452	20.4	C
375 Ramp Ext. -> Zaragoza Ent.	Basic	4	2,105	8.8	A	3,468	14.8	B
Zaragoza Ent.	Ramp	1	78	1.7	A	152	3.4	A
Zaragoza Ent. -> End Ext.	Merge	5	2,175	7.3	A	3,609	12.3	B
Zaragoza Ent. -> End Ext.	Basic	4	2,186	9.2	A	3,623	15.8	B
Segment 4 Ext.	Ramp	1	635	13.5	B	1,257	28.1	D
End Ext. -> 375 Ramp Ent.	Basic	3	1,547	8.6	A	2,354	13.3	B
375 Ramp Ent.	Ramp	2	1,233	13.4	B	1,171	12.7	B
375 Ramp Ent. -> Segment 4	Basic	5	2,782	10.4	A	3,531	13.0	B

By increasing capacity and improving the ramp configurations on Segment 3, the Year 2042 Build condition analysis for westbound Segment 3 showed an improvement of LOS. The majority of segments improved in operating at LOS D or better. The study showed that the worst peak period was the PM peak, with two segments operating at LOS E or worse. This accounts for four percent of the segments, while 96 percent of the segments operate at LOS D or better. The proposed alternative provided the capacity needed to improve traffic flow for the major of the segment and improve the conditions for the majority of Segment 3. Table 48 provides details regarding demand, density, and letter LOS.

Table 48: Segment 3 WB 2042 Build Mainlane LOS

Segment Names	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Segment 4 -> 375 Ramp Ext.	Basic	4	2,963	12.5	B	2,424	10.2	A
375 Ramp Ext.	Ramp	2	1,379	14.8	B	1,817	19.9	B
375 Ramp Ext. -> Segment 4 Ent.	Basic	3	1,574	8.8	A	598	3.3	A
Segment 4 Ent.	Ramp	2	1,150	14.4	B	1,667	21.5	C
Segment 4 Ent. -> George Dieter Ext.	Merge	5	2,721	11.0	B	2,271	10.3	B
Segment 4 Ent. -> George Dieter Ext.	Basic	4	2,730	14.0	B	2,278	13.1	B
Segment 4 Ent. -> George Dieter Ext.	Basic	5	2,717	11.0	B	2,269	10.2	B
George Dieter Ext.	Ramp	1	371	7.9	A	635	14.0	B
George Dieter Ext. -> 375 Ramp Ent.	Basic	5	2,349	9.4	A	1,635	7.2	A
George Dieter Ext. -> 375 Ramp Ent.	Basic	4	2,351	11.7	B	1,637	9.0	A
375 Ramp Ent.	Ramp	1	432	7.5	A	1,636	31.1	D
375 Ramp Ent. -> Pendale Ext.	Merge	5	2,768	10.9	B	3,252	13.4	B
375 Ramp Ent. -> Pendale Ext.	Basic	4	2,751	13.7	B	3,236	16.5	B
Pendale Ext.	Ramp	2	1,055	11.3	B	1,049	14.8	B
Pendale Ext. -> Pendale Ent.	Basic	3	1,694	11.2	B	2,171	14.6	B
Pendale Ent.	Ramp	2	1,495	14.7	B	2,028	20.5	C
Pendale Ent. -> Lee Trevino Ent.	Merge	5	3,180	11.9	B	4,189	16.2	B
Pendale Ent. -> Lee Trevino Ent.	Basic	4	3,174	14.7	B	4,175	22.7	C
Lee Trevino Ent.	Ramp	1	1,005	22.3	C	991	29.5	D
Lee Trevino Ent. -> Yarbrough Ext.	Merge	5	4,171	15.8	B	5,134	26.5	C
Lee Trevino Ent. -> Yarbrough Ext.	Basic	4	4,185	20.8	C	5,115	34.1	D

Segment Names	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Lee Trevino Ent. -> Yarbrough Ext.	Basic	5	4,158	18.5	B	5,046	35.5	E
Yarbrough Ext.	Ramp	1	721	25.8	C	1,038	57.0	F
Yarbrough Ext. -> Lomaland Ent.	Basic	4	3,435	15.8	B	3,988	18.9	C
Lomaland Ent.	Ramp	1	935	19.2	B	1,295	26.9	C
Lomaland Ent. -> Yarbrough Ent.	Merge	5	4,325	15.8	B	5,241	19.7	B
Lomaland Ent. -> Yarbrough Ent.	Basic	4	4,339	20.0	C	5,272	25.2	C
Yarbrough Ent.	Ramp	1	1,297	29.9	D	1,066	24.3	C
Yarbrough Ent. -> Viscount Ext.	Merge	5	5,640	20.5	C	6,347	23.6	C
Yarbrough Ent. -> Viscount Ext.	Basic	5	5,649	20.5	C	6,355	23.7	C
Yarbrough Ent. -> Viscount Ext.	Basic	6	5,643	17.1	B	6,351	19.7	B
Viscount Ext.	Ramp	1	302	6.4	A	311	6.6	A
Viscount Ext. -> Hawkins Ext.	Basic	5	5,343	19.4	C	6,047	22.8	C
Viscount Ext. -> Hawkins Ext.	Basic	6	5,345	16.3	B	6,050	19.8	B
Hawkins Ext.	Ramp	1	653	14.0	B	1,133	25.2	C
Hawkins Ext. -> Airway Ext.	Basic	5	4,682	16.9	B	4,912	18.1	C
Airway Ext.	Ramp	1	676	14.7	B	779	17.0	B
Airway Ext. -> Hawkins Ent.	Basic	4	3,989	18.0	C	4,128	18.9	C
Hawkins Ent.	Ramp	2	2,816	31.1	D	2,549	28.0	D
Hawkins Ent. -> Geronimo Ext.	Merge	6	6,791	20.2	C	6,672	20.0	B
Hawkins Ent. -> Geronimo Ext.	Basic	7	6,761	17.2	B	6,653	17.1	B
Geronimo Ext.	Ramp	1	689	15.9	B	752	17.4	B
Geronimo Ext. -> Airway Ent.	Basic	6	6,095	17.8	B	5,944	17.5	B
Airway Ent.	Ramp	1	615	13.0	B	674	14.3	B
Airway Ent. -> Segment 2 Ext.	Merge	7	6,669	16.7	B	6,586	16.6	B
Airway Ent. -> Segment 2 Ext.	Basic	6	6,686	20.2	C	6,611	20.3	C
Segment 2 Ext.	Ramp	3	2,863	17.5	B	4,359	28.5	D
Segment 2 Ext. -> Segment 2	Basic	3	3,803	23.1	C	2,240	13.0	B

b) Segment 3 Build VISSIM Intersection Level of Service Analysis

The Year 2042 Build condition analysis for the intersections along Segment 3 shows a significant improvement in LOS over the No Build analysis. The study showed only four intersections with poor LOS in the AM peak hour and six intersections with poor LOS in the PM peak hour, which is a significant improvement over the No Build alternative. These intersections are shown in Table 49 and are highlighted in red.

Table 49: Segment 3 2042 Build Alternative Intersection LOS

Intersection	Control Type	AM Peak		PM Peak	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
Paisano and WBFR	Signalized	12.9	B	19.3	B
Paisano and EBFR	Signalized	61.4	E	79.9	E
Trowbridge and EBFR	Signalized	39.5	D	24.9	C
Trowbridge and WBFR	Signalized	20.8	C	17.6	B
Geronimo and EBFR	Signalized	19.0	B	24.3	C
Geronimo and WBFR	Signalized	16.0	B	38.8	D
Airway and EBFR	Signalized	5.2	A	11.9	B
Airway and WBFR	Signalized	4.5	A	5.9	A
Airway and North intersection	Signalized	86.5	F	79.7	E
Viscount and EBFR	Signalized	47.6	D	65.7	E
Viscount and WBFR	Signalized	26.4	C	45.2	D
McRea and EBFR	Signalized	39.1	D	78.0	E
McRae and WBFR	Signalized	51.7	D	28.8	C
Sumac and EBFR	Signalized	14.7	B	18.6	B
Sumac and WBFR	Signalized	16.9	B	13.6	B
Yarbrough and EBFR	Signalized	16.7	B	36.9	D
Yarbrough and WBFR	Signalized	59.2	E	60.9	E
Lomaland and EBFR	Signalized	26.0	C	24.5	C
Lomaland and WBFR	Signalized	20.5	C	21.9	C
Lee Trevino and EBFR	Signalized	85.7	F	56.6	E
Lee Trevino and WBFR	Signalized	41.8	D	158.9	F
Zaragoza	Signalized	39.5	D	52.4	D
Hawkins	Signalized	30.5	C	35.7	D

6.4 Findings

Based on the analysis, there is an improvement in LOS between the No Build alternative and the Build alternative for the AM peak hour. Table 50 below provides a summary of the comparison between each alternative. The table shows that overall, the Build alternative cost to the user decreases from the No Build alternative while serving more vehicles.

Table 50: Segment 3 AM Peak Hour Measures of Effectiveness Comparison

MOE	AM Peak Hour		
	Existing AM	No Build 2042 AM	Build 2042 AM
Total travel time (veh-hr)	4098	8447	5167
Total Delay time (veh-hr)	825	4522	1453
Calculated Total Delay time (veh-hr)	744	3674	1296
Average Delay time per vehicle (sec/veh)	69	285	97
Average speed (mph)	42	24	35
Number of vehicles served	38687	46403	48326
Travel Time (min/veh)	6.36	10.92	6.42
Annual Delay Hours	619,000	3,391,000	1,090,000
Annual Delay ($)	$11,240,000	$61,580,000	$19,790,000
VMT	170591.67	204005.20	181142.46

Annual delay dollars based on 250 Working days/ 3 hours of peak traffic in each AM & PM peak / $18.19 per hour based on TTI's 2015 Urban Mobility Scorecard

Based on the analysis, there is an improvement in LOS between the No Build alternative and the Build alternative for the PM peak hour. Table 51 below provides a summary of the comparison between each alternative. The table shows that overall, the Build alternative cost to the user decreases from the No Build alternative while serving more vehicles.

Table 51: Segment 3 PM Peak Hour Measures of Effectiveness Comparison

MOE	PM Peak Hour		
	Existing PM	No Build 2042 PM	Build 2042 PM
Total travel time (veh-hr)	4613	9644	6878
Total Delay time (veh-hr)	1078	5788	2584
Calculated Total Delay time (veh-hr)	961	4554	2217
Average Delay time per vehicle (sec/veh)	85	357	153
Average speed (mph)	40	21	30
Number of vehicles served	40895	45986	52229
Travel Time (min/veh)	6.77	12.58	7.90
Annual Delay Hours	809,000	4,341,000	1,938,000
Annual Delay ($)	$14,690,000	$78,830,000	$35,190,000

MOE	PM Peak Hour		
	Existing PM	No Build 2042 PM	Build 2042 PM
VMT	183865.1257	198318.4562	209536.8468

Annual delay dollars based on 250 Working days/ 3 hours of peak traffic in each AM & PM peak / $18.19 per hour based on TTI's 2015 Urban Mobility Scorecard

7. Segment 4

7.1 Existing Conditions Analysis

Existing condition analysis provided the baseline analysis to obtain an understanding of the current operations. Segment 4 analysis used HCS and Synchro to determine the current deficiencies along the corridor.

a) Segment 4 Existing Mainlane Level of Service Analysis

The existing condition analysis for eastbound Segment 4 showed the majority of segments operating at LOS D or better. The study showed that the worst peak period was the PM peak, with two segments operating at LOS E or worse. The segments were between Eastlake Boulevard and Horizon Boulevard. Table 52 provides the details of the demand, density, and letter LOS.

Table 52: Segment 4 EB Existing Mainlane LOS Analysis

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Eastlake Ext. ->Eastlake Ent.	Basic	2	1,840	22.4	C	2,850	32.4	D
Eastlake Ent.	Merge	2	1,900	25.7	C	2,900	37.5	F
Eastlake Ent.->Horizon Ext.	Basic	2	1,900	23.1	C	2,900	33.2	D
Horizon Ext.	Diverge	2	1,900	27.2	C	2,900	45.0	F
Horizon Ext. ->Horizon Ent.	Basic	2	900	11.0	A	1,020	11.3	B
Horizon Ent.	Merge	2	1,130	15.0	B	1,300	15.7	B
Horizon Ent.->Clint Cutoff Ext.	Basic	2	1,130	11.0	A	1,300	11.5	B
Clint Cutoff Ext.	Diverge	2	1,130	17.1	B	1,300	17.8	B
Clint Cutoff Ext.->Clint Cutoff Ent	Basic	2	880	8.6	A	930	8.2	A
Clint Cutoff Ent	Merge	2	970	15.0	B	1,020	14.5	B
Clint Cutoff Ent->Fabens Ext.	Basic	2	970	9.4	A	1,020	9.0	A
Fabens Ext.	Diverge	2	970	13.3	B	1,020	12.8	B
Fabens Ext. ->Fabens Ent.	Basic	2	750	7.3	A	650	5.8	A
Fabens Ent.	Merge	2	810	11.0	B	730	9.3	A
Fabens Ent.->Turnillo Ext.	Basic	2	810	7.9	A	730	6.5	A
Turnillo Ext.	Diverge	2	810	11.7	B	730	9.9	A
Turnillo Ext. ->Turnillo Ent.	Basic	2	750	7.3	A	680	6.0	A
Turnillo Ent.	Merge	2	780	11.6	B	710	10.1	B
Turnillo Ent.->IH 10 South	Basic	2	780	7.6	A	710	6.3	A

HCS analysis was done in HCS7 Facilities Module

The existing condition analysis for westbound Segment showed the majority of segments operating at LOS D or better. The study showed that both the AM and PM peak hours operated at LOS D or better with no segments operating worse than LOS D. Table 53 provides the details of the demand, density, and letter LOS.

Table 53: Segment 4 WB Existing Mainlane LOS Analysis

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
IH 10 South->Turnillo Ext.	Basic	2	530	4.9	A	750	6.5	A
Turnillo Ext.	Diverge	2	530	8.8	A	750	10.9	B
Turnillo Ext. ->Turnillo Ent.	Basic	2	500	4.6	A	720	6.3	A
Turnillo Ent.	Merge	2	550	9.9	A	750	11.6	B
Turnillo Ent.->San Felipe Ext.	Basic	2	550	5.1	A	750	6.5	A
San Felipe Ext.	Diverge	2	550	9.0	A	750	10.9	B
San Felipe Ext. ->San Felipe Ent.	Basic	2	490	4.6	A	690	6.0	A
San Felipe Ent.	Merge	2	790	10.8	B	920	11.7	B
San Felipe Ent.->Darrington Ext.	Basic	2	790	7.3	A	920	8.0	A
Darrington Ext.	Diverge	2	790	12.4	B	920	13.3	B
Darrington Ext. ->Darrington Ent.	Basic	2	740	6.9	A	850	7.4	A
Darrington Ent.	Merge	2	1,110	15.2	B	1,100	14.4	B
Darrington Ent.->Horizon Ext.	Basic	2	1,110	10.3	A	1,100	9.6	A
Horizon Ext.	Diverge	2	1,110	16.2	B	1,100	15.3	B
Horizon Ext. ->Horizon Ent.	Basic	2	920	8.6	A	860	7.5	A
Horizon Ent.	Merge	2	2,550	28.6	D	1,980	21.0	C
Horizon Ent.->Eastlake Ext.	Basic	2	2,550	26.0	D	1,980	17.5	B
Eastlake Ext.	Diverge	2	2,550	33.5	D	1,980	25.2	C
Eastlake Ext. ->Eastlake Ent.	Basic	2	2,470	24.9	C	1,890	16.6	B

HCS analysis was done in HCS7 Facilities Module

b) Intersection Level of Service Analysis

Segment 4 has a total of 10 intersections. In the AM Peak, there are six of the 10 intersections operating with an acceptable LOS. The other 4 intersections all operate with a LOS F, with the larges delay being 136.3 sec. The AM peak showed two interchanges operating with poor LOS. This is summarized on Table 54.

Table 54: Segment 4 - Existing Intersection LOS

Intersections	Control Type	AM Peak		PM Peak	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
I-10 EB Frontage Road & Eastlake	Signal Control	66.0	E	54.0	D
I-10 WB Frontage Road & Eastlake	Signal Control	135.3	F	34.1	C
I-10 EB Frontage Road & Horizon	Signal Control	106.8	F	80.2	F
I-10 WB Frontage Road & Horizon	Signal Control	136.3	F	84.5	F
I-10 EB Frontage Road & Darrington	Signal Control	27.6	C	20.3	C
I-10 WB Frontage Road & Darrington	Signal Control	12.3	B	9.2	A
I-10 EB Frontage Road & San Felipe/Fabens	AWSC	11.3	B	12.7	B
I-10 WB Frontage Road & San Felipe/Fabens	AWSC	9.7	A	10.0	A
I-10 EB Frontage Road & OT Smith	AWSC	7.3	A	7.3	A
I-10 WB Frontage Road & OT Smith	AWSC	7.4	A	7.2	A

7.2 No Build Operational Analysis

The 2042 No Build models were used as a comparison tool to measure the effectiveness of the build alternatives. The No Build models assumed committed projects in the analysis. Segment 4 No Build Mainlane Level of Service Analysis

a) Segment 4 – No Build Mainlane Level of Service Analysis

The Year 2042 No Build condition analysis for eastbound Segment 4 showed that the majority of segments still operating at LOS D or better. However, with the increase in vehicles, density increased overall. The study showed that the worst peak period was the PM peak, with 4 segments operating at LOS E or worse. This accounts for 21 percent of the segments, while 79 percent of the segments operate at LOS D or better. The majority of Segment 4 that failed during this period is near Eastlake Blvd and Horizon Blvd. Table 55 provides the details of the demand, density, and letter LOS.

Table 55: Segment 4 EB 2042 No Build Mainlane LOS Analysis

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Eastlake Ext. ->Eastlake Ent.	Basic	2	2,730	30.4	D	4,220	57.9	F
Eastlake Ent.	Merge	2	2,820	35.7	F	4,290	42.8	F
Eastlake Ent.->Horizon Ext.	Basic	2	2,820	31.6	D	4,290	39.2	E
Horizon Ext.->Horizon Ext.	Diverge	2	2,820	35.4	F	4,290	45.0	F
Horizon Ext. ->Horizon Ent.	Basic	2	1,340	14.7	B	1,510	16.7	B
Horizon Ent. ->Horizon Ent.	Merge	2	1,670	20.1	C	1,920	23.4	C
Horizon Ent.->Clint Cutoff Ext.	Basic	2	1,670	14.7	B	1,920	17.2	B
Clint Cutoff Ext.->Clint Cutoff Ext.	Diverge	2	1,670	21.9	C	1,920	24.9	C
Clint Cutoff Ext.->Clint Cutoff Ent	Basic	2	1,300	11.4	B	1,370	12.1	B
Clint Cutoff Ent	Merge	2	1,430	18.6	B	1,500	19.5	B
Clint Cutoff Ent->Fabens Ext.	Basic	2	1,430	12.6	B	1,500	13.3	B
Fabens Ext.	Diverge	2	1,430	17.3	B	1,500	18.3	B
Fabens Ext. ->Fabens Ent.	Basic	2	1,100	9.7	A	950	8.4	A
Fabens Ent.	Merge	2	1,190	14.0	B	1,070	12.8	B
Fabens Ent.->Turnillo Ext.	Basic	2	1,190	10.5	A	1,070	9.5	A
Turnillo Ext.	Diverge	2	1,190	15.1	B	1,070	13.8	B
Turnillo Ext. ->Turnillo Ent.	Basic	2	1,100	9.7	A	1,000	8.9	A
Turnillo Ent.	Merge	2	1,150	14.5	B	1,050	13.6	B
Turnillo Ent.->IH 10 East	Basic	2	1,150	10.1	A	1,050	9.3	A

HCS analysis was done in HCS7 Facilities Module

No Build Analysis considers geometrical improvements from other committed projects shown in the table

The Year 2042 No Build condition analysis for westbound Segment 4 showed that the majority of segments still operating at LOS D or better. However, with the increase in vehicles, density increased overall. The study showed that the worst peak period was the AM peak, with 4 segments operating at LOS E or worse. This accounts for 21 percent of the segments, while 79 percent of the segments operate at LOS D or better. The majority of Segment 4 that failed during this time period is near Eastlake Blvd and Horizon Blvd. Table 56 provides the details of the demand, density, and letter LOS.

Table 56: Segment 4 WB 2042 Build Mainlane LOS Analysis

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
IH 10 East->Turnillo Ext.	Basic	2	780	6.3	A	1,110	9.4	A
Turnillo Ext.	Diverge	2	780	10.5	B	1,110	14.5	B
Turnillo Ext. ->Turnillo Ent.	Basic	2	730	5.9	A	1,060	8.9	A
Turnillo Ent.	Merge	2	800	11.4	B	1,110	14.9	B
Turnillo Ent.->San Felipe Ext.	Basic	2	800	6.4	A	1,110	9.4	A
San Felipe Ext.	Diverge	2	800	10.7	B	1,110	14.5	B
San Felipe Ext. ->San Felipe Ent.	Basic	2	710	5.7	A	1,020	8.6	A
San Felipe Ent.	Merge	2	1,150	12.9	B	1,360	15.7	B
San Felipe Ent.->Darrington Ext.	Basic	2	1,150	9.2	A	1,360	11.5	B
Darrington Ext.	Diverge	2	1,150	14.8	B	1,360	17.7	B
Darrington Ext. ->Darrington Ent.	Basic	2	1,080	8.7	A	1,260	10.6	A
Darrington Ent.	Merge	2	1,640	18.4	B	1,630	19.2	B
Darrington Ent.->Horizon Ext.	Basic	2	1,640	13.1	B	1,630	13.8	B
Horizon Ext.	Diverge	2	1,640	19.9	B	1,630	20.7	C
Horizon Ext. ->Horizon Ent.	Basic	2	1,360	10.9	A	1,270	10.7	A
Horizon Ent.	Merge	2	2,565	24.5	C	2,100	21.4	C
Horizon Ent.	Merge	2	3,770	41.3	F	2,930	30.2	D
Horizon Ent.->Eastlake Ext.	Basic	2	3,770	39.5	E	2,930	27.7	D
Eastlake Ext.	Diverge	2	3,770	41.9	F	2,930	34.8	D
Eastlake Ext. ->Eastlake Ent.	Basic	2	3,650	40.9	E	2,800	25.9	C

HCS analysis was done in HCS7 Facilities Module

No Build Analysis considers geometrical improvements from other committed projects shown in the table

b) Intersection Level of Service Analysis

The Year 2042 No Build condition analysis for the intersections along Segment 4 determined a significant reduction in operating conditions. The study showed that both AM, and PM peak hours have four intersections that operate at a pool LOS. These intersections are shown in Table 57 and are highlighted in red. The No Build analysis considers geometrical improvements from other committed projects.

Table 57: Segment 4 – 2042 No Build Intersection LOS

Intersections	Control Type	AM Peak		PM Peak	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
I-10 EB Frontage Road & Eastlake	Signal Control	66.7	E	229.4	F
I-10 WB Frontage Road & Eastlake	Signal Control	371.4	F	161.7	F
I-10 EB Frontage Road & Horizon	Signal Control	193.0	F	245.0	F
I-10 WB Frontage Road & Horizon	Signal Control	328.7	F	210.8	F
I-10 EB Frontage Road & Darrington	Signal Control	52.8	D	36.9	D
I-10 WB Frontage Road & Darrington	Signal Control	25.7	C	11.3	B
I-10 EB Frontage Road & San Felipe/Fabens	AWSC	21.4	C	34.1	D
I-10 WB Frontage Road & San Felipe/Fabens	AWSC	14.2	B	14.1	B
I-10 EB Frontage Road & OT Smith	AWSC	7.6	A	7.5	A
I-10 WB Frontage Road & OT Smith	AWSC	7.7	A	7.5	A

7.3 Recommended Alternative Analysis

The studied alternative for Segment 4 was Alternative 2 (Ref 6). Alternative 2 provides 15' wide inside shoulders, which improve safety, allow for more effective incident management, and may be used as a peak period or special purpose lanes in the future. This alternative also includes changes in ramping, auxiliary lanes, and additional capacity in some areas. Refer to Section 4 of the Feasibility Report for a detailed description of the Recommended Alternative.

a) Mainlane Level of Service Analysis

The Year 2042 Build condition analysis for eastbound Segment 4 showed that all segments improved and operate at LOS D or better. The proposed alternative provided the capacity needed to improve traffic flow for all the segments and improve conditions near Eastlake and Horizon Blvd. Table 58 provides details regarding demand, density, and letter LOS.

Table 58: Segment 4 EB 2042 Build Mainlane LOS

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
Loop 375 DC ONR -> Frontage RD ONR	Basic	5	2570	11.3	B	3890	17.1	B
Frontage RD ONR	Merge	5	2730	10.6	B	4220	16.5	B
Frontage RD ONR -> Horizon OFR	Basic	5	2730	12	B	4220	18.6	C
Horizon OFR	Diverge	5	273	12	B	4220	18.6	C
Horizon OFR -> Eastlake ONR	Basic	4	1250	6.9	A	1440	7.9	A
Eastlake ONR	Merge	4	1340	7.6	A	1510	8.6	A
Eastlake ONR -> Darrington OFR	Overlap	4	1340	57.9	A	1510	57.8	A
Darrington OFR	Diverge	4	1340	5.9	A	1510	6.6	A
Horizon OFR -> Eastlake ONR	Basic	3	970	5.7	A	960	5.6	A
Horizon ONR	Merge	3	1300	9.7	A	1370	10.4	B
Horizon ONR -> Darrington ONR	Basic	3	1300	7.6	A	1370	8	A
Darrington ONR	Merge	4	1430	6.3	A	1500	6.6	A
Darrington ONR -> San Felipe OFR	Basic	4	1430	6.3	A	1500	6.6	A
San Felipe OFR	Diverge	4	1430	6.3	A	1500	6.6	A
San Felipe OFR -> San Felipe ONR	Basic	3	1100	6.5	A	950	5.6	A
San Felipe ONR	Merge	4	1190	5.2	A	1070	4.7	A
San Felipe ONR -> OT Smith OFR	Basic	4	1190	5.2	A	1070	4.7	A
OT Smith OFR	Diverge	4	1190	5.2	A	1070	4.7	A
OT Smith OFR -> OT Smith ONR	Basic	3	1100	6.5	A	1000	5.9	A
OT Smith ONR	Merge	3	1150	8.1	A	1050	7.5	A
I-10 EB	Basic	3	1150	6.7	A	1050	6.2	A

The Year 2042 Build condition analysis for eastbound Segment 4 showed that all segments improved and operate at LOS D or better. The proposed alternative provided the capacity needed to improve traffic flow for all the segments and improve conditions near Eastlake and Horizon Blvd. Table 59 provides details regarding demand, density, and letter LOS.

Table 59: Segment 4 WB 2042 Build Mainlane LOS

Segment Name	Segment Type	# of Lanes	AM Peak			PM Peak		
			Demand	Density	LOS	Demand	Density	LOS
I-10 WB -> OT Smith OFR	Basic	3	780	4.2	A	780	3.7	A
OT Smith OFR	Diverge	3	780	9.4	A	780	4	A
OT Smith OFR -> OT Smith ONR	Basic	3	730	3.9	A	730	3.5	A
OT Smith ONR	Merge	4	800	3.2	A	800	2.8	A
OT Smith ONR -> San Felipe OFR	Basic	4	800	3.2	A	800	2.8	A
San Felipe OFR	Diverge	4	800	3.2	A	800	2.8	A
San Felipe OFR -> San Felipe ONR	Basic	3	710	3.8	A	710	3.4	A
San Felipe ONR	Merge	4	1150	4.6	A	1150	4.1	A
San Felipe ONR -> Darrington OFR	Basic	4	1150	4.6	A	1150	4.1	A
Darrington OFR	Diverge	4	1150	4.6	A	1150	4.1	A
Darrington OFR -> New Connection OFR	Basic	3	1080	5.8	A	1080	5.1	A
New Connection OFR	Diverge	3	1080	11.2	B	1080	10.3	B
New Connection OFR -> New Connection ONR	Basic	3	800	4.3	A	800	3.8	A
New Connection ONR	Merge	4	1360	5.4	A	1360	4.8	A
New Connection ONR -> Eastlake OFR	Basic	4	1360	5.5	A	1360	4.8	A
Eastlake OFR	Diverge	4	1360	6.8	A	1360	6.1	A
Eastlake OFR -> Horizon ONR	Basic	4	1240	6.2	A	1240	5.5	A
Horizon ONR	Merge	5	3500	14	B	3500	12.4	B
Horizon ONR -> Add Lane	Basic	5	3500	14	B	3500	12.4	B
Joe Battle OFR	Diverge	5	3500	20	B	3500	19.4	B
Joe Battle OFR -> Loop 375 DC OFR	Basic	5	2920	11.7	B	2920	10.4	A

b) Intersection Level of Service Analysis

Interchanges that explicitly designed for high-left turning volume include the continuous flow intersection (CFI), the single point urban interchange (SPUI), and the diverging diamond interchange (DDI). The main differences between these interchanges and a traditional diamond interchange include a reduced number of signal phases (CFI, DDI, and SPUI) and increased storage bays (CFI). These interchanges were analyzed with volumes from the Eastlake Blvd and Horizon Blvd interchanges and operated effectively with the provision of two free flowing right turn lanes for the southbound to westbound movement. Table 60 summarizes the results.

A DDI is proposed at both Eastlake Blvd and Horizon Blvd. Two free flowing right turns lanes are provided for the southbound to westbound movements at these interchanges to accommodate high right turn volumes. Impacts and access to adjacent properties will need to be evaluated during future phases of design.

Table 60: Segment 4 – 2042 Build Intersection LOS Analysis

Segment 4 Intersections	Alternative Improvements	AM Peak		PM Peak	
		Delay (Sec/veh)	LOS	Delay (Sec/veh	LOS
I-10 EB Frontage Road & Eastlake	Changed to DDI	B	19.7	D	46.6
I-10 WB Frontage Road & Eastlake		B	15.4	D	35.5
I-10 EB Frontage Road & Horizon	Changed to DDI	C	21.6	D	41.3
I-10 WB Frontage Road & Horizon		C	21.2	D	38.5
I-10 EB Frontage Road & Darrington		D	51.0	C	33.1
I-10 WB Frontage Road & Darrington		C	33.2	B	11.6
I-10 EB Frontage Road & San Felipe/Fabens		B	13.1	B	11.6
I-10 WB Frontage Road & San Felipe/Fabens	Added Turn Bay	B	10.9	B	12.9
I-10 EB Frontage Road & OT Smith		A	7.7	A	7.5
I-10 WB Frontage Road & OT Smith		A	7.7	A	7.5

7.4 Findings

a) Segment 4 Build Mainlane Level of Service Analysis Summary

Based on the analysis, there is a significant improvement in LOS between the No Build alternative and the Build alternative. **Figure 12** below provides a summary of the comparison between each alternative. The figure shows a reduction of the number of segments in the LOS E & F column between the No Build and Build alternatives for both AM and PM peak hours.

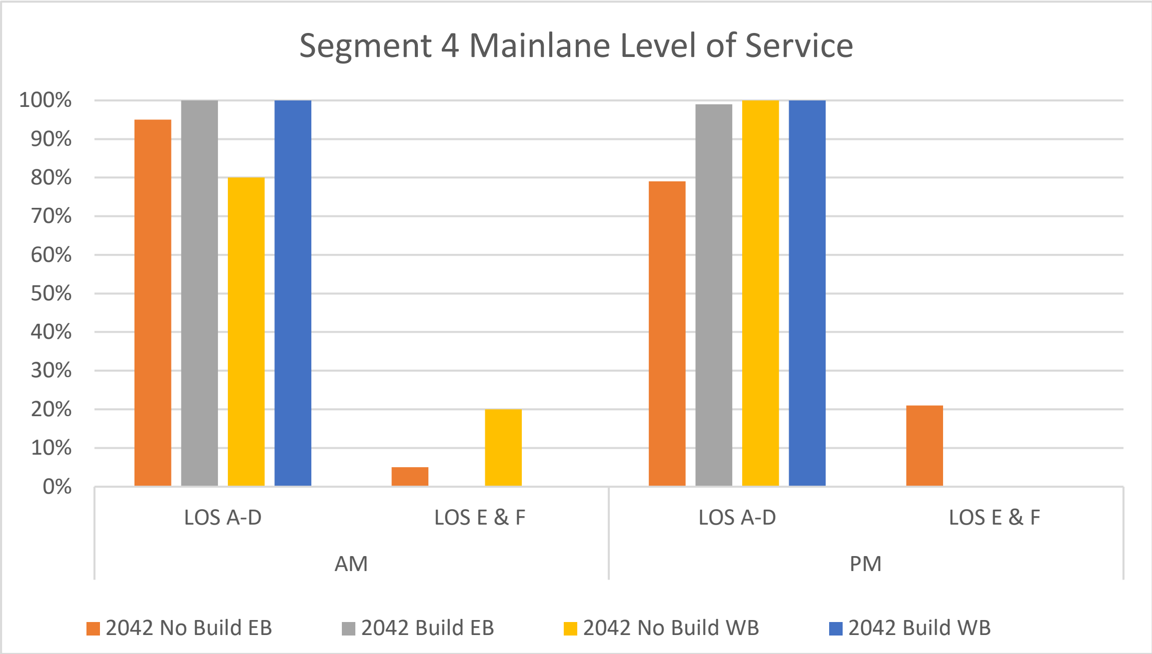


Figure 12: Segment 4 Mainlane Level of Service Summary

b) Segment 4 Intersection Level of Service Analysis Summary

Based on the analysis, there is a significant improvement between the No Build alternative and the Build alternative.

3 below provides a summary of the comparison between each alternative. The figure shows a reduction of the number of segments in the LOS E&F column between the No Build and Build alternatives for both AM and PM peak hours.

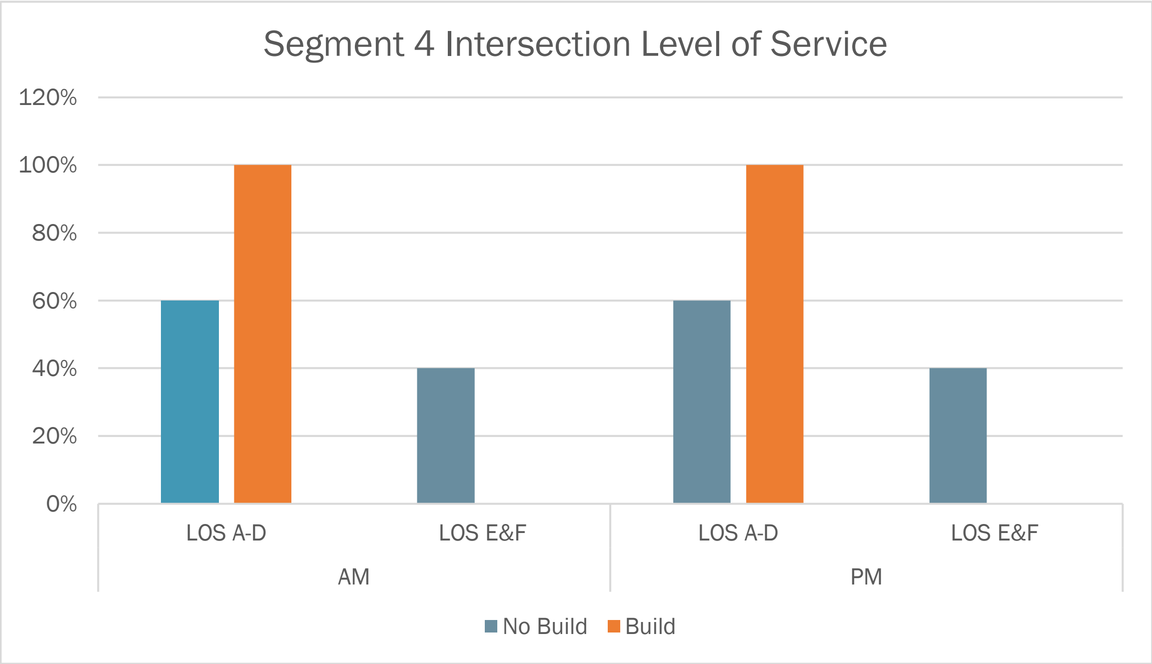


Figure 13: Segment 4 Mainlane Level of Service Summary

8. Summary

The primary objectives of the study were to address the following criteria:

1. Mobility & Circulation: Facilitate movement through and within the corridor
2. Design: Comply with accepted design standards to provide a safer facility
3. Technology: Leverage advancing technologies to address corridor issues

This analysis assisted the roadway planners and designers in helping determine the benefits of the proposed alternatives.

8.1 Results and Analysis

Segment 1 alternative comparison clearly shows that the LOS improves in both directions of travel and both peak hours in the Build alternative when compared with the No Build alternative, as shown in Table 61. The PM peak hour showed the most improvement, with the eastbound percent of segments at LOS E or worse going from 33 percent to 11 percent and the westbound percent of segments at LOS E or worse going from 32 percent to 18 percent.

Table 61: Segment 1 Percent Passing Comparison – From the HCS Analysis

Direction	Time	Existing		2042 No Build		2042 Build	
		% LOS D or better	% LOS E or worse	% LOS D or better	% LOS E or worse	% LOS D or better	% LOS E or worse
EB	AM	87%	13%	80%	20%	93%	7%
	PM	95%	5%	67%	33%	89%	11%
WB	AM	91%	9%	82%	18%	94%	6%
	PM	82%	18%	68%	32%	82%	18%

Segment 2 alternative comparison clearly shows that LOS improves in both the directions of travel and in both peak hours in the Build alternative when compared with the No Build alternative, as shown in Table 62. The PM peak hour showed the most improvement, with the eastbound percent of segments at LOS E or worse going from 76 percent to six percent and the westbound percent of segments at LOS E or worse going from 53 percent to 10 percent LOS E or worse. The eastbound AM peak hour also improved significantly, with the number segments at LOS E or worse, reducing from 52 percent to nine percent.

Table 62: Segment 2 Percent Passing Comparison - From the HCS Analysis

Direction	Time	Existing		2042 No Build		2042 Build	
		% LOS D or better	% LOS E or worse	% LOS D or better	% LOS E or worse	% LOS D or better	% LOS E or worse
EB	AM	88%	12%	48%	52%	91%	9%
	PM	85%	15%	24%	76%	94%	6%
WB	AM	89%	11%	56%	44%	58%	42%
	PM	95%	5%	47%	53%	90%	10%

Segment 2 No Build and Build 2042 alternatives relative delay and speed were compared against each other for four 15-minute intervals to get a sense of how peak hour spreading increased for the No Build alternative and how the recommended Build alternative improved congestion on the corridor. Figure 14 and Figure 15 shows the comparison.

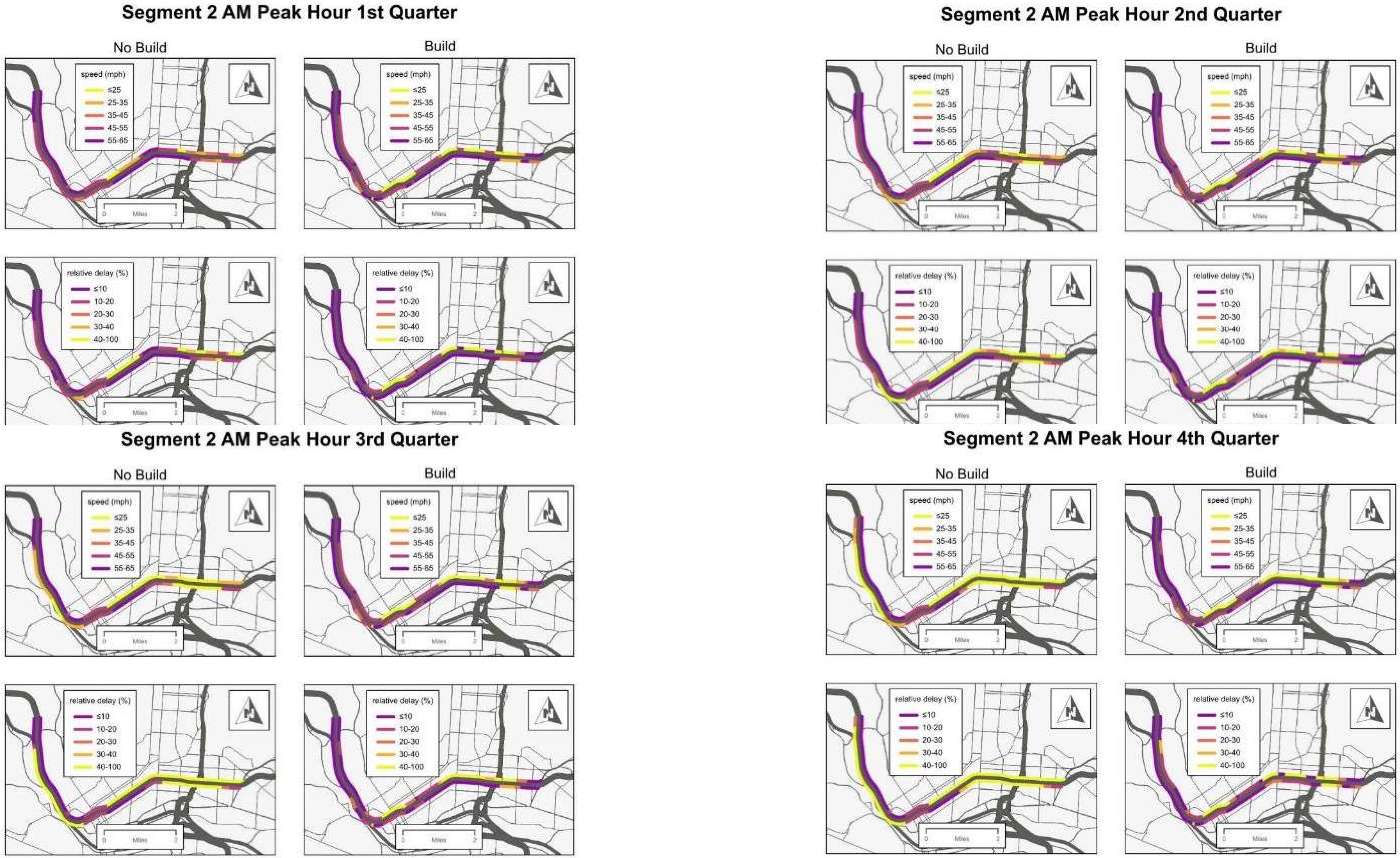
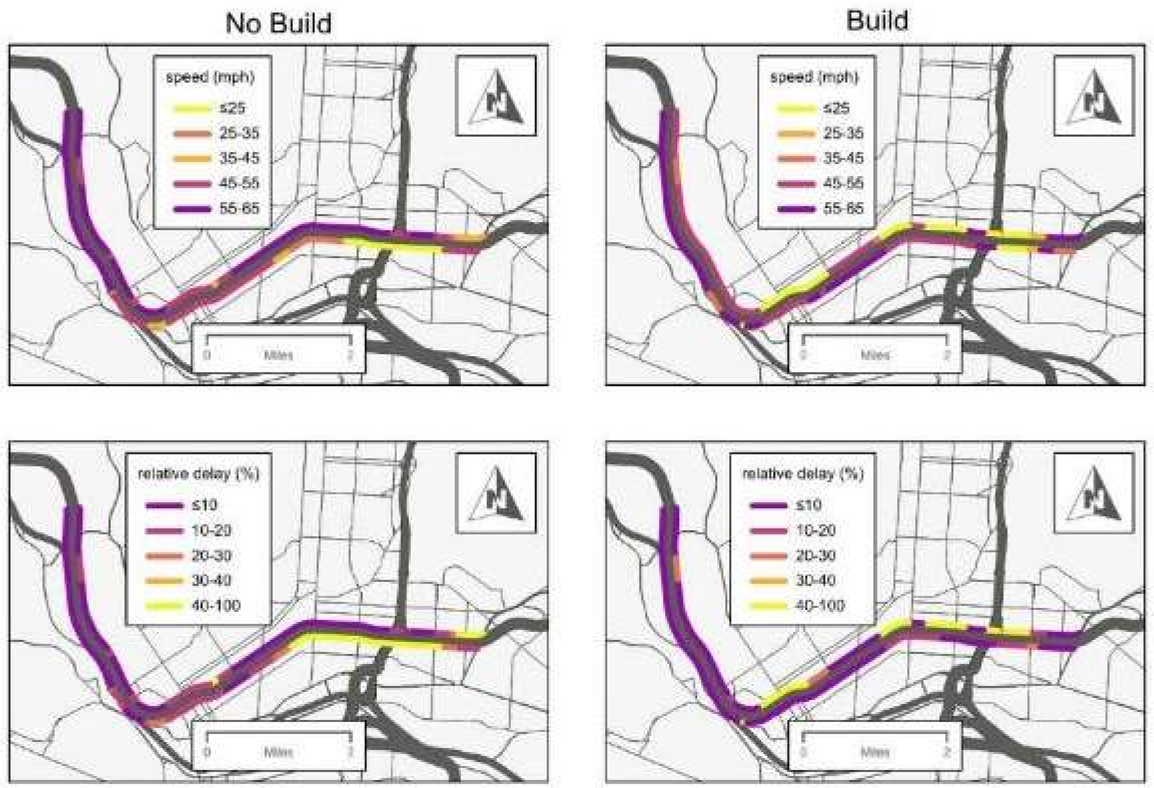
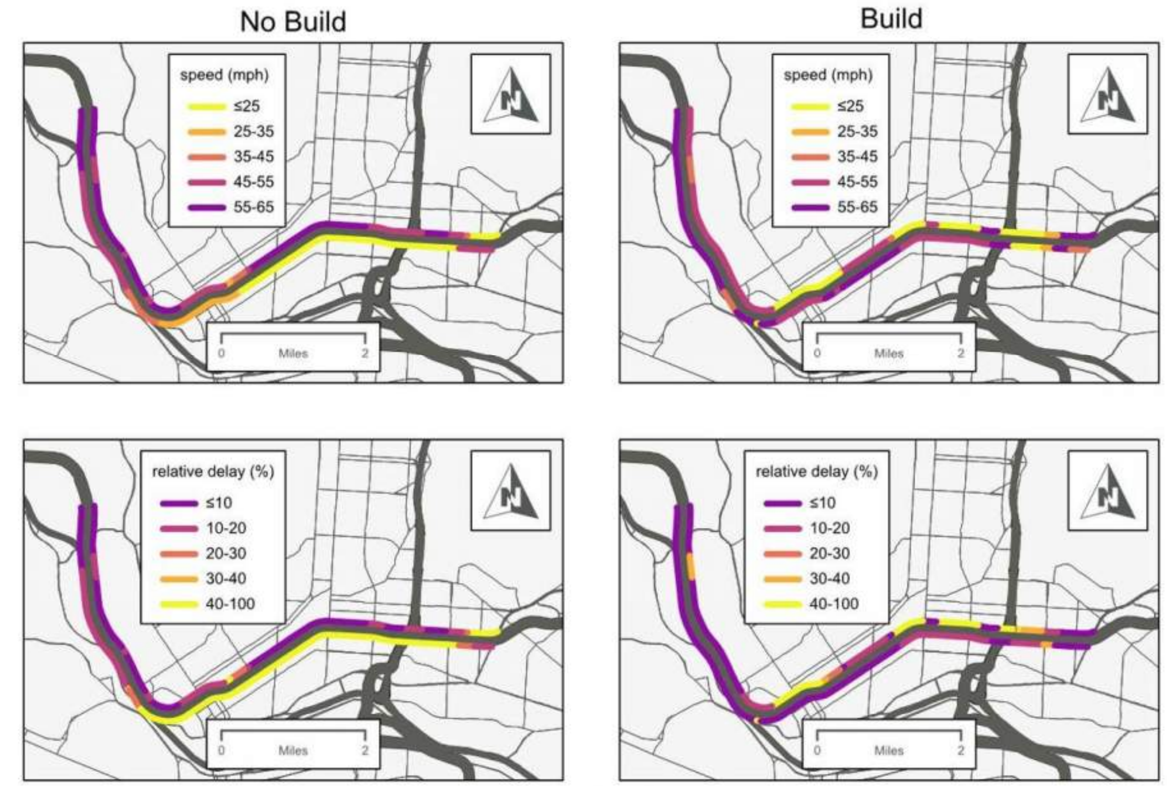


Figure 14: Segment 2 No Build and Build 2042 AM Delay and Speed Comparison

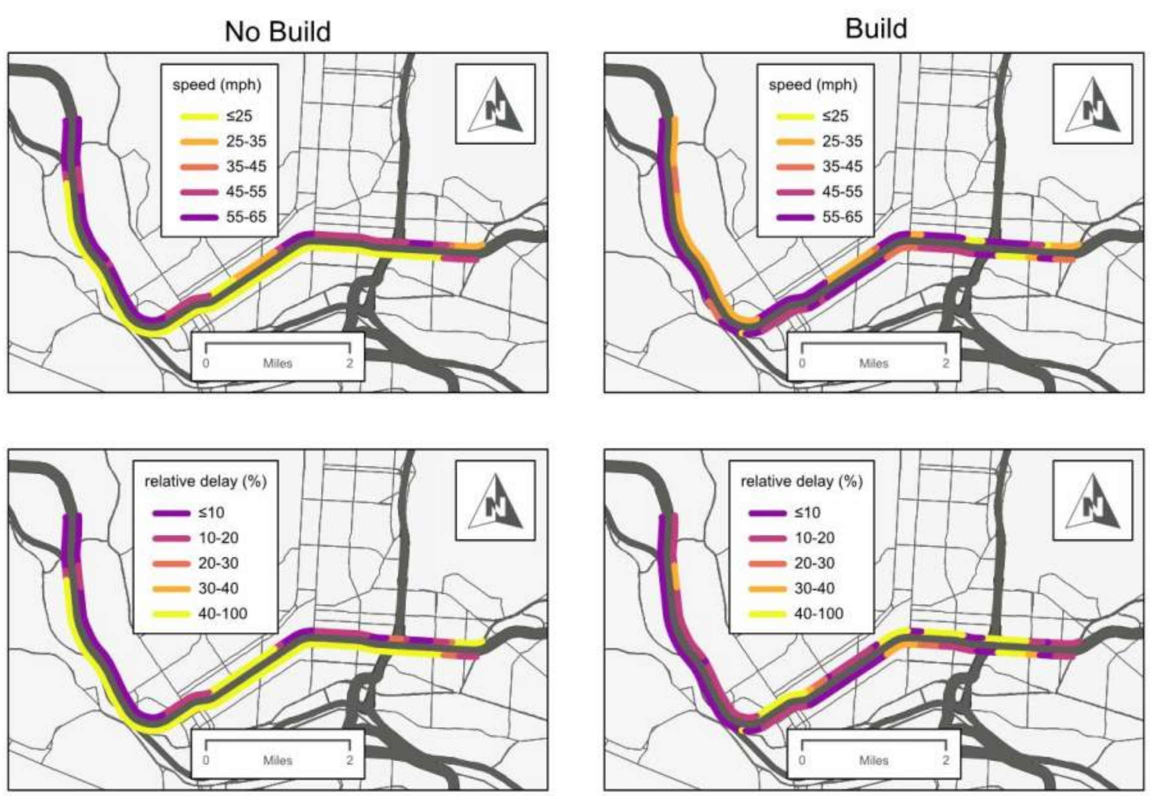
Segment 2 PM Peak Hour 1st Quarter



Segment 2 PM Peak Hour 2nd Quarter



Segment 2 PM Peak Hour 3rd Quarter



Segment 2 PM Peak Hour 4th Quarter

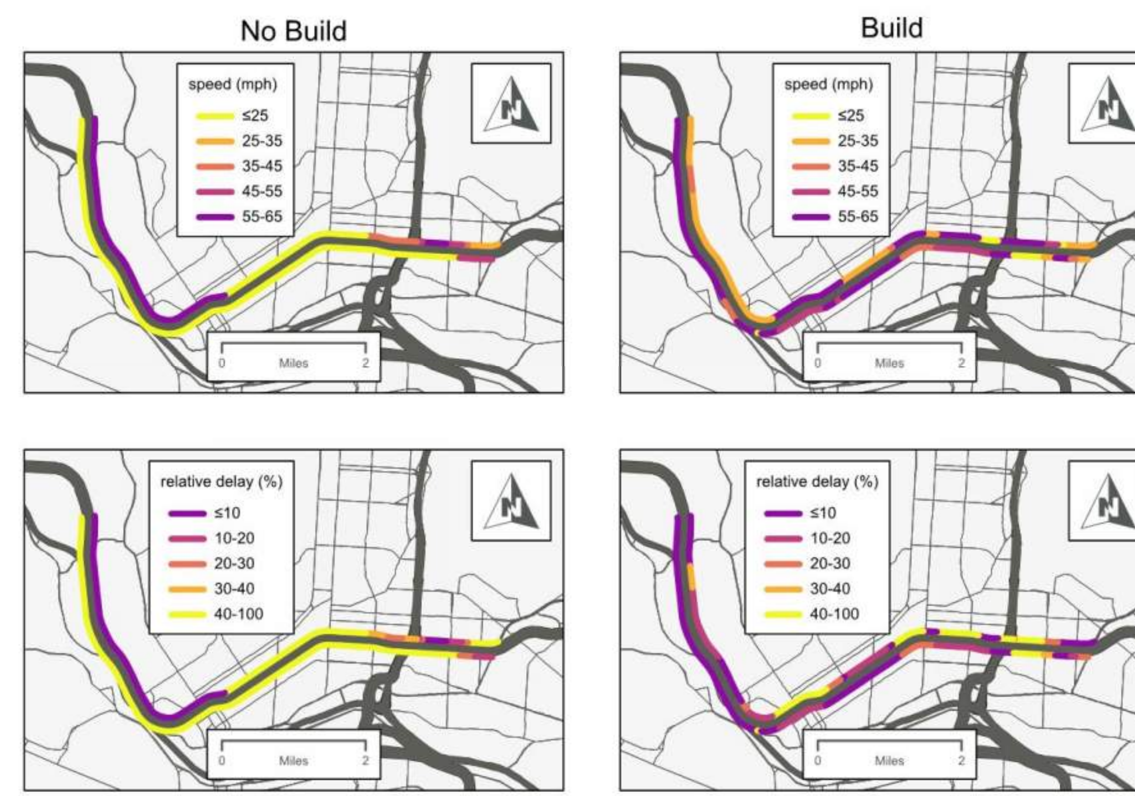


Figure 15: Segment 2 No Build and Build 2042 PM Delay and Speed Comparison

Segment 3 alternative comparison clearly shows that LOS improves in both the directions of travel and in both peak hours in the Build alternative when compared with the No Build alternative, as shown in Table 63. Both the AM and PM peak hours showed significant improvements over the No Build. The most considerable improvement was in the AM peak hour in the westbound direction, with the number of segments at LOS E or worse, reducing from 53 percent to zero percent.

Table 63: Segment 3 Percent Passing Comparison

Direction	Time	Existing		2042 No Build		2042 Build	
		% LOS E or worse	% LOS D or better	% LOS E or worse	% LOS E or worse	% LOS D or better	% LOS E or worse
EB	AM	100%	0%	64%	36%	91%	9%
	PM	87%	13%	36%	64%	79%	21%
WB	AM	93%	7%	47%	53%	100%	0%
	PM	98%	2%	55%	45%	96%	4%

Segment 3 No Build and Build 2042 alternatives relative delay and speed were compared against each other for four 15-minute intervals to get a sense of how peak hour spreading increased for the No Build alternative and how the recommended Build alternative improved congestion on the corridor.

8.2 Conclusion

Based on available data from TxDOT, cities in the El Paso Metropolitan area, the El Paso MPO, and supplemental data provided by GRV, the traffic analysis concluded that if improvements are not implemented on IH 10, delays and user costs will significantly increase over the next 20 years. Potential negative impacts on the economy (from extensive delays and increased incidences due to substandard design) are mitigated through the implementation of the recommended alternative designs.

References

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4. Cambridge Systematics, Inc. *NCFRP Report 649: Separation of Vehicles: CMV-Only Lanes.* TRB, National Research Council, Washington, DC, 2010.
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6. Feasibility Study

Appendix F

IHSDM Mainlane Predictive Crash Analysis Outputs

No Build

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

September 17, 2019

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Table of Contents

List of Tables

List of Figures

Report Overview

Report Generated: Sep 17, 2019 10:34 AM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Jun 18, 2019 9:17 AM)

Evaluation Date: Thu Feb 21 16:31:31 CST 2019
IHSDM Version: v14.0.0 (Sep 26, 2018)
Crash Prediction Module: v9.0.0 (Sep 26, 2018)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: Reimagine I-10 Existing
Project Comment: Created Thu Jul 05 15:19:00 CDT 2018
Project Unit System: U.S. Customary

Highway Title: Alignment I10P
Highway Comment: Imported from I10-P.xml
Highway Version: 1

Evaluation Title: Evaluation AADT Fix
Evaluation Comment: Created Thu Feb 21 16:09:18 CST 2019

Minimum Location: 1000+00.000
Maximum Location: 4035+90.691
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
Empirical-Bayes Analysis: None
First Year of Analysis: 2022
Last Year of Analysis: 2042

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 1000+00.000
Evaluation End Location: 4035+90.691
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_EN=1.0; FI_EX=1.0; FI_MV=1.0; FI_SV=1.0; PDO_EN=1.0; PDO_EX=1.0; PDO_MV=1.0; PDO_SV=1.0;

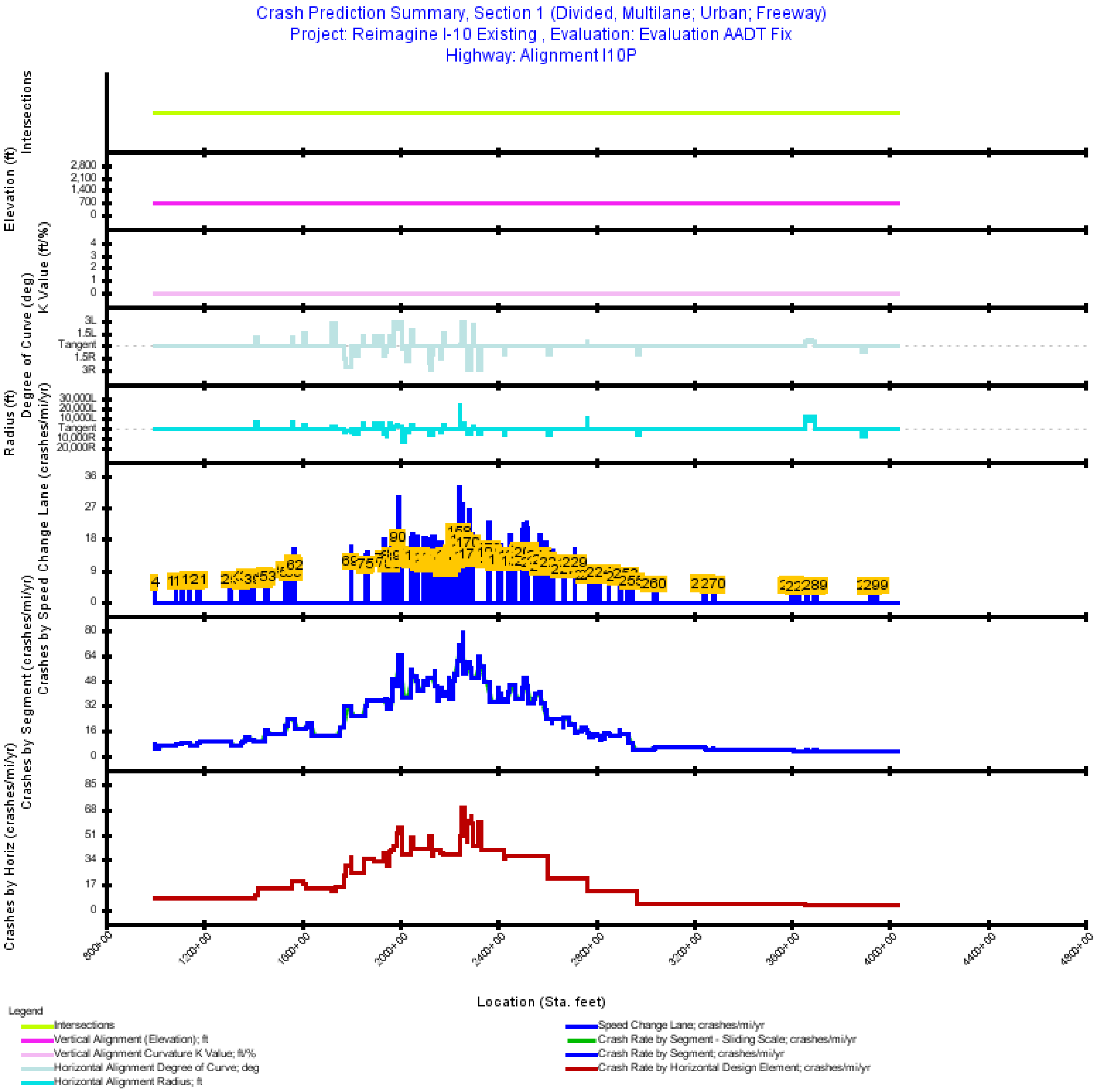

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	4F	Urban	1000+00.000	1001+07.510	107.51	0.0204	2022: 28,450; 2023: 28,937; 2024: 29,425; 2025: 29,912; 2026: 30,400; 2027: 30,887; 2028: 31,375; 2029: 31,862; 2030: 32,350; 2031: 32,837; 2032: 33,325; 2033: 33,812; 2034: 34,300; 2035: 34,787; 2036: 35,275; 2037: 35,762; 2038: 36,250; 2039: 36,737; 2040: 37,225; 2041: 37,712; 2042: 38,200	6.00	Non-Traversable Median	26.00
3	4F	Urban	1001+07.510	1001+30.470	22.96	0.0043	2022: 25,800; 2023: 26,242; 2024: 26,685; 2025: 27,127; 2026: 27,570; 2027: 28,012; 2028: 28,455; 2029: 28,897; 2030: 29,340; 2031: 29,782; 2032: 30,225; 2033: 30,667; 2034: 31,110; 2035: 31,552; 2036: 31,995; 2037: 32,437; 2038: 32,880; 2039: 33,322; 2040: 33,765; 2041: 34,207; 2042: 34,650	6.00	Non-Traversable Median	26.00
5	4F	Urban	1001+30.470	1018+93.610	1,763.14	0.3339	2022: 23,750; 2023: 24,157; 2024: 24,565; 2025: 24,972; 2026: 25,380; 2027: 25,787; 2028: 26,195; 2029: 26,602; 2030: 27,010; 2031: 27,417; 2032: 27,825; 2033: 28,232; 2034: 28,640; 2035: 29,047; 2036: 29,455; 2037: 29,862; 2038: 30,270; 2039: 30,677; 2040: 31,085; 2041: 31,492; 2042: 31,900	6.00	Non-Traversable Median	26.00
6	4F	Urban	1018+93.610	1035+88.900	1,695.29	0.3211	2022: 28,750; 2023: 29,242; 2024: 29,735; 2025: 30,227; 2026: 30,720; 2027: 31,212; 2028: 31,705; 2029: 32,197; 2030: 32,690; 2031: 33,182; 2032: 33,675; 2033: 34,167; 2034: 34,660; 2035: 35,152; 2036: 35,645; 2037: 36,137; 2038: 36,630; 2039: 37,122; 2040: 37,615; 2041: 38,107; 2042: 38,600	6.00	Non-Traversable Median	26.00
7	4F	Urban	1035+88.900	1081+93.610	4,604.71	0.8721	2022: 28,400; 2023: 28,887; 2024: 29,375; 2025: 29,862; 2026: 30,350; 2027: 30,837; 2028: 31,325; 2029: 31,812; 2030: 32,300; 2031: 32,787; 2032: 33,275; 2033: 33,762; 2034: 34,250; 2035: 34,737; 2036: 35,225; 2037: 35,712; 2038: 36,200; 2039: 36,687; 2040: 37,175; 2041: 37,662; 2042: 38,150	6.00	Non-Traversable Median	26.00
8	4F	Urban	1081+93.610	1084+46.040	252.43	0.0478	2022: 28,400; 2023: 28,887; 2024: 29,375; 2025: 29,862; 2026: 30,350; 2027: 30,837; 2028: 31,325; 2029: 31,812; 2030: 32,300; 2031: 32,787; 2032: 33,275; 2033: 33,762; 2034: 34,250; 2035: 34,737; 2036: 35,225; 2037: 35,712; 2038: 36,200; 2039: 36,687; 2040: 37,175; 2041: 37,662; 2042: 38,150	6.00	Non-Traversable Median	26.00
9	4F	Urban	1084+46.040	1108+25.790	2,379.75	0.4507	2022: 32,800; 2023: 33,365; 2024: 33,930; 2025: 34,495; 2026: 35,060; 2027: 35,625; 2028: 36,190; 2029: 36,755; 2030: 37,320; 2031: 37,885; 2032: 38,450; 2033: 39,015; 2034: 39,580; 2035: 40,145; 2036: 40,710; 2037: 41,275; 2038: 41,840; 2039: 42,405; 2040: 42,970; 2041: 43,535; 2042: 44,100	6.00	Non-Traversable Median	26.00
11	4F	Urban	1108+25.790	1141+21.180	3,295.39	0.6241	2022: 34,050; 2023: 34,635; 2024: 35,220; 2025: 35,805; 2026: 36,390; 2027: 36,975; 2028: 37,560; 2029: 38,145; 2030: 38,730; 2031: 39,315; 2032: 39,900; 2033: 40,485; 2034: 41,070; 2035: 41,655; 2036: 42,240; 2037: 42,825; 2038: 43,410; 2039: 43,995; 2040: 44,580; 2041: 45,165; 2042: 45,750	6.00	Non-Traversable Median	26.00
15	4F	Urban	1141+21.180	1142+97.170	175.99	0.0333	2022: 32,350; 2023: 32,907; 2024: 33,465; 2025: 34,022; 2026: 34,580; 2027: 35,137; 2028: 35,695; 2029: 36,252; 2030: 36,810; 2031: 37,367; 2032: 37,925; 2033: 38,482; 2034: 39,040; 2035: 39,597; 2036: 40,155; 2037: 40,712; 2038: 41,270; 2039: 41,827; 2040: 42,385; 2041: 42,942; 2042: 43,500	6.00	Non-Traversable Median	26.00
17	4F	Urban	1142+97.170	1171+25.410	2,828.24	0.5356	2022: 30,850; 2023: 31,380; 2024: 31,910; 2025: 32,440; 2026: 32,970; 2027: 33,500; 2028: 34,030; 2029: 34,560; 2030: 35,090; 2031: 35,620; 2032: 36,150; 2033: 36,680; 2034: 37,210; 2035: 37,740; 2036: 38,270; 2037: 38,800; 2038: 39,330; 2039: 39,860; 2040: 40,390; 2041: 40,920; 2042: 41,450	6.00	Non-Traversable Median	26.00
18	4F	Urban	1171+25.410	1181+76.080	1,050.67	0.1990	2022: 35,250; 2023: 35,855; 2024: 36,460; 2025: 37,065; 2026: 37,670; 2027: 38,275; 2028: 38,880; 2029: 39,485; 2030: 40,090; 2031: 40,695; 2032: 41,300; 2033: 41,905; 2034: 42,510; 2035: 43,115; 2036: 43,720; 2037: 44,325; 2038: 44,930; 2039: 45,535; 2040: 46,140; 2041: 46,745; 2042: 47,350	6.00	Non-Traversable Median	26.00
20	4F	Urban	1181+76.080	1310+09.960	12,833.88	2.4307	2022: 39,650; 2023: 40,330; 2024: 41,010; 2025: 41,690; 2026: 42,370; 2027: 43,050; 2028: 43,730; 2029: 44,410; 2030: 45,090; 2031: 45,770; 2032: 46,450; 2033: 47,130; 2034: 47,810; 2035: 48,490; 2036: 49,170; 2037: 49,850; 2038: 50,530; 2039: 51,210; 2040: 51,890; 2041: 52,570; 2042: 53,250	6.00	Non-Traversable Median	26.00
24	4F	Urban	1310+09.960	1311+36.670	126.71	0.0240	2022: 36,450; 2023: 37,075; 2024: 37,700; 2025: 38,325; 2026: 38,950; 2027: 39,575; 2028: 40,200; 2029: 40,825; 2030: 41,450; 2031: 42,075; 2032: 42,700; 2033: 43,325; 2034: 43,950; 2035: 44,575; 2036: 45,200; 2037: 45,825; 2038: 46,450; 2039: 47,075; 2040: 47,700; 2041: 48,325; 2042: 48,950	6.00	Non-Traversable Median	26.00
26	4F	Urban	1311+36.670	1353+89.440	4,252.77	0.8054	2022: 31,500; 2023: 32,040; 2024: 32,580; 2025: 33,120; 2026: 33,660; 2027: 34,200; 2028: 34,740; 2029: 35,280; 2030: 35,820; 2031: 36,360; 2032: 36,900; 2033: 37,440; 2034: 37,980; 2035: 38,520; 2036: 39,060; 2037: 39,600; 2038: 40,140; 2039: 40,680; 2040: 41,220; 2041: 41,760; 2042: 42,300	6.00	Non-Traversable Median	26.00
27	4F	Urban	1353+89.440	1355+18.280	128.84	0.0244	2022: 33,100; 2023: 33,670; 2024: 34,240; 2025: 34,810; 2026: 35,380; 2027: 35,950; 2028: 36,520; 2029: 37,090; 2030: 37,660; 2031: 38,230; 2032: 38,800; 2033: 39,370; 2034: 39,940; 2035: 40,510; 2036: 41,080; 2037: 41,650; 2038: 42,220; 2039: 42,790; 2040: 43,360; 2041: 43,930; 2042: 44,500	6.00	Non-Traversable Median	26.00
29	4F	Urban	1355+18.280	1365+82.620	1,064.34	0.2016	2022: 37,950; 2023: 38,605; 2024: 39,260; 2025: 39,915; 2026: 40,570; 2027: 41,225; 2028: 41,880; 2029: 42,535; 2030: 43,190; 2031: 43,845; 2032: 44,500; 2033: 45,155; 2034: 45,810; 2035: 46,465; 2036: 47,120; 2037: 47,775; 2038: 48,430; 2039: 49,085; 2040: 49,740; 2041: 50,395; 2042: 51,050	6.00	Non-Traversable Median	26.00
32	4F	Urban	1365+82.620	1366+63.080	80.46	0.0152	2022: 43,450; 2023: 44,200; 2024: 44,950; 2025: 45,700; 2026: 46,450; 2027: 47,200; 2028: 47,950; 2029: 48,700; 2030: 49,450; 2031: 50,200; 2032: 50,950; 2033: 51,700; 2034: 52,450; 2035: 53,200; 2036: 53,950; 2037: 54,700; 2038: 55,450; 2039: 56,200; 2040: 56,950; 2041: 57,700; 2042: 58,450	6.00	Non-Traversable Median	26.00
34	4F	Urban	1366+63.080	1387+72.400	2,109.32	0.3995	2022: 45,100; 2023: 45,877; 2024: 46,655; 2025: 47,432; 2026: 48,210; 2027: 48,987; 2028: 49,765; 2029: 50,542; 2030: 51,320; 2031: 52,097; 2032: 52,875; 2033: 53,652; 2034: 54,430; 2035: 55,207; 2036: 55,985; 2037: 56,762; 2038: 57,540; 2039: 58,317; 2040: 59,095; 2041: 59,872; 2042: 60,650	6.00	Non-Traversable Median	26.00
38	4F	Urban	1387+72.400	1401+83.800	1,411.40	0.2673	2022: 41,250; 2023: 41,960; 2024: 42,670; 2025: 43,380; 2026: 44,090; 2027: 44,800; 2028: 45,510; 2029: 46,220; 2030: 46,930; 2031: 47,640; 2032: 48,350; 2033: 49,060; 2034: 49,770; 2035: 50,480; 2036: 51,190; 2037: 51,900; 2038: 52,610; 2039: 53,320; 2040: 54,030; 2041: 54,740; 2042: 55,450	6.00	Non-Traversable Median	26.00

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
40	4F	Urban	1401+83.800	1448+14.880	4,631.08	0.8771	2022: 40,500; 2023: 41,197; 2024: 41,895; 2025: 42,592; 2026: 43,290; 2027: 43,987; 2028: 44,685; 2029: 45,382; 2030: 46,080; 2031: 46,777; 2032: 47,475; 2033: 48,172; 2034: 48,870; 2035: 49,567; 2036: 50,265; 2037: 50,962; 2038: 51,660; 2039: 52,357; 2040: 53,055; 2041: 53,752; 2042: 54,450	6.00	Non-Traversable Median	26.00
41	5F	Urban	1448+14.880	1448+51.680	36.80	0.0070	2022: 51,850; 2023: 52,742; 2024: 53,635; 2025: 54,527; 2026: 55,420; 2027: 56,312; 2028: 57,205; 2029: 58,097; 2030: 58,990; 2031: 59,882; 2032: 60,775; 2033: 61,667; 2034: 62,560; 2035: 63,452; 2036: 64,345; 2037: 65,237; 2038: 66,130; 2039: 67,022; 2040: 67,915; 2041: 68,807; 2042: 69,700	6.00	Non-Traversable Median	26.00
45	6F	Urban	1448+51.680	1461+68.620	1,316.94	0.2494	2022: 64,300; 2023: 65,407; 2024: 66,515; 2025: 67,622; 2026: 68,730; 2027: 69,837; 2028: 70,945; 2029: 72,052; 2030: 73,160; 2031: 74,267; 2032: 75,375; 2033: 76,482; 2034: 77,590; 2035: 78,697; 2036: 79,805; 2037: 80,912; 2038: 82,020; 2039: 83,127; 2040: 84,235; 2041: 85,342; 2042: 86,450	6.00	Non-Traversable Median	26.00
50	5F	Urban	1461+68.620	1463+36.890	168.27	0.0319	2022: 59,750; 2023: 60,777; 2024: 61,805; 2025: 62,832; 2026: 63,860; 2027: 64,887; 2028: 65,915; 2029: 66,942; 2030: 67,970; 2031: 68,997; 2032: 70,025; 2033: 71,052; 2034: 72,080; 2035: 73,107; 2036: 74,135; 2037: 75,162; 2038: 76,190; 2039: 77,217; 2040: 78,245; 2041: 79,272; 2042: 80,300	6.00	Non-Traversable Median	26.00
54	4F	Urban	1463+36.890	1532+41.010	6,904.12	1.3076	2022: 54,750; 2023: 55,690; 2024: 56,630; 2025: 57,570; 2026: 58,510; 2027: 59,450; 2028: 60,390; 2029: 61,330; 2030: 62,270; 2031: 63,210; 2032: 64,150; 2033: 65,090; 2034: 66,030; 2035: 66,970; 2036: 67,910; 2037: 68,850; 2038: 69,790; 2039: 70,730; 2040: 71,670; 2041: 72,610; 2042: 73,550	6.00	Non-Traversable Median	26.00
55	4F	Urban	1532+41.010	1542+72.380	1,031.37	0.1953	2022: 64,950; 2023: 66,065; 2024: 67,180; 2025: 68,295; 2026: 69,410; 2027: 70,525; 2028: 71,640; 2029: 72,755; 2030: 73,870; 2031: 74,985; 2032: 76,100; 2033: 77,215; 2034: 78,330; 2035: 79,445; 2036: 80,560; 2037: 81,675; 2038: 82,790; 2039: 83,905; 2040: 85,020; 2041: 86,135; 2042: 87,250	6.00	Non-Traversable Median	26.00
57	4F	Urban	1542+72.380	1571+03.740	2,831.36	0.5362	2022: 74,850; 2023: 76,137; 2024: 77,425; 2025: 78,712; 2026: 80,000; 2027: 81,287; 2028: 82,575; 2029: 83,862; 2030: 85,150; 2031: 86,437; 2032: 87,725; 2033: 89,012; 2034: 90,300; 2035: 91,587; 2036: 92,875; 2037: 94,162; 2038: 95,450; 2039: 96,737; 2040: 98,025; 2041: 99,312; 2042: 100,600	6.00	Non-Traversable Median	26.00
61	4F	Urban	1571+03.740	1571+65.940	62.20	0.0118	2022: 68,050; 2023: 69,220; 2024: 70,390; 2025: 71,560; 2026: 72,730; 2027: 73,900; 2028: 75,070; 2029: 76,240; 2030: 77,410; 2031: 78,580; 2032: 79,750; 2033: 80,920; 2034: 82,090; 2035: 83,260; 2036: 84,430; 2037: 85,600; 2038: 86,770; 2039: 87,940; 2040: 89,110; 2041: 90,280; 2042: 91,450	6.00	Non-Traversable Median	26.00
63	4F	Urban	1571+65.940	1616+96.040	4,530.10	0.8580	2022: 61,500; 2023: 62,557; 2024: 63,615; 2025: 64,672; 2026: 65,730; 2027: 66,787; 2028: 67,845; 2029: 68,902; 2030: 69,960; 2031: 71,017; 2032: 72,075; 2033: 73,132; 2034: 74,190; 2035: 75,247; 2036: 76,305; 2037: 77,362; 2038: 78,420; 2039: 79,477; 2040: 80,535; 2041: 81,592; 2042: 82,650	6.00	Non-Traversable Median	26.00
64	6F	Urban	1616+96.040	1620+37.170	341.13	0.0646	2022: 70,500; 2023: 71,715; 2024: 72,930; 2025: 74,145; 2026: 75,360; 2027: 76,575; 2028: 77,790; 2029: 79,005; 2030: 80,220; 2031: 81,435; 2032: 82,650; 2033: 83,865; 2034: 85,080; 2035: 86,295; 2036: 87,510; 2037: 88,725; 2038: 89,940; 2039: 91,155; 2040: 92,370; 2041: 93,585; 2042: 94,800	6.00	Non-Traversable Median	26.00
65	8F	Urban	1620+37.170	1641+82.890	2,145.72	0.4064	2022: 82,100; 2023: 83,512; 2024: 84,925; 2025: 86,337; 2026: 87,750; 2027: 89,162; 2028: 90,575; 2029: 91,987; 2030: 93,400; 2031: 94,812; 2032: 96,225; 2033: 97,637; 2034: 99,050; 2035: 100,462; 2036: 101,875; 2037: 103,287; 2038: 104,700; 2039: 106,112; 2040: 107,525; 2041: 108,937; 2042: 110,350	6.00	Non-Traversable Median	26.00
66	6F	Urban	1641+82.890	1752+45.780	11,062.89	2.0952	2022: 51,600; 2023: 52,485; 2024: 53,370; 2025: 54,255; 2026: 55,140; 2027: 56,025; 2028: 56,910; 2029: 57,795; 2030: 58,680; 2031: 59,565; 2032: 60,450; 2033: 61,335; 2034: 62,220; 2035: 63,105; 2036: 63,990; 2037: 64,875; 2038: 65,760; 2039: 66,645; 2040: 67,530; 2041: 68,415; 2042: 69,300	6.00	Non-Traversable Median	26.00
67	7F	Urban	1752+45.780	1774+96.080	2,250.30	0.4262	2022: 73,800; 2023: 75,067; 2024: 76,335; 2025: 77,602; 2026: 78,870; 2027: 80,137; 2028: 81,405; 2029: 82,672; 2030: 83,940; 2031: 85,207; 2032: 86,475; 2033: 87,742; 2034: 89,010; 2035: 90,277; 2036: 91,545; 2037: 92,812; 2038: 94,080; 2039: 95,347; 2040: 96,615; 2041: 97,882; 2042: 99,150	6.00	Non-Traversable Median	26.00
68	9F	Urban	1774+96.080	1802+00.210	2,704.13	0.5121	2022: 101,350; 2023: 103,092; 2024: 104,835; 2025: 106,577; 2026: 108,320; 2027: 110,062; 2028: 111,805; 2029: 113,547; 2030: 115,290; 2031: 117,032; 2032: 118,775; 2033: 120,517; 2034: 122,260; 2035: 124,002; 2036: 125,745; 2037: 127,487; 2038: 129,230; 2039: 130,972; 2040: 132,715; 2041: 134,457; 2042: 136,200	6.00	Non-Traversable Median	26.00
70	9F	Urban	1802+00.210	1802+34.860	34.65	0.0066	2022: 97,500; 2023: 99,177; 2024: 100,855; 2025: 102,532; 2026: 104,210; 2027: 105,887; 2028: 107,565; 2029: 109,242; 2030: 110,920; 2031: 112,597; 2032: 114,275; 2033: 115,952; 2034: 117,630; 2035: 119,307; 2036: 120,985; 2037: 122,662; 2038: 124,340; 2039: 126,017; 2040: 127,695; 2041: 129,372; 2042: 131,050	6.00	Non-Traversable Median	26.00
71	8F	Urban	1802+34.860	1858+89.680	5,654.82	1.0710	2022: 94,950; 2023: 96,585; 2024: 98,220; 2025: 99,855; 2026: 101,490; 2027: 103,125; 2028: 104,760; 2029: 106,395; 2030: 108,030; 2031: 109,665; 2032: 111,300; 2033: 112,935; 2034: 114,570; 2035: 116,205; 2036: 117,840; 2037: 119,475; 2038: 121,110; 2039: 122,745; 2040: 124,380; 2041: 126,015; 2042: 127,650	6.00	Non-Traversable Median	26.00
72	8F	Urban	1858+89.680	1862+31.360	341.68	0.0647	2022: 106,850; 2023: 108,687; 2024: 110,525; 2025: 112,362; 2026: 114,200; 2027: 116,037; 2028: 117,875; 2029: 119,712; 2030: 121,550; 2031: 123,387; 2032: 125,225; 2033: 127,062; 2034: 128,900; 2035: 130,737; 2036: 132,575; 2037: 134,412; 2038: 136,250; 2039: 138,087; 2040: 139,925; 2041: 141,762; 2042: 143,600	6.00	Non-Traversable Median	26.00
74	8F	Urban	1862+31.360	1937+57.720	7,526.36	1.4255	2022: 118,200; 2023: 120,230; 2024: 122,260; 2025: 124,290; 2026: 126,320; 2027: 128,350; 2028: 130,380; 2029: 132,410; 2030: 134,440; 2031: 136,470; 2032: 138,500; 2033: 140,530; 2034: 142,560; 2035: 144,590; 2036: 146,620; 2037: 148,650; 2038: 150,680; 2039: 152,710; 2040: 154,740; 2041: 156,770; 2042: 158,800	6.00	Non-Traversable Median	26.00
77	8F	Urban	1937+57.720	1945+10.160	752.44	0.1425	2022: 114,600; 2023: 116,570; 2024: 118,540; 2025: 120,510; 2026: 122,480; 2027: 124,450; 2028: 126,420; 2029: 128,390; 2030: 130,360; 2031: 132,330; 2032: 134,300; 2033: 136,270; 2034: 138,240; 2035: 140,210; 2036: 142,180; 2037: 144,150; 2038: 146,120; 2039: 148,090; 2040: 150,060; 2041: 152,030; 2042: 154,000	6.00	Non-Traversable Median	26.00
79	8F	Urban	1945+10.160	1962+27.940	1,717.78	0.3253	2022: 108,750; 2023: 110,622; 2024: 112,495; 2025: 114,367; 2026: 116,240; 2027: 118,112; 2028: 119,985; 2029: 121,857; 2030: 123,730; 2031: 125,602; 2032: 127,475; 2033: 129,347; 2034: 131,220; 2035: 133,092; 2036: 134,965; 2037: 136,837; 2038: 138,710; 2039: 140,582; 2040: 142,455; 2041: 144,327; 2042: 146,200	6.00	Non-Traversable Median	26.00

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
80	8F	Urban	1962+27.940	1969+25.480	697.54	0.1321	2022: 112,750; 2023: 114,690; 2024: 116,630; 2025: 118,570; 2026: 120,510; 2027: 122,450; 2028: 124,390; 2029: 126,330; 2030: 128,270; 2031: 130,210; 2032: 132,150; 2033: 134,090; 2034: 136,030; 2035: 137,970; 2036: 139,910; 2037: 141,850; 2038: 143,790; 2039: 145,730; 2040: 147,670; 2041: 149,610; 2042: 151,550	6.00	Non-Traversable Median	26.00
82	8F	Urban	1969+25.480	1983+70.120	1,444.64	0.2736	2022: 122,250; 2023: 124,352; 2024: 126,455; 2025: 128,557; 2026: 130,660; 2027: 132,762; 2028: 134,865; 2029: 136,967; 2030: 139,070; 2031: 141,172; 2032: 143,275; 2033: 145,377; 2034: 147,480; 2035: 149,582; 2036: 151,685; 2037: 153,787; 2038: 155,890; 2039: 157,992; 2040: 160,095; 2041: 162,197; 2042: 164,300	6.00	Non-Traversable Median	26.00
85	8F	Urban	1983+70.120	1992+04.960	834.84	0.1581	2022: 121,150; 2023: 123,232; 2024: 125,315; 2025: 127,397; 2026: 129,480; 2027: 131,562; 2028: 133,645; 2029: 135,727; 2030: 137,810; 2031: 139,892; 2032: 141,975; 2033: 144,057; 2034: 146,140; 2035: 148,222; 2036: 150,305; 2037: 152,387; 2038: 154,470; 2039: 156,552; 2040: 158,635; 2041: 160,717; 2042: 162,800	6.00	Non-Traversable Median	26.00
86	8F	Urban	1992+04.960	1993+20.390	115.43	0.0219	2022: 123,950; 2023: 126,080; 2024: 128,210; 2025: 130,340; 2026: 132,470; 2027: 134,600; 2028: 136,730; 2029: 138,860; 2030: 140,990; 2031: 143,120; 2032: 145,250; 2033: 147,380; 2034: 149,510; 2035: 151,640; 2036: 153,770; 2037: 155,900; 2038: 158,030; 2039: 160,160; 2040: 162,290; 2041: 164,420; 2042: 166,550	6.00	Non-Traversable Median	26.00
88	8F	Urban	1993+20.390	2006+55.130	1,334.74	0.2528	2022: 130,350; 2023: 132,590; 2024: 134,830; 2025: 137,070; 2026: 139,310; 2027: 141,550; 2028: 143,790; 2029: 146,030; 2030: 148,270; 2031: 150,510; 2032: 152,750; 2033: 154,990; 2034: 157,230; 2035: 159,470; 2036: 161,710; 2037: 163,950; 2038: 166,190; 2039: 168,430; 2040: 170,670; 2041: 172,910; 2042: 175,150	6.00	Non-Traversable Median	26.00
92	7F	Urban	2006+55.130	2006+91.220	36.09	0.0068	2022: 121,900; 2023: 123,997; 2024: 126,095; 2025: 128,192; 2026: 130,290; 2027: 132,387; 2028: 134,485; 2029: 136,582; 2030: 138,680; 2031: 140,777; 2032: 142,875; 2033: 144,972; 2034: 147,070; 2035: 149,167; 2036: 151,265; 2037: 153,362; 2038: 155,460; 2039: 157,557; 2040: 159,655; 2041: 161,752; 2042: 163,850	6.00	Non-Traversable Median	26.00
94	6F	Urban	2006+91.220	2045+17.910	3,826.69	0.7248	2022: 112,900; 2023: 114,842; 2024: 116,785; 2025: 118,727; 2026: 120,670; 2027: 122,612; 2028: 124,555; 2029: 126,497; 2030: 128,440; 2031: 130,382; 2032: 132,325; 2033: 134,267; 2034: 136,210; 2035: 138,152; 2036: 140,095; 2037: 142,037; 2038: 143,980; 2039: 145,922; 2040: 147,865; 2041: 149,807; 2042: 151,750	6.00	Non-Traversable Median	26.00
95	7F	Urban	2045+17.910	2046+03.220	85.31	0.0162	2022: 120,650; 2023: 122,722; 2024: 124,795; 2025: 126,867; 2026: 128,940; 2027: 131,012; 2028: 133,085; 2029: 135,157; 2030: 137,230; 2031: 139,302; 2032: 141,375; 2033: 143,447; 2034: 145,520; 2035: 147,592; 2036: 149,665; 2037: 151,737; 2038: 153,810; 2039: 155,882; 2040: 157,955; 2041: 160,027; 2042: 162,100	6.00	Non-Traversable Median	26.00
97	8F	Urban	2046+03.220	2049+38.400	335.18	0.0635	2022: 133,950; 2023: 136,252; 2024: 138,555; 2025: 140,857; 2026: 143,160; 2027: 145,462; 2028: 147,765; 2029: 150,067; 2030: 152,370; 2031: 154,672; 2032: 156,975; 2033: 159,277; 2034: 161,580; 2035: 163,882; 2036: 166,185; 2037: 168,487; 2038: 170,790; 2039: 173,092; 2040: 175,395; 2041: 177,697; 2042: 180,000	6.00	Non-Traversable Median	26.00
99	9F	Urban	2049+38.400	2051+11.970	173.57	0.0329	2022: 148,750; 2023: 151,310; 2024: 153,870; 2025: 156,430; 2026: 158,990; 2027: 161,550; 2028: 164,110; 2029: 166,670; 2030: 169,230; 2031: 171,790; 2032: 174,350; 2033: 176,910; 2034: 179,470; 2035: 182,030; 2036: 184,590; 2037: 187,150; 2038: 189,710; 2039: 192,270; 2040: 194,830; 2041: 197,390; 2042: 199,950	6.00	Non-Traversable Median	26.00
101	10F	Urban	2051+11.970	2067+62.740	1,650.77	0.3126	2022: 158,450; 2023: 161,175; 2024: 163,900; 2025: 166,625; 2026: 169,350; 2027: 172,075; 2028: 174,800; 2029: 177,525; 2030: 180,250; 2031: 182,975; 2032: 185,700; 2033: 188,425; 2034: 191,150; 2035: 193,875; 2036: 196,600; 2037: 199,325; 2038: 202,050; 2039: 204,775; 2040: 207,500; 2041: 210,225; 2042: 212,950	6.00	Non-Traversable Median	26.00
104	10F	Urban	2067+62.740	2072+80.530	517.79	0.0981	2022: 155,400; 2023: 158,070; 2024: 160,740; 2025: 163,410; 2026: 166,080; 2027: 168,750; 2028: 171,420; 2029: 174,090; 2030: 176,760; 2031: 179,430; 2032: 182,100; 2033: 184,770; 2034: 187,440; 2035: 190,110; 2036: 192,780; 2037: 195,450; 2038: 198,120; 2039: 200,790; 2040: 203,460; 2041: 206,130; 2042: 208,800	6.00	Non-Traversable Median	26.00
106	10F	Urban	2072+80.530	2096+65.070	2,384.54	0.4516	2022: 152,400; 2023: 155,020; 2024: 157,640; 2025: 160,260; 2026: 162,880; 2027: 165,500; 2028: 168,120; 2029: 170,740; 2030: 173,360; 2031: 175,980; 2032: 178,600; 2033: 181,220; 2034: 183,840; 2035: 186,460; 2036: 189,080; 2037: 191,700; 2038: 194,320; 2039: 196,940; 2040: 199,560; 2041: 202,180; 2042: 204,800	6.00	Non-Traversable Median	26.00
108	10F	Urban	2096+65.070	2108+05.270	1,140.20	0.2160	2022: 162,300; 2023: 165,090; 2024: 167,880; 2025: 170,670; 2026: 173,460; 2027: 176,250; 2028: 179,040; 2029: 181,830; 2030: 184,620; 2031: 187,410; 2032: 190,200; 2033: 192,990; 2034: 195,780; 2035: 198,570; 2036: 201,360; 2037: 204,150; 2038: 206,940; 2039: 209,730; 2040: 212,520; 2041: 215,310; 2042: 218,100	6.00	Non-Traversable Median	26.00
112	10F	Urban	2108+05.270	2112+02.880	397.61	0.0753	2022: 158,150; 2023: 160,870; 2024: 163,590; 2025: 166,310; 2026: 169,030; 2027: 171,750; 2028: 174,470; 2029: 177,190; 2030: 179,910; 2031: 182,630; 2032: 185,350; 2033: 188,070; 2034: 190,790; 2035: 193,510; 2036: 196,230; 2037: 198,950; 2038: 201,670; 2039: 204,390; 2040: 207,110; 2041: 209,830; 2042: 212,550	6.00	Non-Traversable Median	26.00
115	10F	Urban	2112+02.880	2132+94.000	2,091.12	0.3961	2022: 152,800; 2023: 155,427; 2024: 158,055; 2025: 160,682; 2026: 163,310; 2027: 165,937; 2028: 168,565; 2029: 171,192; 2030: 173,820; 2031: 176,447; 2032: 179,075; 2033: 181,702; 2034: 184,330; 2035: 186,957; 2036: 189,585; 2037: 192,212; 2038: 194,840; 2039: 197,467; 2040: 200,095; 2041: 202,722; 2042: 205,350	6.00	Non-Traversable Median	26.00
118	10F	Urban	2132+94.000	2141+38.040	844.04	0.1599	2022: 163,000; 2023: 165,802; 2024: 168,605; 2025: 171,407; 2026: 174,210; 2027: 177,012; 2028: 179,815; 2029: 182,617; 2030: 185,420; 2031: 188,222; 2032: 191,025; 2033: 193,827; 2034: 196,630; 2035: 199,432; 2036: 202,235; 2037: 205,037; 2038: 207,840; 2039: 210,642; 2040: 213,445; 2041: 216,247; 2042: 219,050	6.00	Non-Traversable Median	26.00
121	10F	Urban	2141+38.040	2142+01.770	63.73	0.0121	2022: 160,600; 2023: 163,360; 2024: 166,120; 2025: 168,880; 2026: 171,640; 2027: 174,400; 2028: 177,160; 2029: 179,920; 2030: 182,680; 2031: 185,440; 2032: 188,200; 2033: 190,960; 2034: 193,720; 2035: 196,480; 2036: 199,240; 2037: 202,000; 2038: 204,760; 2039: 207,520; 2040: 210,280; 2041: 213,040; 2042: 215,800	6.00	Non-Traversable Median	26.00
123	10F	Urban	2142+01.770	2156+10.790	1,409.02	0.2669	2022: 156,300; 2023: 158,987; 2024: 161,675; 2025: 164,362; 2026: 167,050; 2027: 169,737; 2028: 172,425; 2029: 175,112; 2030: 177,800; 2031: 180,487; 2032: 183,175; 2033: 185,862; 2034: 188,550; 2035: 191,237; 2036: 193,925; 2037: 196,612; 2038: 199,300; 2039: 201,987; 2040: 204,675; 2041: 207,362; 2042: 210,050	6.00	Non-Traversable Median	26.00
124	8F	Urban	2156+10.790	2159+38.930	328.14	0.0621	2022: 136,700; 2023: 139,050; 2024: 141,400; 2025: 143,750; 2026: 146,100; 2027: 148,450; 2028: 150,800; 2029: 153,150; 2030: 155,500; 2031: 157,850; 2032: 160,200; 2033: 162,550; 2034: 164,900; 2035: 167,250; 2036: 169,600; 2037: 171,950; 2038: 174,300; 2039: 176,650; 2040: 179,000; 2041: 181,350; 2042: 183,700	6.00	Non-Traversable Median	26.00

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
125	8F	Urban	2159+38.930	2171+54.400	1,215.47	0.2302	2022: 142,500; 2023: 144,952; 2024: 147,405; 2025: 149,857; 2026: 152,310; 2027: 154,762; 2028: 157,215; 2029: 159,667; 2030: 162,120; 2031: 164,572; 2032: 167,025; 2033: 169,477; 2034: 171,930; 2035: 174,382; 2036: 176,835; 2037: 179,287; 2038: 181,740; 2039: 184,192; 2040: 186,645; 2041: 189,097; 2042: 191,550	6.00	Non-Traversable Median	26.00
127	7F	Urban	2171+54.400	2183+64.830	1,210.43	0.2293	2022: 123,850; 2023: 125,980; 2024: 128,110; 2025: 130,240; 2026: 132,370; 2027: 134,500; 2028: 136,630; 2029: 138,760; 2030: 140,890; 2031: 143,020; 2032: 145,150; 2033: 147,280; 2034: 149,410; 2035: 151,540; 2036: 153,670; 2037: 155,800; 2038: 157,930; 2039: 160,060; 2040: 162,190; 2041: 164,320; 2042: 166,450	6.00	Non-Traversable Median	26.00
130	8F	Urban	2183+64.830	2187+07.690	342.86	0.0649	2022: 130,200; 2023: 132,440; 2024: 134,680; 2025: 136,920; 2026: 139,160; 2027: 141,400; 2028: 143,640; 2029: 145,880; 2030: 148,120; 2031: 150,360; 2032: 152,600; 2033: 154,840; 2034: 157,080; 2035: 159,320; 2036: 161,560; 2037: 163,800; 2038: 166,040; 2039: 168,280; 2040: 170,520; 2041: 172,760; 2042: 175,000	6.00	Non-Traversable Median	26.00
134	9F	Urban	2187+07.690	2197+66.440	1,058.75	0.2005	2022: 135,250; 2023: 137,577; 2024: 139,905; 2025: 142,232; 2026: 144,560; 2027: 146,887; 2028: 149,215; 2029: 151,542; 2030: 153,870; 2031: 156,197; 2032: 158,525; 2033: 160,852; 2034: 163,180; 2035: 165,507; 2036: 167,835; 2037: 170,162; 2038: 172,490; 2039: 174,817; 2040: 177,145; 2041: 179,472; 2042: 181,800	6.00	Non-Traversable Median	26.00
139	8F	Urban	2197+66.440	2198+41.760	75.32	0.0143	2022: 129,650; 2023: 131,880; 2024: 134,110; 2025: 136,340; 2026: 138,570; 2027: 140,800; 2028: 143,030; 2029: 145,260; 2030: 147,490; 2031: 149,720; 2032: 151,950; 2033: 154,180; 2034: 156,410; 2035: 158,640; 2036: 160,870; 2037: 163,100; 2038: 165,330; 2039: 167,560; 2040: 169,790; 2041: 172,020; 2042: 174,250	6.00	Non-Traversable Median	26.00
144	7F	Urban	2198+41.760	2201+64.630	322.87	0.0612	2022: 128,850; 2023: 131,065; 2024: 133,280; 2025: 135,495; 2026: 137,710; 2027: 139,925; 2028: 142,140; 2029: 144,355; 2030: 146,570; 2031: 148,785; 2032: 151,000; 2033: 153,215; 2034: 155,430; 2035: 157,645; 2036: 159,860; 2037: 162,075; 2038: 164,290; 2039: 166,505; 2040: 168,720; 2041: 170,935; 2042: 173,150	6.00	Non-Traversable Median	26.00
147	7F	Urban	2201+64.630	2216+63.010	1,498.38	0.2838	2022: 123,700; 2023: 125,827; 2024: 127,955; 2025: 130,082; 2026: 132,210; 2027: 134,337; 2028: 136,465; 2029: 138,592; 2030: 140,720; 2031: 142,847; 2032: 144,975; 2033: 147,102; 2034: 149,230; 2035: 151,357; 2036: 153,485; 2037: 155,612; 2038: 157,740; 2039: 159,867; 2040: 161,995; 2041: 164,122; 2042: 166,250	6.00	Non-Traversable Median	26.00
148	7F	Urban	2216+63.010	2221+59.740	496.73	0.0941	2022: 142,150; 2023: 144,595; 2024: 147,040; 2025: 149,485; 2026: 151,930; 2027: 154,375; 2028: 156,820; 2029: 159,265; 2030: 161,710; 2031: 164,155; 2032: 166,600; 2033: 169,045; 2034: 171,490; 2035: 173,935; 2036: 176,380; 2037: 178,825; 2038: 181,270; 2039: 183,715; 2040: 186,160; 2041: 188,605; 2042: 191,050	6.00	Non-Traversable Median	26.00
150	9F	Urban	2221+59.740	2230+01.910	842.17	0.1595	2022: 161,650; 2023: 164,430; 2024: 167,210; 2025: 169,990; 2026: 172,770; 2027: 175,550; 2028: 178,330; 2029: 181,110; 2030: 183,890; 2031: 186,670; 2032: 189,450; 2033: 192,230; 2034: 195,010; 2035: 197,790; 2036: 200,570; 2037: 203,350; 2038: 206,130; 2039: 208,910; 2040: 211,690; 2041: 214,470; 2042: 217,250	6.00	Non-Traversable Median	26.00
153	8F	Urban	2230+01.910	2234+63.570	461.66	0.0874	2022: 155,100; 2023: 157,767; 2024: 160,435; 2025: 163,102; 2026: 165,770; 2027: 168,437; 2028: 171,105; 2029: 173,772; 2030: 176,440; 2031: 179,107; 2032: 181,775; 2033: 184,442; 2034: 187,110; 2035: 189,777; 2036: 192,445; 2037: 195,112; 2038: 197,780; 2039: 200,447; 2040: 203,115; 2041: 205,782; 2042: 208,450	6.00	Non-Traversable Median	26.00
155	8F	Urban	2234+63.570	2240+93.000	629.43	0.1192	2022: 159,550; 2023: 162,292; 2024: 165,035; 2025: 167,777; 2026: 170,520; 2027: 173,262; 2028: 176,005; 2029: 178,747; 2030: 181,490; 2031: 184,232; 2032: 186,975; 2033: 189,717; 2034: 192,460; 2035: 195,202; 2036: 197,945; 2037: 200,687; 2038: 203,430; 2039: 206,172; 2040: 208,915; 2041: 211,657; 2042: 214,400	6.00	Non-Traversable Median	26.00
157	8F	Urban	2240+93.000	2245+71.310	478.31	0.0906	2022: 164,350; 2023: 167,175; 2024: 170,000; 2025: 172,825; 2026: 175,650; 2027: 178,475; 2028: 181,300; 2029: 184,125; 2030: 186,950; 2031: 189,775; 2032: 192,600; 2033: 195,425; 2034: 198,250; 2035: 201,075; 2036: 203,900; 2037: 206,725; 2038: 209,550; 2039: 212,375; 2040: 215,200; 2041: 218,025; 2042: 220,850	6.00	Non-Traversable Median	26.00
160	8F	Urban	2245+71.310	2258+50.450	1,279.14	0.2423	2022: 157,550; 2023: 160,260; 2024: 162,970; 2025: 165,680; 2026: 168,390; 2027: 171,100; 2028: 173,810; 2029: 176,520; 2030: 179,230; 2031: 181,940; 2032: 184,650; 2033: 187,360; 2034: 190,070; 2035: 192,780; 2036: 195,490; 2037: 198,200; 2038: 200,910; 2039: 203,620; 2040: 206,330; 2041: 209,040; 2042: 211,750	6.00	Non-Traversable Median	26.00
163	8F	Urban	2258+50.450	2258+79.500	29.05	0.0055	2022: 152,000; 2023: 154,615; 2024: 157,230; 2025: 159,845; 2026: 162,460; 2027: 165,075; 2028: 167,690; 2029: 170,305; 2030: 172,920; 2031: 175,535; 2032: 178,150; 2033: 180,765; 2034: 183,380; 2035: 185,995; 2036: 188,610; 2037: 191,225; 2038: 193,840; 2039: 196,455; 2040: 199,070; 2041: 201,685; 2042: 204,300	6.00	Non-Traversable Median	26.00
165	8F	Urban	2258+79.500	2268+46.280	966.78	0.1831	2022: 146,250; 2023: 148,767; 2024: 151,285; 2025: 153,802; 2026: 156,320; 2027: 158,837; 2028: 161,355; 2029: 163,872; 2030: 166,390; 2031: 168,907; 2032: 171,425; 2033: 173,942; 2034: 176,460; 2035: 178,977; 2036: 181,495; 2037: 184,012; 2038: 186,530; 2039: 189,047; 2040: 191,565; 2041: 194,082; 2042: 196,600	6.00	Non-Traversable Median	26.00
166	8F	Urban	2268+46.280	2274+72.630	626.35	0.1186	2022: 151,650; 2023: 154,260; 2024: 156,870; 2025: 159,480; 2026: 162,090; 2027: 164,700; 2028: 167,310; 2029: 169,920; 2030: 172,530; 2031: 175,140; 2032: 177,750; 2033: 180,360; 2034: 182,970; 2035: 185,580; 2036: 188,190; 2037: 190,800; 2038: 193,410; 2039: 196,020; 2040: 198,630; 2041: 201,240; 2042: 203,850	6.00	Non-Traversable Median	26.00
169	8F	Urban	2274+72.630	2284+00.230	927.60	0.1757	2022: 142,750; 2023: 145,205; 2024: 147,660; 2025: 150,115; 2026: 152,570; 2027: 155,025; 2028: 157,480; 2029: 159,935; 2030: 162,390; 2031: 164,845; 2032: 167,300; 2033: 169,755; 2034: 172,210; 2035: 174,665; 2036: 177,120; 2037: 179,575; 2038: 182,030; 2039: 184,485; 2040: 186,940; 2041: 189,395; 2042: 191,850	6.00	Non-Traversable Median	26.00
171	8F	Urban	2284+00.230	2289+18.000	517.77	0.0981	2022: 134,700; 2023: 137,017; 2024: 139,335; 2025: 141,652; 2026: 143,970; 2027: 146,287; 2028: 148,605; 2029: 150,922; 2030: 153,240; 2031: 155,557; 2032: 157,875; 2033: 160,192; 2034: 162,510; 2035: 164,827; 2036: 167,145; 2037: 169,462; 2038: 171,780; 2039: 174,097; 2040: 176,415; 2041: 178,732; 2042: 181,050	6.00	Non-Traversable Median	26.00
172	8F	Urban	2289+18.000	2319+47.290	3,029.29	0.5737	2022: 144,400; 2023: 146,885; 2024: 149,370; 2025: 151,855; 2026: 154,340; 2027: 156,825; 2028: 159,310; 2029: 161,795; 2030: 164,280; 2031: 166,765; 2032: 169,250; 2033: 171,735; 2034: 174,220; 2035: 176,705; 2036: 179,190; 2037: 181,675; 2038: 184,160; 2039: 186,645; 2040: 189,130; 2041: 191,615; 2042: 194,100	6.00	Non-Traversable Median	26.00
174	9F	Urban	2319+47.290	2324+20.370	473.08	0.0896	2022: 154,750; 2023: 157,410; 2024: 160,070; 2025: 162,730; 2026: 165,390; 2027: 168,050; 2028: 170,710; 2029: 173,370; 2030: 176,030; 2031: 178,690; 2032: 181,350; 2033: 184,010; 2034: 186,670; 2035: 189,330; 2036: 191,990; 2037: 194,650; 2038: 197,310; 2039: 199,970; 2040: 202,630; 2041: 205,290; 2042: 207,950	6.00	Non-Traversable Median	26.00

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
175	10F	Urban	2324+20.370	2342+71.190	1,850.82	0.3505	2022: 160,600; 2023: 163,360; 2024: 166,120; 2025: 168,880; 2026: 171,640; 2027: 174,400; 2028: 177,160; 2029: 179,920; 2030: 182,680; 2031: 185,440; 2032: 188,200; 2033: 190,960; 2034: 193,720; 2035: 196,480; 2036: 199,240; 2037: 202,000; 2038: 204,760; 2039: 207,520; 2040: 210,280; 2041: 213,040; 2042: 215,800	6.00	Non-Traversable Median	26.00
176	9F	Urban	2342+71.190	2343+28.110	56.92	0.0108	2022: 152,500; 2023: 155,122; 2024: 157,745; 2025: 160,367; 2026: 162,990; 2027: 165,612; 2028: 168,235; 2029: 170,857; 2030: 173,480; 2031: 176,102; 2032: 178,725; 2033: 181,347; 2034: 183,970; 2035: 186,592; 2036: 189,215; 2037: 191,837; 2038: 194,460; 2039: 197,082; 2040: 199,705; 2041: 202,327; 2042: 204,950	6.00	Non-Traversable Median	26.00
177	8F	Urban	2343+28.110	2365+64.260	2,236.15	0.4235	2022: 143,450; 2023: 145,917; 2024: 148,385; 2025: 150,852; 2026: 153,320; 2027: 155,787; 2028: 158,255; 2029: 160,722; 2030: 163,190; 2031: 165,657; 2032: 168,125; 2033: 170,592; 2034: 173,060; 2035: 175,527; 2036: 177,995; 2037: 180,462; 2038: 182,930; 2039: 185,397; 2040: 187,865; 2041: 190,332; 2042: 192,800	6.00	Non-Traversable Median	26.00
180	8F	Urban	2365+64.260	2366+17.960	53.70	0.0102	2022: 131,400; 2023: 133,660; 2024: 135,920; 2025: 138,180; 2026: 140,440; 2027: 142,700; 2028: 144,960; 2029: 147,220; 2030: 149,480; 2031: 151,740; 2032: 154,000; 2033: 156,260; 2034: 158,520; 2035: 160,780; 2036: 163,040; 2037: 165,300; 2038: 167,560; 2039: 169,820; 2040: 172,080; 2041: 174,340; 2042: 176,600	6.00	Non-Traversable Median	26.00
182	8F	Urban	2366+17.960	2401+60.950	3,542.99	0.6710	2022: 120,000; 2023: 122,065; 2024: 124,130; 2025: 126,195; 2026: 128,260; 2027: 130,325; 2028: 132,390; 2029: 134,455; 2030: 136,520; 2031: 138,585; 2032: 140,650; 2033: 142,715; 2034: 144,780; 2035: 146,845; 2036: 148,910; 2037: 150,975; 2038: 153,040; 2039: 155,105; 2040: 157,170; 2041: 159,235; 2042: 161,300	6.00	Non-Traversable Median	26.00
184	8F	Urban	2401+60.950	2402+12.440	51.49	0.0097	2022: 126,150; 2023: 128,322; 2024: 130,495; 2025: 132,667; 2026: 134,840; 2027: 137,012; 2028: 139,185; 2029: 141,357; 2030: 143,530; 2031: 145,702; 2032: 147,875; 2033: 150,047; 2034: 152,220; 2035: 154,392; 2036: 156,565; 2037: 158,737; 2038: 160,910; 2039: 163,082; 2040: 165,255; 2041: 167,427; 2042: 169,600	6.00	Non-Traversable Median	26.00
186	9F	Urban	2402+12.440	2414+12.230	1,199.79	0.2272	2022: 134,550; 2023: 136,865; 2024: 139,180; 2025: 141,495; 2026: 143,810; 2027: 146,125; 2028: 148,440; 2029: 150,755; 2030: 153,070; 2031: 155,385; 2032: 157,700; 2033: 160,015; 2034: 162,330; 2035: 164,645; 2036: 166,960; 2037: 169,275; 2038: 171,590; 2039: 173,905; 2040: 176,220; 2041: 178,535; 2042: 180,850	6.00	Non-Traversable Median	26.00
189	9F	Urban	2414+12.230	2424+35.910	1,023.68	0.1939	2022: 126,250; 2023: 128,422; 2024: 130,595; 2025: 132,767; 2026: 134,940; 2027: 137,112; 2028: 139,285; 2029: 141,457; 2030: 143,630; 2031: 145,802; 2032: 147,975; 2033: 150,147; 2034: 152,320; 2035: 154,492; 2036: 156,665; 2037: 158,837; 2038: 161,010; 2039: 163,182; 2040: 165,355; 2041: 167,527; 2042: 169,700	6.00	Non-Traversable Median	26.00
190	9F	Urban	2424+35.910	2427+01.170	265.26	0.0502	2022: 123,000; 2023: 125,117; 2024: 127,235; 2025: 129,352; 2026: 131,470; 2027: 133,587; 2028: 135,705; 2029: 137,822; 2030: 139,940; 2031: 142,057; 2032: 144,175; 2033: 146,292; 2034: 148,410; 2035: 150,527; 2036: 152,645; 2037: 154,762; 2038: 156,880; 2039: 158,997; 2040: 161,115; 2041: 163,232; 2042: 165,350	6.00	Non-Traversable Median	26.00
191	8F	Urban	2427+01.170	2443+40.790	1,639.62	0.3105	2022: 119,750; 2023: 121,812; 2024: 123,875; 2025: 125,937; 2026: 128,000; 2027: 130,062; 2028: 132,125; 2029: 134,187; 2030: 136,250; 2031: 138,312; 2032: 140,375; 2033: 142,437; 2034: 144,500; 2035: 146,562; 2036: 148,625; 2037: 150,687; 2038: 152,750; 2039: 154,812; 2040: 156,875; 2041: 158,937; 2042: 161,000	6.00	Non-Traversable Median	26.00
192	8F	Urban	2443+40.790	2450+69.650	728.86	0.1380	2022: 128,900; 2023: 131,117; 2024: 133,335; 2025: 135,552; 2026: 137,770; 2027: 139,987; 2028: 142,205; 2029: 144,422; 2030: 146,640; 2031: 148,857; 2032: 151,075; 2033: 153,292; 2034: 155,510; 2035: 157,727; 2036: 159,945; 2037: 162,162; 2038: 164,380; 2039: 166,597; 2040: 168,815; 2041: 171,032; 2042: 173,250	6.00	Non-Traversable Median	26.00
194	8F	Urban	2450+69.650	2471+86.300	2,116.65	0.4009	2022: 135,700; 2023: 138,032; 2024: 140,365; 2025: 142,697; 2026: 145,030; 2027: 147,362; 2028: 149,695; 2029: 152,027; 2030: 154,360; 2031: 156,692; 2032: 159,025; 2033: 161,357; 2034: 163,690; 2035: 166,022; 2036: 168,355; 2037: 170,687; 2038: 173,020; 2039: 175,352; 2040: 177,685; 2041: 180,017; 2042: 182,350	6.00	Non-Traversable Median	26.00
197	7F	Urban	2471+86.300	2473+42.600	156.30	0.0296	2022: 125,850; 2023: 128,012; 2024: 130,175; 2025: 132,337; 2026: 134,500; 2027: 136,662; 2028: 138,825; 2029: 140,987; 2030: 143,150; 2031: 145,312; 2032: 147,475; 2033: 149,637; 2034: 151,800; 2035: 153,962; 2036: 156,125; 2037: 158,287; 2038: 160,450; 2039: 162,612; 2040: 164,775; 2041: 166,937; 2042: 169,100	6.00	Non-Traversable Median	26.00
198	6F	Urban	2473+42.600	2501+93.380	2,850.78	0.5399	2022: 115,700; 2023: 117,687; 2024: 119,675; 2025: 121,662; 2026: 123,650; 2027: 125,637; 2028: 127,625; 2029: 129,612; 2030: 131,600; 2031: 133,587; 2032: 135,575; 2033: 137,562; 2034: 139,550; 2035: 141,537; 2036: 143,525; 2037: 145,512; 2038: 147,500; 2039: 149,487; 2040: 151,475; 2041: 153,462; 2042: 155,450	6.00	Non-Traversable Median	26.00
199	6F	Urban	2501+93.380	2506+47.600	454.22	0.0860	2022: 122,650; 2023: 124,757; 2024: 126,865; 2025: 128,972; 2026: 131,080; 2027: 133,187; 2028: 135,295; 2029: 137,402; 2030: 139,510; 2031: 141,617; 2032: 143,725; 2033: 145,832; 2034: 147,940; 2035: 150,047; 2036: 152,155; 2037: 154,262; 2038: 156,370; 2039: 158,477; 2040: 160,585; 2041: 162,692; 2042: 164,800	6.00	Non-Traversable Median	26.00
201	6F	Urban	2506+47.600	2519+74.560	1,326.96	0.2513	2022: 129,350; 2023: 131,575; 2024: 133,800; 2025: 136,025; 2026: 138,250; 2027: 140,475; 2028: 142,700; 2029: 144,925; 2030: 147,150; 2031: 149,375; 2032: 151,600; 2033: 153,825; 2034: 156,050; 2035: 158,275; 2036: 160,500; 2037: 162,725; 2038: 164,950; 2039: 167,175; 2040: 169,400; 2041: 171,625; 2042: 173,850	6.00	Non-Traversable Median	26.00
206	6F	Urban	2519+74.560	2521+89.240	214.68	0.0407	2022: 122,300; 2023: 124,405; 2024: 126,510; 2025: 128,615; 2026: 130,720; 2027: 132,825; 2028: 134,930; 2029: 137,035; 2030: 139,140; 2031: 141,245; 2032: 143,350; 2033: 145,455; 2034: 147,560; 2035: 149,665; 2036: 151,770; 2037: 153,875; 2038: 155,980; 2039: 158,085; 2040: 160,190; 2041: 162,295; 2042: 164,400	6.00	Non-Traversable Median	26.00
208	6F	Urban	2521+89.240	2545+80.950	2,391.71	0.4530	2022: 110,400; 2023: 112,300; 2024: 114,200; 2025: 116,100; 2026: 118,000; 2027: 119,900; 2028: 121,800; 2029: 123,700; 2030: 125,600; 2031: 127,500; 2032: 129,400; 2033: 131,300; 2034: 133,200; 2035: 135,100; 2036: 137,000; 2037: 138,900; 2038: 140,800; 2039: 142,700; 2040: 144,600; 2041: 146,500; 2042: 148,400	6.00	Non-Traversable Median	26.00
209	7F	Urban	2545+80.950	2550+11.330	430.38	0.0815	2022: 116,550; 2023: 118,555; 2024: 120,560; 2025: 122,565; 2026: 124,570; 2027: 126,575; 2028: 128,580; 2029: 130,585; 2030: 132,590; 2031: 134,595; 2032: 136,600; 2033: 138,605; 2034: 140,610; 2035: 142,615; 2036: 144,620; 2037: 146,625; 2038: 148,630; 2039: 150,635; 2040: 152,640; 2041: 154,645; 2042: 156,650	6.00	Non-Traversable Median	26.00
210	7F	Urban	2550+11.330	2569+42.420	1,931.09	0.3657	2022: 124,050; 2023: 126,182; 2024: 128,315; 2025: 130,447; 2026: 132,580; 2027: 134,712; 2028: 136,845; 2029: 138,977; 2030: 141,110; 2031: 143,242; 2032: 145,375; 2033: 147,507; 2034: 149,640; 2035: 151,772; 2036: 153,905; 2037: 156,037; 2038: 158,170; 2039: 160,302; 2040: 162,435; 2041: 164,567; 2042: 166,700	6.00	Non-Traversable Median	26.00

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
213	6F	Urban	2569+42.420	2572+70.470	328.05	0.0621	2022: 116,000; 2023: 117,995; 2024: 119,990; 2025: 121,985; 2026: 123,980; 2027: 125,975; 2028: 127,970; 2029: 129,965; 2030: 131,960; 2031: 133,955; 2032: 135,950; 2033: 137,945; 2034: 139,940; 2035: 141,935; 2036: 143,930; 2037: 145,925; 2038: 147,920; 2039: 149,915; 2040: 151,910; 2041: 153,905; 2042: 155,900	6.00	Non-Traversable Median	26.00
215	6F	Urban	2572+70.470	2590+47.570	1,777.10	0.3366	2022: 108,000; 2023: 109,860; 2024: 111,720; 2025: 113,580; 2026: 115,440; 2027: 117,300; 2028: 119,160; 2029: 121,020; 2030: 122,880; 2031: 124,740; 2032: 126,600; 2033: 128,460; 2034: 130,320; 2035: 132,180; 2036: 134,040; 2037: 135,900; 2038: 137,760; 2039: 139,620; 2040: 141,480; 2041: 143,340; 2042: 145,200	6.00	Non-Traversable Median	26.00
217	6F	Urban	2590+47.570	2598+01.640	754.07	0.1428	2022: 94,700; 2023: 96,330; 2024: 97,960; 2025: 99,590; 2026: 101,220; 2027: 102,850; 2028: 104,480; 2029: 106,110; 2030: 107,740; 2031: 109,370; 2032: 111,000; 2033: 112,630; 2034: 114,260; 2035: 115,890; 2036: 117,520; 2037: 119,150; 2038: 120,780; 2039: 122,410; 2040: 124,040; 2041: 125,670; 2042: 127,300	6.00	Non-Traversable Median	26.00
219	6F	Urban	2598+01.640	2622+49.470	2,447.83	0.4636	2022: 84,550; 2023: 86,002; 2024: 87,455; 2025: 88,907; 2026: 90,360; 2027: 91,812; 2028: 93,265; 2029: 94,717; 2030: 96,170; 2031: 97,622; 2032: 99,075; 2033: 100,527; 2034: 101,980; 2035: 103,432; 2036: 104,885; 2037: 106,337; 2038: 107,790; 2039: 109,242; 2040: 110,695; 2041: 112,147; 2042: 113,600	6.00	Non-Traversable Median	26.00
221	6F	Urban	2622+49.470	2622+79.700	30.23	0.0057	2022: 78,550; 2023: 79,900; 2024: 81,250; 2025: 82,600; 2026: 83,950; 2027: 85,300; 2028: 86,650; 2029: 88,000; 2030: 89,350; 2031: 90,700; 2032: 92,050; 2033: 93,400; 2034: 94,750; 2035: 96,100; 2036: 97,450; 2037: 98,800; 2038: 100,150; 2039: 101,500; 2040: 102,850; 2041: 104,200; 2042: 105,550	6.00	Non-Traversable Median	26.00
222	6F	Urban	2622+79.700	2622+98.790	19.09	0.0036	2022: 85,150; 2023: 86,615; 2024: 88,080; 2025: 89,545; 2026: 91,010; 2027: 92,475; 2028: 93,940; 2029: 95,405; 2030: 96,870; 2031: 98,335; 2032: 99,800; 2033: 101,265; 2034: 102,730; 2035: 104,195; 2036: 105,660; 2037: 107,125; 2038: 108,590; 2039: 110,055; 2040: 111,520; 2041: 112,985; 2042: 114,450	6.00	Non-Traversable Median	26.00
223	6F	Urban	2622+98.790	2666+50.570	4,351.78	0.8242	2022: 85,150; 2023: 86,615; 2024: 88,080; 2025: 89,545; 2026: 91,010; 2027: 92,475; 2028: 93,940; 2029: 95,405; 2030: 96,870; 2031: 98,335; 2032: 99,800; 2033: 101,265; 2034: 102,730; 2035: 104,195; 2036: 105,660; 2037: 107,125; 2038: 108,590; 2039: 110,055; 2040: 111,520; 2041: 112,985; 2042: 114,450	6.00	Non-Traversable Median	26.00
225	6F	Urban	2666+50.570	2667+75.600	125.03	0.0237	2022: 72,400; 2023: 73,645; 2024: 74,890; 2025: 76,135; 2026: 77,380; 2027: 78,625; 2028: 79,870; 2029: 81,115; 2030: 82,360; 2031: 83,605; 2032: 84,850; 2033: 86,095; 2034: 87,340; 2035: 88,585; 2036: 89,830; 2037: 91,075; 2038: 92,320; 2039: 93,565; 2040: 94,810; 2041: 96,055; 2042: 97,300	6.00	Non-Traversable Median	26.00
226	6F	Urban	2667+75.600	2689+23.280	2,147.68	0.4068	2022: 85,450; 2023: 86,920; 2024: 88,390; 2025: 89,860; 2026: 91,330; 2027: 92,800; 2028: 94,270; 2029: 95,740; 2030: 97,210; 2031: 98,680; 2032: 100,150; 2033: 101,620; 2034: 103,090; 2035: 104,560; 2036: 106,030; 2037: 107,500; 2038: 108,970; 2039: 110,440; 2040: 111,910; 2041: 113,380; 2042: 114,850	6.00	Non-Traversable Median	26.00
228	6F	Urban	2689+23.280	2716+03.470	2,680.19	0.5076	2022: 75,700; 2023: 77,002; 2024: 78,305; 2025: 79,607; 2026: 80,910; 2027: 82,212; 2028: 83,515; 2029: 84,817; 2030: 86,120; 2031: 87,422; 2032: 88,725; 2033: 90,027; 2034: 91,330; 2035: 92,632; 2036: 93,935; 2037: 95,237; 2038: 96,540; 2039: 97,842; 2040: 99,145; 2041: 100,447; 2042: 101,750	6.00	Non-Traversable Median	26.00
230	8F	Urban	2716+03.470	2723+97.650	794.18	0.1504	2022: 70,400; 2023: 71,612; 2024: 72,825; 2025: 74,037; 2026: 75,250; 2027: 76,462; 2028: 77,675; 2029: 78,887; 2030: 80,100; 2031: 81,312; 2032: 82,525; 2033: 83,737; 2034: 84,950; 2035: 86,162; 2036: 87,375; 2037: 88,587; 2038: 89,800; 2039: 91,012; 2040: 92,225; 2041: 93,437; 2042: 94,650	6.00	Non-Traversable Median	26.00
231	10F	Urban	2723+97.650	2741+43.420	1,745.77	0.3306	2022: 72,250; 2023: 73,492; 2024: 74,735; 2025: 75,977; 2026: 77,220; 2027: 78,462; 2028: 79,705; 2029: 80,947; 2030: 82,190; 2031: 83,432; 2032: 84,675; 2033: 85,917; 2034: 87,160; 2035: 88,402; 2036: 89,645; 2037: 90,887; 2038: 92,130; 2039: 93,372; 2040: 94,615; 2041: 95,857; 2042: 97,100	6.00	Non-Traversable Median	26.00
232	10F	Urban	2741+43.420	2758+30.970	1,687.55	0.3196	2022: 80,400; 2023: 81,782; 2024: 83,165; 2025: 84,547; 2026: 85,930; 2027: 87,312; 2028: 88,695; 2029: 90,077; 2030: 91,460; 2031: 92,842; 2032: 94,225; 2033: 95,607; 2034: 96,990; 2035: 98,372; 2036: 99,755; 2037: 101,137; 2038: 102,520; 2039: 103,902; 2040: 105,285; 2041: 106,667; 2042: 108,050	6.00	Non-Traversable Median	26.00
233	9F	Urban	2758+30.970	2768+12.430	981.46	0.1859	2022: 72,400; 2023: 73,647; 2024: 74,895; 2025: 76,142; 2026: 77,390; 2027: 78,637; 2028: 79,885; 2029: 81,132; 2030: 82,380; 2031: 83,627; 2032: 84,875; 2033: 86,122; 2034: 87,370; 2035: 88,617; 2036: 89,865; 2037: 91,112; 2038: 92,360; 2039: 93,607; 2040: 94,855; 2041: 96,102; 2042: 97,350	6.00	Non-Traversable Median	26.00
234	8F	Urban	2768+12.430	2771+42.500	330.07	0.0625	2022: 58,850; 2023: 59,862; 2024: 60,875; 2025: 61,887; 2026: 62,900; 2027: 63,912; 2028: 64,925; 2029: 65,937; 2030: 66,950; 2031: 67,962; 2032: 68,975; 2033: 69,987; 2034: 71,000; 2035: 72,012; 2036: 73,025; 2037: 74,037; 2038: 75,050; 2039: 76,062; 2040: 77,075; 2041: 78,087; 2042: 79,100	6.00	Non-Traversable Median	26.00
236	8F	Urban	2771+42.500	2787+05.200	1,562.70	0.2960	2022: 56,250; 2023: 57,215; 2024: 58,180; 2025: 59,145; 2026: 60,110; 2027: 61,075; 2028: 62,040; 2029: 63,005; 2030: 63,970; 2031: 64,935; 2032: 65,900; 2033: 66,865; 2034: 67,830; 2035: 68,795; 2036: 69,760; 2037: 70,725; 2038: 71,690; 2039: 72,655; 2040: 73,620; 2041: 74,585; 2042: 75,550	6.00	Non-Traversable Median	26.00
237	8F	Urban	2787+05.200	2805+56.170	1,850.97	0.3506	2022: 59,750; 2023: 60,777; 2024: 61,805; 2025: 62,832; 2026: 63,860; 2027: 64,887; 2028: 65,915; 2029: 66,942; 2030: 67,970; 2031: 68,997; 2032: 70,025; 2033: 71,052; 2034: 72,080; 2035: 73,107; 2036: 74,135; 2037: 75,162; 2038: 76,190; 2039: 77,217; 2040: 78,245; 2041: 79,272; 2042: 80,300	6.00	Non-Traversable Median	26.00
240	8F	Urban	2805+56.170	2816+87.790	1,131.62	0.2143	2022: 56,950; 2023: 57,930; 2024: 58,910; 2025: 59,890; 2026: 60,870; 2027: 61,850; 2028: 62,830; 2029: 63,810; 2030: 64,790; 2031: 65,770; 2032: 66,750; 2033: 67,730; 2034: 68,710; 2035: 69,690; 2036: 70,670; 2037: 71,650; 2038: 72,630; 2039: 73,610; 2040: 74,590; 2041: 75,570; 2042: 76,550	6.00	Non-Traversable Median	26.00
242	8F	Urban	2816+87.790	2821+10.420	422.63	0.0800	2022: 49,700; 2023: 50,552; 2024: 51,405; 2025: 52,257; 2026: 53,110; 2027: 53,962; 2028: 54,815; 2029: 55,667; 2030: 56,520; 2031: 57,372; 2032: 58,225; 2033: 59,077; 2034: 59,930; 2035: 60,782; 2036: 61,635; 2037: 62,487; 2038: 63,340; 2039: 64,192; 2040: 65,045; 2041: 65,897; 2042: 66,750	6.00	Non-Traversable Median	26.00
243	9F	Urban	2821+10.420	2835+32.750	1,422.33	0.2694	2022: 56,650; 2023: 57,622; 2024: 58,595; 2025: 59,567; 2026: 60,540; 2027: 61,512; 2028: 62,485; 2029: 63,457; 2030: 64,430; 2031: 65,402; 2032: 66,375; 2033: 67,347; 2034: 68,320; 2035: 69,292; 2036: 70,265; 2037: 71,237; 2038: 72,210; 2039: 73,182; 2040: 74,155; 2041: 75,127; 2042: 76,100	6.00	Non-Traversable Median	26.00

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
244	10F	Urban	2835+32.750	2852+52.420	1,719.67	0.3257	2022: 68,450; 2023: 69,627; 2024: 70,805; 2025: 71,982; 2026: 73,160; 2027: 74,337; 2028: 75,515; 2029: 76,692; 2030: 77,870; 2031: 79,047; 2032: 80,225; 2033: 81,402; 2034: 82,580; 2035: 83,757; 2036: 84,935; 2037: 86,112; 2038: 87,290; 2039: 88,467; 2040: 89,645; 2041: 90,822; 2042: 92,000	6.00	Non-Traversable Median	26.00
246	7F	Urban	2852+52.420	2856+90.300	437.88	0.0829	2022: 65,200; 2023: 66,322; 2024: 67,445; 2025: 68,567; 2026: 69,690; 2027: 70,812; 2028: 71,935; 2029: 73,057; 2030: 74,180; 2031: 75,302; 2032: 76,425; 2033: 77,547; 2034: 78,670; 2035: 79,792; 2036: 80,915; 2037: 82,037; 2038: 83,160; 2039: 84,282; 2040: 85,405; 2041: 86,527; 2042: 87,650	6.00	Non-Traversable Median	26.00
247	4F	Urban	2856+90.300	2896+04.190	3,913.89	0.7413	2022: 49,850; 2023: 50,707; 2024: 51,565; 2025: 52,422; 2026: 53,280; 2027: 54,137; 2028: 54,995; 2029: 55,852; 2030: 56,710; 2031: 57,567; 2032: 58,425; 2033: 59,282; 2034: 60,140; 2035: 60,997; 2036: 61,855; 2037: 62,712; 2038: 63,570; 2039: 64,427; 2040: 65,285; 2041: 66,142; 2042: 67,000	6.00	Non-Traversable Median	26.00
248	4F	Urban	2896+04.190	2896+24.130	19.94	0.0038	2022: 50,800; 2023: 51,672; 2024: 52,545; 2025: 53,417; 2026: 54,290; 2027: 55,162; 2028: 56,035; 2029: 56,907; 2030: 57,780; 2031: 58,652; 2032: 59,525; 2033: 60,397; 2034: 61,270; 2035: 62,142; 2036: 63,015; 2037: 63,887; 2038: 64,760; 2039: 65,632; 2040: 66,505; 2041: 67,377; 2042: 68,250	6.00	Non-Traversable Median	26.00
250	4F	Urban	2896+24.130	2933+76.050	3,751.92	0.7106	2022: 51,400; 2023: 52,282; 2024: 53,165; 2025: 54,047; 2026: 54,930; 2027: 55,812; 2028: 56,695; 2029: 57,577; 2030: 58,460; 2031: 59,342; 2032: 60,225; 2033: 61,107; 2034: 61,990; 2035: 62,872; 2036: 63,755; 2037: 64,637; 2038: 65,520; 2039: 66,402; 2040: 67,285; 2041: 68,167; 2042: 69,050	6.00	Non-Traversable Median	26.00
254	4F	Urban	2933+76.050	2952+01.360	1,825.31	0.3457	2022: 36,250; 2023: 36,872; 2024: 37,495; 2025: 38,117; 2026: 38,740; 2027: 39,362; 2028: 39,985; 2029: 40,607; 2030: 41,230; 2031: 41,852; 2032: 42,475; 2033: 43,097; 2034: 43,720; 2035: 44,342; 2036: 44,965; 2037: 45,587; 2038: 46,210; 2039: 46,832; 2040: 47,455; 2041: 48,077; 2042: 48,700	6.00	Non-Traversable Median	26.00
256	4F	Urban	2952+01.360	3035+33.800	8,332.44	1.5781	2022: 20,400; 2023: 20,750; 2024: 21,100; 2025: 21,450; 2026: 21,800; 2027: 22,150; 2028: 22,500; 2029: 22,850; 2030: 23,200; 2031: 23,550; 2032: 23,900; 2033: 24,250; 2034: 24,600; 2035: 24,950; 2036: 25,300; 2037: 25,650; 2038: 26,000; 2039: 26,350; 2040: 26,700; 2041: 27,050; 2042: 27,400	6.00	Non-Traversable Median	26.00
257	4F	Urban	3035+33.800	3041+43.060	609.26	0.1154	2022: 22,750; 2023: 23,142; 2024: 23,535; 2025: 23,927; 2026: 24,320; 2027: 24,712; 2028: 25,105; 2029: 25,497; 2030: 25,890; 2031: 26,282; 2032: 26,675; 2033: 27,067; 2034: 27,460; 2035: 27,852; 2036: 28,245; 2037: 28,637; 2038: 29,030; 2039: 29,422; 2040: 29,815; 2041: 30,207; 2042: 30,600	6.00	Non-Traversable Median	26.00
259	4F	Urban	3041+43.060	3244+29.990	20,286.93	3.8422	2022: 25,500; 2023: 25,940; 2024: 26,380; 2025: 26,820; 2026: 27,260; 2027: 27,700; 2028: 28,140; 2029: 28,580; 2030: 29,020; 2031: 29,460; 2032: 29,900; 2033: 30,340; 2034: 30,780; 2035: 31,220; 2036: 31,660; 2037: 32,100; 2038: 32,540; 2039: 32,980; 2040: 33,420; 2041: 33,860; 2042: 34,300	6.00	Non-Traversable Median	26.00
263	4F	Urban	3244+29.990	3248+03.710	373.72	0.0708	2022: 22,100; 2023: 22,480; 2024: 22,860; 2025: 23,240; 2026: 23,620; 2027: 24,000; 2028: 24,380; 2029: 24,760; 2030: 25,140; 2031: 25,520; 2032: 25,900; 2033: 26,280; 2034: 26,660; 2035: 27,040; 2036: 27,420; 2037: 27,800; 2038: 28,180; 2039: 28,560; 2040: 28,940; 2041: 29,320; 2042: 29,700	6.00	Non-Traversable Median	26.00
265	4F	Urban	3248+03.710	3279+26.650	3,122.94	0.5915	2022: 18,650; 2023: 18,970; 2024: 19,290; 2025: 19,610; 2026: 19,930; 2027: 20,250; 2028: 20,570; 2029: 20,890; 2030: 21,210; 2031: 21,530; 2032: 21,850; 2033: 22,170; 2034: 22,490; 2035: 22,810; 2036: 23,130; 2037: 23,450; 2038: 23,770; 2039: 24,090; 2040: 24,410; 2041: 24,730; 2042: 25,050	6.00	Non-Traversable Median	26.00
266	4F	Urban	3279+26.650	3281+21.530	194.88	0.0369	2022: 19,600; 2023: 19,937; 2024: 20,275; 2025: 20,612; 2026: 20,950; 2027: 21,287; 2028: 21,625; 2029: 21,962; 2030: 22,300; 2031: 22,637; 2032: 22,975; 2033: 23,312; 2034: 23,650; 2035: 23,987; 2036: 24,325; 2037: 24,662; 2038: 25,000; 2039: 25,337; 2040: 25,675; 2041: 26,012; 2042: 26,350	6.00	Non-Traversable Median	26.00
268	4F	Urban	3281+21.530	3603+79.950	32,258.42	6.1095	2022: 20,250; 2023: 20,597; 2024: 20,945; 2025: 21,292; 2026: 21,640; 2027: 21,987; 2028: 22,335; 2029: 22,682; 2030: 23,030; 2031: 23,377; 2032: 23,725; 2033: 24,072; 2034: 24,420; 2035: 24,767; 2036: 25,115; 2037: 25,462; 2038: 25,810; 2039: 26,157; 2040: 26,505; 2041: 26,852; 2042: 27,200	6.00	Non-Traversable Median	26.00
273	4F	Urban	3603+79.950	3606+16.800	236.85	0.0449	2022: 17,000; 2023: 17,290; 2024: 17,580; 2025: 17,870; 2026: 18,160; 2027: 18,450; 2028: 18,740; 2029: 19,030; 2030: 19,320; 2031: 19,610; 2032: 19,900; 2033: 20,190; 2034: 20,480; 2035: 20,770; 2036: 21,060; 2037: 21,350; 2038: 21,640; 2039: 21,930; 2040: 22,220; 2041: 22,510; 2042: 22,800	6.00	Non-Traversable Median	26.00
275	4F	Urban	3606+16.800	3624+73.190	1,856.39	0.3516	2022: 14,100; 2023: 14,340; 2024: 14,580; 2025: 14,820; 2026: 15,060; 2027: 15,300; 2028: 15,540; 2029: 15,780; 2030: 16,020; 2031: 16,260; 2032: 16,500; 2033: 16,740; 2034: 16,980; 2035: 17,220; 2036: 17,460; 2037: 17,700; 2038: 17,940; 2039: 18,180; 2040: 18,420; 2041: 18,660; 2042: 18,900	6.00	Non-Traversable Median	26.00
276	4F	Urban	3624+73.190	3627+05.090	231.90	0.0439	2022: 14,750; 2023: 15,002; 2024: 15,255; 2025: 15,507; 2026: 15,760; 2027: 16,012; 2028: 16,265; 2029: 16,517; 2030: 16,770; 2031: 17,022; 2032: 17,275; 2033: 17,527; 2034: 17,780; 2035: 18,032; 2036: 18,285; 2037: 18,537; 2038: 18,790; 2039: 19,042; 2040: 19,295; 2041: 19,547; 2042: 19,800	6.00	Non-Traversable Median	26.00
278	4F	Urban	3627+05.090	3662+27.630	3,522.54	0.6672	2022: 15,500; 2023: 15,767; 2024: 16,035; 2025: 16,302; 2026: 16,570; 2027: 16,837; 2028: 17,105; 2029: 17,372; 2030: 17,640; 2031: 17,907; 2032: 18,175; 2033: 18,442; 2034: 18,710; 2035: 18,977; 2036: 19,245; 2037: 19,512; 2038: 19,780; 2039: 20,047; 2040: 20,315; 2041: 20,582; 2042: 20,850	6.00	Non-Traversable Median	26.00
283	4F	Urban	3662+27.630	3667+36.010	508.38	0.0963	2022: 15,450; 2023: 15,715; 2024: 15,980; 2025: 16,245; 2026: 16,510; 2027: 16,775; 2028: 17,040; 2029: 17,305; 2030: 17,570; 2031: 17,835; 2032: 18,100; 2033: 18,365; 2034: 18,630; 2035: 18,895; 2036: 19,160; 2037: 19,425; 2038: 19,690; 2039: 19,955; 2040: 20,220; 2041: 20,485; 2042: 20,750	6.00	Non-Traversable Median	26.00
285	4F	Urban	3667+36.010	3690+73.620	2,337.61	0.4427	2022: 15,400; 2023: 15,662; 2024: 15,925; 2025: 16,187; 2026: 16,450; 2027: 16,712; 2028: 16,975; 2029: 17,237; 2030: 17,500; 2031: 17,762; 2032: 18,025; 2033: 18,287; 2034: 18,550; 2035: 18,812; 2036: 19,075; 2037: 19,337; 2038: 19,600; 2039: 19,862; 2040: 20,125; 2041: 20,387; 2042: 20,650	6.00	Non-Traversable Median	26.00
286	4F	Urban	3690+73.620	3699+52.710	879.09	0.1665	2022: 15,450; 2023: 15,715; 2024: 15,980; 2025: 16,245; 2026: 16,510; 2027: 16,775; 2028: 17,040; 2029: 17,305; 2030: 17,570; 2031: 17,835; 2032: 18,100; 2033: 18,365; 2034: 18,630; 2035: 18,895; 2036: 19,160; 2037: 19,425; 2038: 19,690; 2039: 19,955; 2040: 20,220; 2041: 20,485; 2042: 20,750	6.00	Non-Traversable Median	26.00

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
288	4F	Urban	3699+52.710	3923+33.470	22,380.76	4.2388	2022: 15,500; 2023: 15,767; 2024: 16,035; 2025: 16,302; 2026: 16,570; 2027: 16,837; 2028: 17,105; 2029: 17,372; 2030: 17,640; 2031: 17,907; 2032: 18,175; 2033: 18,442; 2034: 18,710; 2035: 18,977; 2036: 19,245; 2037: 19,512; 2038: 19,780; 2039: 20,047; 2040: 20,315; 2041: 20,582; 2042: 20,850	6.00	Non-Traversable Median	26.00
292	4F	Urban	3923+33.470	3924+35.300	101.83	0.0193	2022: 15,050; 2023: 15,310; 2024: 15,570; 2025: 15,830; 2026: 16,090; 2027: 16,350; 2028: 16,610; 2029: 16,870; 2030: 17,130; 2031: 17,390; 2032: 17,650; 2033: 17,910; 2034: 18,170; 2035: 18,430; 2036: 18,690; 2037: 18,950; 2038: 19,210; 2039: 19,470; 2040: 19,730; 2041: 19,990; 2042: 20,250	6.00	Non-Traversable Median	26.00
294	4F	Urban	3924+35.300	3943+28.330	1,893.03	0.3585	2022: 14,450; 2023: 14,700; 2024: 14,950; 2025: 15,200; 2026: 15,450; 2027: 15,700; 2028: 15,950; 2029: 16,200; 2030: 16,450; 2031: 16,700; 2032: 16,950; 2033: 17,200; 2034: 17,450; 2035: 17,700; 2036: 17,950; 2037: 18,200; 2038: 18,450; 2039: 18,700; 2040: 18,950; 2041: 19,200; 2042: 19,450	6.00	Non-Traversable Median	26.00
295	4F	Urban	3943+28.330	3945+80.010	251.68	0.0477	2022: 14,850; 2023: 15,105; 2024: 15,360; 2025: 15,615; 2026: 15,870; 2027: 16,125; 2028: 16,380; 2029: 16,635; 2030: 16,890; 2031: 17,145; 2032: 17,400; 2033: 17,655; 2034: 17,910; 2035: 18,165; 2036: 18,420; 2037: 18,675; 2038: 18,930; 2039: 19,185; 2040: 19,440; 2041: 19,695; 2042: 19,950	6.00	Non-Traversable Median	26.00
297	4F	Urban	3945+80.010	4035+90.691	9,010.68	1.7066	2022: 15,250; 2023: 15,510; 2024: 15,770; 2025: 16,030; 2026: 16,290; 2027: 16,550; 2028: 16,810; 2029: 17,070; 2030: 17,330; 2031: 17,590; 2032: 17,850; 2033: 18,110; 2034: 18,370; 2035: 18,630; 2036: 18,890; 2037: 19,150; 2038: 19,410; 2039: 19,670; 2040: 19,930; 2041: 20,190; 2042: 20,450	6.00	Non-Traversable Median	26.00

Table 2. Evaluation Freeway - Speed Change Lanes (Speed Change)

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
2	4SC	Exit	1000+00.000	1001+07.510	107.51	0.0204	2022: 28,450; 2023: 28,937; 2024: 29,425; 2025: 29,912; 2026: 30,400; 2027: 30,887; 2028: 31,375; 2029: 31,862; 2030: 32,350; 2031: 32,837; 2032: 33,325; 2033: 33,812; 2034: 34,300; 2035: 34,787; 2036: 35,275; 2037: 35,762; 2038: 36,250; 2039: 36,737; 2040: 37,225; 2041: 37,712; 2042: 38,200	6.00	Non-Traversable Median	26.00
4	4SC	Exit	1001+07.510	1001+30.470	22.96	0.0043	2022: 25,800; 2023: 26,242; 2024: 26,685; 2025: 27,127; 2026: 27,570; 2027: 28,012; 2028: 28,455; 2029: 28,897; 2030: 29,340; 2031: 29,782; 2032: 30,225; 2033: 30,667; 2034: 31,110; 2035: 31,552; 2036: 31,995; 2037: 32,437; 2038: 32,880; 2039: 33,322; 2040: 33,765; 2041: 34,207; 2042: 34,650	6.00	Non-Traversable Median	26.00
10	4SC	Exit	1084+46.040	1087+36.040	290.00	0.0549	2022: 32,800; 2023: 33,365; 2024: 33,930; 2025: 34,495; 2026: 35,060; 2027: 35,625; 2028: 36,190; 2029: 36,755; 2030: 37,320; 2031: 37,885; 2032: 38,450; 2033: 39,015; 2034: 39,580; 2035: 40,145; 2036: 40,710; 2037: 41,275; 2038: 41,840; 2039: 42,405; 2040: 42,970; 2041: 43,535; 2042: 44,100	6.00	Non-Traversable Median	26.00
12	4SC	Entrance	1108+25.790	1113+55.790	530.00	0.1004	2022: 34,050; 2023: 34,635; 2024: 35,220; 2025: 35,805; 2026: 36,390; 2027: 36,975; 2028: 37,560; 2029: 38,145; 2030: 38,730; 2031: 39,315; 2032: 39,900; 2033: 40,485; 2034: 41,070; 2035: 41,655; 2036: 42,240; 2037: 42,825; 2038: 43,410; 2039: 43,995; 2040: 44,580; 2041: 45,165; 2042: 45,750	6.00	Non-Traversable Median	26.00
13	4SC	Exit	1138+01.180	1141+21.180	320.00	0.0606	2022: 34,050; 2023: 34,635; 2024: 35,220; 2025: 35,805; 2026: 36,390; 2027: 36,975; 2028: 37,560; 2029: 38,145; 2030: 38,730; 2031: 39,315; 2032: 39,900; 2033: 40,485; 2034: 41,070; 2035: 41,655; 2036: 42,240; 2037: 42,825; 2038: 43,410; 2039: 43,995; 2040: 44,580; 2041: 45,165; 2042: 45,750	6.00	Non-Traversable Median	26.00
14	4SC	Entrance	1138+97.170	1141+21.180	224.01	0.0424	2022: 34,050; 2023: 34,635; 2024: 35,220; 2025: 35,805; 2026: 36,390; 2027: 36,975; 2028: 37,560; 2029: 38,145; 2030: 38,730; 2031: 39,315; 2032: 39,900; 2033: 40,485; 2034: 41,070; 2035: 41,655; 2036: 42,240; 2037: 42,825; 2038: 43,410; 2039: 43,995; 2040: 44,580; 2041: 45,165; 2042: 45,750	6.00	Non-Traversable Median	26.00
16	4SC	Entrance	1141+21.180	1142+97.170	175.99	0.0333	2022: 32,350; 2023: 32,907; 2024: 33,465; 2025: 34,022; 2026: 34,580; 2027: 35,137; 2028: 35,695; 2029: 36,252; 2030: 36,810; 2031: 37,367; 2032: 37,925; 2033: 38,482; 2034: 39,040; 2035: 39,597; 2036: 40,155; 2037: 40,712; 2038: 41,270; 2039: 41,827; 2040: 42,385; 2041: 42,942; 2042: 43,500	6.00	Non-Traversable Median	26.00
19	4SC	Entrance	1171+25.410	1178+75.410	750.00	0.1421	2022: 35,250; 2023: 35,855; 2024: 36,460; 2025: 37,065; 2026: 37,670; 2027: 38,275; 2028: 38,880; 2029: 39,485; 2030: 40,090; 2031: 40,695; 2032: 41,300; 2033: 41,905; 2034: 42,510; 2035: 43,115; 2036: 43,720; 2037: 44,325; 2038: 44,930; 2039: 45,535; 2040: 46,140; 2041: 46,745; 2042: 47,350	6.00	Non-Traversable Median	26.00
21	4SC	Exit	1181+76.080	1184+86.080	310.00	0.0587	2022: 39,650; 2023: 40,330; 2024: 41,010; 2025: 41,690; 2026: 42,370; 2027: 43,050; 2028: 43,730; 2029: 44,410; 2030: 45,090; 2031: 45,770; 2032: 46,450; 2033: 47,130; 2034: 47,810; 2035: 48,490; 2036: 49,170; 2037: 49,850; 2038: 50,530; 2039: 51,210; 2040: 51,890; 2041: 52,570; 2042: 53,250	6.00	Non-Traversable Median	26.00
22	4SC	Exit	1307+34.960	1310+09.960	275.00	0.0521	2022: 39,650; 2023: 40,330; 2024: 41,010; 2025: 41,690; 2026: 42,370; 2027: 43,050; 2028: 43,730; 2029: 44,410; 2030: 45,090; 2031: 45,770; 2032: 46,450; 2033: 47,130; 2034: 47,810; 2035: 48,490; 2036: 49,170; 2037: 49,850; 2038: 50,530; 2039: 51,210; 2040: 51,890; 2041: 52,570; 2042: 53,250	6.00	Non-Traversable Median	26.00
23	4SC	Entrance	1304+66.670	1310+09.960	543.29	0.1029	2022: 39,650; 2023: 40,330; 2024: 41,010; 2025: 41,690; 2026: 42,370; 2027: 43,050; 2028: 43,730; 2029: 44,410; 2030: 45,090; 2031: 45,770; 2032: 46,450; 2033: 47,130; 2034: 47,810; 2035: 48,490; 2036: 49,170; 2037: 49,850; 2038: 50,530; 2039: 51,210; 2040: 51,890; 2041: 52,570; 2042: 53,250	6.00	Non-Traversable Median	26.00
25	4SC	Entrance	1310+09.960	1311+36.670	126.71	0.0240	2022: 36,450; 2023: 37,075; 2024: 37,700; 2025: 38,325; 2026: 38,950; 2027: 39,575; 2028: 40,200; 2029: 40,825; 2030: 41,450; 2031: 42,075; 2032: 42,700; 2033: 43,325; 2034: 43,950; 2035: 44,575; 2036: 45,200; 2037: 45,825; 2038: 46,450; 2039: 47,075; 2040: 47,700; 2041: 48,325; 2042: 48,950	6.00	Non-Traversable Median	26.00
28	4SC	Exit	1353+89.440	1355+18.280	128.84	0.0244	2022: 33,100; 2023: 33,670; 2024: 34,240; 2025: 34,810; 2026: 35,380; 2027: 35,950; 2028: 36,520; 2029: 37,090; 2030: 37,660; 2031: 38,230; 2032: 38,800; 2033: 39,370; 2034: 39,940; 2035: 40,510; 2036: 41,080; 2037: 41,650; 2038: 42,220; 2039: 42,790; 2040: 43,360; 2041: 43,930; 2042: 44,500	6.00	Non-Traversable Median	26.00
30	4SC	Exit	1355+18.280	1356+89.440	171.16	0.0324	2022: 37,950; 2023: 38,605; 2024: 39,260; 2025: 39,915; 2026: 40,570; 2027: 41,225; 2028: 41,880; 2029: 42,535; 2030: 43,190; 2031: 43,845; 2032: 44,500; 2033: 45,155; 2034: 45,810; 2035: 46,465; 2036: 47,120; 2037: 47,775; 2038: 48,430; 2039: 49,085; 2040: 49,740; 2041: 50,395; 2042: 51,050	6.00	Non-Traversable Median	26.00
31	4SC	Entrance	1355+18.280	1361+68.280	650.00	0.1231	2022: 37,950; 2023: 38,605; 2024: 39,260; 2025: 39,915; 2026: 40,570; 2027: 41,225; 2028: 41,880; 2029: 42,535; 2030: 43,190; 2031: 43,845; 2032: 44,500; 2033: 45,155; 2034: 45,810; 2035: 46,465; 2036: 47,120; 2037: 47,775; 2038: 48,430; 2039: 49,085; 2040: 49,740; 2041: 50,395; 2042: 51,050	6.00	Non-Traversable Median	26.00
33	4SC	Exit	1365+82.620	1366+63.080	80.46	0.0152	2022: 43,450; 2023: 44,200; 2024: 44,950; 2025: 45,700; 2026: 46,450; 2027: 47,200; 2028: 47,950; 2029: 48,700; 2030: 49,450; 2031: 50,200; 2032: 50,950; 2033: 51,700; 2034: 52,450; 2035: 53,200; 2036: 53,950; 2037: 54,700; 2038: 55,450; 2039: 56,200; 2040: 56,950; 2041: 57,700; 2042: 58,450	6.00	Non-Traversable Median	26.00
35	4SC	Exit	1366+63.080	1369+92.620	329.54	0.0624	2022: 45,100; 2023: 45,877; 2024: 46,655; 2025: 47,432; 2026: 48,210; 2027: 48,987; 2028: 49,765; 2029: 50,542; 2030: 51,320; 2031: 52,097; 2032: 52,875; 2033: 53,652; 2034: 54,430; 2035: 55,207; 2036: 55,985; 2037: 56,762; 2038: 57,540; 2039: 58,317; 2040: 59,095; 2041: 59,872; 2042: 60,650	6.00	Non-Traversable Median	26.00
36	4SC	Entrance	1366+63.080	1374+93.080	830.00	0.1572	2022: 45,100; 2023: 45,877; 2024: 46,655; 2025: 47,432; 2026: 48,210; 2027: 48,987; 2028: 49,765; 2029: 50,542; 2030: 51,320; 2031: 52,097; 2032: 52,875; 2033: 53,652; 2034: 54,430; 2035: 55,207; 2036: 55,985; 2037: 56,762; 2038: 57,540; 2039: 58,317; 2040: 59,095; 2041: 59,872; 2042: 60,650	6.00	Non-Traversable Median	26.00
37	4SC	Entrance	1382+12.400	1387+72.400	560.00	0.1061	2022: 45,100; 2023: 45,877; 2024: 46,655; 2025: 47,432; 2026: 48,210; 2027: 48,987; 2028: 49,765; 2029: 50,542; 2030: 51,320; 2031: 52,097; 2032: 52,875; 2033: 53,652; 2034: 54,430; 2035: 55,207; 2036: 55,985; 2037: 56,762; 2038: 57,540; 2039: 58,317; 2040: 59,095; 2041: 59,872; 2042: 60,650	6.00	Non-Traversable Median	26.00

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
39	4SC	Exit	1399+68.800	1401+83.800	215.00	0.0407	2022: 41,250; 2023: 41,960; 2024: 42,670; 2025: 43,380; 2026: 44,090; 2027: 44,800; 2028: 45,510; 2029: 46,220; 2030: 46,930; 2031: 47,640; 2032: 48,350; 2033: 49,060; 2034: 49,770; 2035: 50,480; 2036: 51,190; 2037: 51,900; 2038: 52,610; 2039: 53,320; 2040: 54,030; 2041: 54,740; 2042: 55,450	6.00	Non-Traversable Median	26.00
42	5SC	Exit	1448+14.880	1448+51.680	36.80	0.0070	2022: 51,850; 2023: 52,742; 2024: 53,635; 2025: 54,527; 2026: 55,420; 2027: 56,312; 2028: 57,205; 2029: 58,097; 2030: 58,990; 2031: 59,882; 2032: 60,775; 2033: 61,667; 2034: 62,560; 2035: 63,452; 2036: 64,345; 2037: 65,237; 2038: 66,130; 2039: 67,022; 2040: 67,915; 2041: 68,807; 2042: 69,700	6.00	Non-Traversable Median	26.00
43	5SC	Exit	1448+48.620	1448+51.680	3.06	0.0006	2022: 51,850; 2023: 52,742; 2024: 53,635; 2025: 54,527; 2026: 55,420; 2027: 56,312; 2028: 57,205; 2029: 58,097; 2030: 58,990; 2031: 59,882; 2032: 60,775; 2033: 61,667; 2034: 62,560; 2035: 63,452; 2036: 64,345; 2037: 65,237; 2038: 66,130; 2039: 67,022; 2040: 67,915; 2041: 68,807; 2042: 69,700	6.00	Non-Traversable Median	26.00
44	5SC	Entrance	1448+16.890	1448+51.680	34.79	0.0066	2022: 51,850; 2023: 52,742; 2024: 53,635; 2025: 54,527; 2026: 55,420; 2027: 56,312; 2028: 57,205; 2029: 58,097; 2030: 58,990; 2031: 59,882; 2032: 60,775; 2033: 61,667; 2034: 62,560; 2035: 63,452; 2036: 64,345; 2037: 65,237; 2038: 66,130; 2039: 67,022; 2040: 67,915; 2041: 68,807; 2042: 69,700	6.00	Non-Traversable Median	26.00
46	6SC	Exit	1448+51.680	1461+68.620	1,316.94	0.2494	2022: 64,300; 2023: 65,407; 2024: 66,515; 2025: 67,622; 2026: 68,730; 2027: 69,837; 2028: 70,945; 2029: 72,052; 2030: 73,160; 2031: 74,267; 2032: 75,375; 2033: 76,482; 2034: 77,590; 2035: 78,697; 2036: 79,805; 2037: 80,912; 2038: 82,020; 2039: 83,127; 2040: 84,235; 2041: 85,342; 2042: 86,450	6.00	Non-Traversable Median	26.00
47	6SC	Entrance	1448+51.680	1461+68.620	1,316.94	0.2494	2022: 64,300; 2023: 65,407; 2024: 66,515; 2025: 67,622; 2026: 68,730; 2027: 69,837; 2028: 70,945; 2029: 72,052; 2030: 73,160; 2031: 74,267; 2032: 75,375; 2033: 76,482; 2034: 77,590; 2035: 78,697; 2036: 79,805; 2037: 80,912; 2038: 82,020; 2039: 83,127; 2040: 84,235; 2041: 85,342; 2042: 86,450	6.00	Non-Traversable Median	26.00
48	6SC	Exit	1448+51.680	1461+68.620	1,316.94	0.2494	2022: 64,300; 2023: 65,407; 2024: 66,515; 2025: 67,622; 2026: 68,730; 2027: 69,837; 2028: 70,945; 2029: 72,052; 2030: 73,160; 2031: 74,267; 2032: 75,375; 2033: 76,482; 2034: 77,590; 2035: 78,697; 2036: 79,805; 2037: 80,912; 2038: 82,020; 2039: 83,127; 2040: 84,235; 2041: 85,342; 2042: 86,450	6.00	Non-Traversable Median	26.00
49	6SC	Entrance	1448+51.680	1461+68.620	1,316.94	0.2494	2022: 64,300; 2023: 65,407; 2024: 66,515; 2025: 67,622; 2026: 68,730; 2027: 69,837; 2028: 70,945; 2029: 72,052; 2030: 73,160; 2031: 74,267; 2032: 75,375; 2033: 76,482; 2034: 77,590; 2035: 78,697; 2036: 79,805; 2037: 80,912; 2038: 82,020; 2039: 83,127; 2040: 84,235; 2041: 85,342; 2042: 86,450	6.00	Non-Traversable Median	26.00
51	5SC	Exit	1461+68.620	1463+34.880	166.26	0.0315	2022: 59,750; 2023: 60,777; 2024: 61,805; 2025: 62,832; 2026: 63,860; 2027: 64,887; 2028: 65,915; 2029: 66,942; 2030: 67,970; 2031: 68,997; 2032: 70,025; 2033: 71,052; 2034: 72,080; 2035: 73,107; 2036: 74,135; 2037: 75,162; 2038: 76,190; 2039: 77,217; 2040: 78,245; 2041: 79,272; 2042: 80,300	6.00	Non-Traversable Median	26.00
52	5SC	Entrance	1461+68.620	1461+71.680	3.06	0.0006	2022: 59,750; 2023: 60,777; 2024: 61,805; 2025: 62,832; 2026: 63,860; 2027: 64,887; 2028: 65,915; 2029: 66,942; 2030: 67,970; 2031: 68,997; 2032: 70,025; 2033: 71,052; 2034: 72,080; 2035: 73,107; 2036: 74,135; 2037: 75,162; 2038: 76,190; 2039: 77,217; 2040: 78,245; 2041: 79,272; 2042: 80,300	6.00	Non-Traversable Median	26.00
53	5SC	Entrance	1461+68.620	1463+36.890	168.27	0.0319	2022: 59,750; 2023: 60,777; 2024: 61,805; 2025: 62,832; 2026: 63,860; 2027: 64,887; 2028: 65,915; 2029: 66,942; 2030: 67,970; 2031: 68,997; 2032: 70,025; 2033: 71,052; 2034: 72,080; 2035: 73,107; 2036: 74,135; 2037: 75,162; 2038: 76,190; 2039: 77,217; 2040: 78,245; 2041: 79,272; 2042: 80,300	6.00	Non-Traversable Median	26.00
56	4SC	Entrance	1532+41.010	1540+41.010	800.00	0.1515	2022: 64,950; 2023: 66,065; 2024: 67,180; 2025: 68,295; 2026: 69,410; 2027: 70,525; 2028: 71,640; 2029: 72,755; 2030: 73,870; 2031: 74,985; 2032: 76,100; 2033: 77,215; 2034: 78,330; 2035: 79,445; 2036: 80,560; 2037: 81,675; 2038: 82,790; 2039: 83,905; 2040: 85,020; 2041: 86,135; 2042: 87,250	6.00	Non-Traversable Median	26.00
58	4SC	Exit	1542+72.380	1545+72.380	300.00	0.0568	2022: 74,850; 2023: 76,137; 2024: 77,425; 2025: 78,712; 2026: 80,000; 2027: 81,287; 2028: 82,575; 2029: 83,862; 2030: 85,150; 2031: 86,437; 2032: 87,725; 2033: 89,012; 2034: 90,300; 2035: 91,587; 2036: 92,875; 2037: 94,162; 2038: 95,450; 2039: 96,737; 2040: 98,025; 2041: 99,312; 2042: 100,600	6.00	Non-Traversable Median	26.00
59	4SC	Exit	1568+23.740	1571+03.740	280.00	0.0530	2022: 74,850; 2023: 76,137; 2024: 77,425; 2025: 78,712; 2026: 80,000; 2027: 81,287; 2028: 82,575; 2029: 83,862; 2030: 85,150; 2031: 86,437; 2032: 87,725; 2033: 89,012; 2034: 90,300; 2035: 91,587; 2036: 92,875; 2037: 94,162; 2038: 95,450; 2039: 96,737; 2040: 98,025; 2041: 99,312; 2042: 100,600	6.00	Non-Traversable Median	26.00
60	4SC	Entrance	1567+65.940	1571+03.740	337.80	0.0640	2022: 74,850; 2023: 76,137; 2024: 77,425; 2025: 78,712; 2026: 80,000; 2027: 81,287; 2028: 82,575; 2029: 83,862; 2030: 85,150; 2031: 86,437; 2032: 87,725; 2033: 89,012; 2034: 90,300; 2035: 91,587; 2036: 92,875; 2037: 94,162; 2038: 95,450; 2039: 96,737; 2040: 98,025; 2041: 99,312; 2042: 100,600	6.00	Non-Traversable Median	26.00
62	4SC	Entrance	1571+03.740	1571+65.940	62.20	0.0118	2022: 68,050; 2023: 69,220; 2024: 70,390; 2025: 71,560; 2026: 72,730; 2027: 73,900; 2028: 75,070; 2029: 76,240; 2030: 77,410; 2031: 78,580; 2032: 79,750; 2033: 80,920; 2034: 82,090; 2035: 83,260; 2036: 84,430; 2037: 85,600; 2038: 86,770; 2039: 87,940; 2040: 89,110; 2041: 90,280; 2042: 91,450	6.00	Non-Traversable Median	26.00
69	9SC	Entrance	1800+10.210	1802+00.210	190.00	0.0360	2022: 101,350; 2023: 103,092; 2024: 104,835; 2025: 106,577; 2026: 108,320; 2027: 110,062; 2028: 111,805; 2029: 113,547; 2030: 115,290; 2031: 117,032; 2032: 118,775; 2033: 120,517; 2034: 122,260; 2035: 124,002; 2036: 125,745; 2037: 127,487; 2038: 129,230; 2039: 130,972; 2040: 132,715; 2041: 134,457; 2042: 136,200	6.00	Non-Traversable Median	26.00
73	8SC	Exit	1858+89.680	1861+14.680	225.00	0.0426	2022: 106,850; 2023: 108,687; 2024: 110,525; 2025: 112,362; 2026: 114,200; 2027: 116,037; 2028: 117,875; 2029: 119,712; 2030: 121,550; 2031: 123,387; 2032: 125,225; 2033: 127,062; 2034: 128,900; 2035: 130,737; 2036: 132,575; 2037: 134,412; 2038: 136,250; 2039: 138,087; 2040: 139,925; 2041: 141,762; 2042: 143,600	6.00	Non-Traversable Median	26.00
75	8SC	Entrance	1862+31.360	1871+31.360	900.00	0.1704	2022: 118,200; 2023: 120,230; 2024: 122,260; 2025: 124,290; 2026: 126,320; 2027: 128,350; 2028: 130,380; 2029: 132,410; 2030: 134,440; 2031: 136,470; 2032: 138,500; 2033: 140,530; 2034: 142,560; 2035: 144,590; 2036: 146,620; 2037: 148,650; 2038: 150,680; 2039: 152,710; 2040: 154,740; 2041: 156,770; 2042: 158,800	6.00	Non-Traversable Median	26.00
76	8SC	Entrance	1934+07.720	1937+57.720	350.00	0.0663	2022: 118,200; 2023: 120,230; 2024: 122,260; 2025: 124,290; 2026: 126,320; 2027: 128,350; 2028: 130,380; 2029: 132,410; 2030: 134,440; 2031: 136,470; 2032: 138,500; 2033: 140,530; 2034: 142,560; 2035: 144,590; 2036: 146,620; 2037: 148,650; 2038: 150,680; 2039: 152,710; 2040: 154,740; 2041: 156,770; 2042: 158,800	6.00	Non-Traversable Median	26.00

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
78	8SC	Exit	1943+40.160	1945+10.160	170.00	0.0322	2022: 114,600; 2023: 116,570; 2024: 118,540; 2025: 120,510; 2026: 122,480; 2027: 124,450; 2028: 126,420; 2029: 128,390; 2030: 130,360; 2031: 132,330; 2032: 134,300; 2033: 136,270; 2034: 138,240; 2035: 140,210; 2036: 142,180; 2037: 144,150; 2038: 146,120; 2039: 148,090; 2040: 150,060; 2041: 152,030; 2042: 154,000	6.00	Non-Traversable Median	26.00
81	8SC	Entrance	1962+27.940	1964+92.940	265.00	0.0502	2022: 112,750; 2023: 114,690; 2024: 116,630; 2025: 118,570; 2026: 120,510; 2027: 122,450; 2028: 124,390; 2029: 126,330; 2030: 128,270; 2031: 130,210; 2032: 132,150; 2033: 134,090; 2034: 136,030; 2035: 137,970; 2036: 139,910; 2037: 141,850; 2038: 143,790; 2039: 145,730; 2040: 147,670; 2041: 149,610; 2042: 151,550	6.00	Non-Traversable Median	26.00
83	8SC	Exit	1969+25.480	1973+25.480	400.00	0.0758	2022: 122,250; 2023: 124,352; 2024: 126,455; 2025: 128,557; 2026: 130,660; 2027: 132,762; 2028: 134,865; 2029: 136,967; 2030: 139,070; 2031: 141,172; 2032: 143,275; 2033: 145,377; 2034: 147,480; 2035: 149,582; 2036: 151,685; 2037: 153,787; 2038: 155,890; 2039: 157,992; 2040: 160,095; 2041: 162,197; 2042: 164,300	6.00	Non-Traversable Median	26.00
84	8SC	Exit	1982+00.120	1983+70.120	170.00	0.0322	2022: 122,250; 2023: 124,352; 2024: 126,455; 2025: 128,557; 2026: 130,660; 2027: 132,762; 2028: 134,865; 2029: 136,967; 2030: 139,070; 2031: 141,172; 2032: 143,275; 2033: 145,377; 2034: 147,480; 2035: 149,582; 2036: 151,685; 2037: 153,787; 2038: 155,890; 2039: 157,992; 2040: 160,095; 2041: 162,197; 2042: 164,300	6.00	Non-Traversable Median	26.00
87	8SC	Exit	1992+04.960	1993+20.390	115.43	0.0219	2022: 123,950; 2023: 126,080; 2024: 128,210; 2025: 130,340; 2026: 132,470; 2027: 134,600; 2028: 136,730; 2029: 138,860; 2030: 140,990; 2031: 143,120; 2032: 145,250; 2033: 147,380; 2034: 149,510; 2035: 151,640; 2036: 153,770; 2037: 155,900; 2038: 158,030; 2039: 160,160; 2040: 162,290; 2041: 164,420; 2042: 166,550	6.00	Non-Traversable Median	26.00
89	8SC	Exit	1993+20.390	1993+94.960	74.57	0.0141	2022: 130,350; 2023: 132,590; 2024: 134,830; 2025: 137,070; 2026: 139,310; 2027: 141,550; 2028: 143,790; 2029: 146,030; 2030: 148,270; 2031: 150,510; 2032: 152,750; 2033: 154,990; 2034: 157,230; 2035: 159,470; 2036: 161,710; 2037: 163,950; 2038: 166,190; 2039: 168,430; 2040: 170,670; 2041: 172,910; 2042: 175,150	6.00	Non-Traversable Median	26.00
90	8SC	Entrance	1993+20.390	1995+45.390	225.00	0.0426	2022: 130,350; 2023: 132,590; 2024: 134,830; 2025: 137,070; 2026: 139,310; 2027: 141,550; 2028: 143,790; 2029: 146,030; 2030: 148,270; 2031: 150,510; 2032: 152,750; 2033: 154,990; 2034: 157,230; 2035: 159,470; 2036: 161,710; 2037: 163,950; 2038: 166,190; 2039: 168,430; 2040: 170,670; 2041: 172,910; 2042: 175,150	6.00	Non-Traversable Median	26.00
91	8SC	Exit	2004+81.220	2006+55.130	173.91	0.0329	2022: 130,350; 2023: 132,590; 2024: 134,830; 2025: 137,070; 2026: 139,310; 2027: 141,550; 2028: 143,790; 2029: 146,030; 2030: 148,270; 2031: 150,510; 2032: 152,750; 2033: 154,990; 2034: 157,230; 2035: 159,470; 2036: 161,710; 2037: 163,950; 2038: 166,190; 2039: 168,430; 2040: 170,670; 2041: 172,910; 2042: 175,150	6.00	Non-Traversable Median	26.00
93	7SC	Exit	2006+55.130	2006+91.220	36.09	0.0068	2022: 121,900; 2023: 123,997; 2024: 126,095; 2025: 128,192; 2026: 130,290; 2027: 132,387; 2028: 134,485; 2029: 136,582; 2030: 138,680; 2031: 140,777; 2032: 142,875; 2033: 144,972; 2034: 147,070; 2035: 149,167; 2036: 151,265; 2037: 153,362; 2038: 155,460; 2039: 157,557; 2040: 159,655; 2041: 161,752; 2042: 163,850	6.00	Non-Traversable Median	26.00
96	7SC	Exit	2045+17.910	2046+03.220	85.31	0.0162	2022: 120,650; 2023: 122,722; 2024: 124,795; 2025: 126,867; 2026: 128,940; 2027: 131,012; 2028: 133,085; 2029: 135,157; 2030: 137,230; 2031: 139,302; 2032: 141,375; 2033: 143,447; 2034: 145,520; 2035: 147,592; 2036: 149,665; 2037: 151,737; 2038: 153,810; 2039: 155,882; 2040: 157,955; 2041: 160,027; 2042: 162,100	6.00	Non-Traversable Median	26.00
98	8SC	Exit	2046+03.220	2047+37.910	134.69	0.0255	2022: 133,950; 2023: 136,252; 2024: 138,555; 2025: 140,857; 2026: 143,160; 2027: 145,462; 2028: 147,765; 2029: 150,067; 2030: 152,370; 2031: 154,672; 2032: 156,975; 2033: 159,277; 2034: 161,580; 2035: 163,882; 2036: 166,185; 2037: 168,487; 2038: 170,790; 2039: 173,092; 2040: 175,395; 2041: 177,697; 2042: 180,000	6.00	Non-Traversable Median	26.00
100	9SC	Entrance	2049+38.400	2051+11.970	173.57	0.0329	2022: 148,750; 2023: 151,310; 2024: 153,870; 2025: 156,430; 2026: 158,990; 2027: 161,550; 2028: 164,110; 2029: 166,670; 2030: 169,230; 2031: 171,790; 2032: 174,350; 2033: 176,910; 2034: 179,470; 2035: 182,030; 2036: 184,590; 2037: 187,150; 2038: 189,710; 2039: 192,270; 2040: 194,830; 2041: 197,390; 2042: 199,950	6.00	Non-Traversable Median	26.00
102	10SC	Entrance	2051+11.970	2054+58.400	346.43	0.0656	2022: 158,450; 2023: 161,175; 2024: 163,900; 2025: 166,625; 2026: 169,350; 2027: 172,075; 2028: 174,800; 2029: 177,525; 2030: 180,250; 2031: 182,975; 2032: 185,700; 2033: 188,425; 2034: 191,150; 2035: 193,875; 2036: 196,600; 2037: 199,325; 2038: 202,050; 2039: 204,775; 2040: 207,500; 2041: 210,225; 2042: 212,950	6.00	Non-Traversable Median	26.00
103	10SC	Entrance	2063+12.740	2067+62.740	450.00	0.0852	2022: 158,450; 2023: 161,175; 2024: 163,900; 2025: 166,625; 2026: 169,350; 2027: 172,075; 2028: 174,800; 2029: 177,525; 2030: 180,250; 2031: 182,975; 2032: 185,700; 2033: 188,425; 2034: 191,150; 2035: 193,875; 2036: 196,600; 2037: 199,325; 2038: 202,050; 2039: 204,775; 2040: 207,500; 2041: 210,225; 2042: 212,950	6.00	Non-Traversable Median	26.00
105	10SC	Exit	2070+65.530	2072+80.530	215.00	0.0407	2022: 155,400; 2023: 158,070; 2024: 160,740; 2025: 163,410; 2026: 166,080; 2027: 168,750; 2028: 171,420; 2029: 174,090; 2030: 176,760; 2031: 179,430; 2032: 182,100; 2033: 184,770; 2034: 187,440; 2035: 190,110; 2036: 192,780; 2037: 195,450; 2038: 198,120; 2039: 200,790; 2040: 203,460; 2041: 206,130; 2042: 208,800	6.00	Non-Traversable Median	26.00
107	10SC	Exit	2096+62.880	2096+65.070	2.19	0.0004	2022: 152,400; 2023: 155,020; 2024: 157,640; 2025: 160,260; 2026: 162,880; 2027: 165,500; 2028: 168,120; 2029: 170,740; 2030: 173,360; 2031: 175,980; 2032: 178,600; 2033: 181,220; 2034: 183,840; 2035: 186,460; 2036: 189,080; 2037: 191,700; 2038: 194,320; 2039: 196,940; 2040: 199,560; 2041: 202,180; 2042: 204,800	6.00	Non-Traversable Median	26.00
109	10SC	Entrance	2096+65.070	2108+05.270	1,140.20	0.2160	2022: 162,300; 2023: 165,090; 2024: 167,880; 2025: 170,670; 2026: 173,460; 2027: 176,250; 2028: 179,040; 2029: 181,830; 2030: 184,620; 2031: 187,410; 2032: 190,200; 2033: 192,990; 2034: 195,780; 2035: 198,570; 2036: 201,360; 2037: 204,150; 2038: 206,940; 2039: 209,730; 2040: 212,520; 2041: 215,310; 2042: 218,100	6.00	Non-Traversable Median	26.00
110	10SC	Entrance	2102+85.270	2108+05.270	520.00	0.0985	2022: 162,300; 2023: 165,090; 2024: 167,880; 2025: 170,670; 2026: 173,460; 2027: 176,250; 2028: 179,040; 2029: 181,830; 2030: 184,620; 2031: 187,410; 2032: 190,200; 2033: 192,990; 2034: 195,780; 2035: 198,570; 2036: 201,360; 2037: 204,150; 2038: 206,940; 2039: 209,730; 2040: 212,520; 2041: 215,310; 2042: 218,100	6.00	Non-Traversable Median	26.00
111	10SC	Exit	2096+65.070	2108+05.270	1,140.20	0.2160	2022: 162,300; 2023: 165,090; 2024: 167,880; 2025: 170,670; 2026: 173,460; 2027: 176,250; 2028: 179,040; 2029: 181,830; 2030: 184,620; 2031: 187,410; 2032: 190,200; 2033: 192,990; 2034: 195,780; 2035: 198,570; 2036: 201,360; 2037: 204,150; 2038: 206,940; 2039: 209,730; 2040: 212,520; 2041: 215,310; 2042: 218,100	6.00	Non-Traversable Median	26.00
113	10SC	Entrance	2108+05.270	2112+02.880	397.61	0.0753	2022: 158,150; 2023: 160,870; 2024: 163,590; 2025: 166,310; 2026: 169,030; 2027: 171,750; 2028: 174,470; 2029: 177,190; 2030: 179,910; 2031: 182,630; 2032: 185,350; 2033: 188,070; 2034: 190,790; 2035: 193,510; 2036: 196,230; 2037: 198,950; 2038: 201,670; 2039: 204,390; 2040: 207,110; 2041: 209,830; 2042: 212,550	6.00	Non-Traversable Median	26.00

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
114	10SC	Exit	2108+05.270	2112+02.880	397.61	0.0753	2022: 158,150; 2023: 160,870; 2024: 163,590; 2025: 166,310; 2026: 169,030; 2027: 171,750; 2028: 174,470; 2029: 177,190; 2030: 179,910; 2031: 182,630; 2032: 185,350; 2033: 188,070; 2034: 190,790; 2035: 193,510; 2036: 196,230; 2037: 198,950; 2038: 201,670; 2039: 204,390; 2040: 207,110; 2041: 209,830; 2042: 212,550	6.00	Non-Traversable Median	26.00
116	10SC	Entrance	2112+02.880	2112+05.070	2.19	0.0004	2022: 152,800; 2023: 155,427; 2024: 158,055; 2025: 160,682; 2026: 163,310; 2027: 165,937; 2028: 168,565; 2029: 171,192; 2030: 173,820; 2031: 176,447; 2032: 179,075; 2033: 181,702; 2034: 184,330; 2035: 186,957; 2036: 189,585; 2037: 192,212; 2038: 194,840; 2039: 197,467; 2040: 200,095; 2041: 202,722; 2042: 205,350	6.00	Non-Traversable Median	26.00
117	10SC	Entrance	2132+88.040	2132+94.000	5.96	0.0011	2022: 152,800; 2023: 155,427; 2024: 158,055; 2025: 160,682; 2026: 163,310; 2027: 165,937; 2028: 168,565; 2029: 171,192; 2030: 173,820; 2031: 176,447; 2032: 179,075; 2033: 181,702; 2034: 184,330; 2035: 186,957; 2036: 189,585; 2037: 192,212; 2038: 194,840; 2039: 197,467; 2040: 200,095; 2041: 202,722; 2042: 205,350	6.00	Non-Traversable Median	26.00
119	10SC	Exit	2132+94.000	2141+38.040	844.04	0.1599	2022: 163,000; 2023: 165,802; 2024: 168,605; 2025: 171,407; 2026: 174,210; 2027: 177,012; 2028: 179,815; 2029: 182,617; 2030: 185,420; 2031: 188,222; 2032: 191,025; 2033: 193,827; 2034: 196,630; 2035: 199,432; 2036: 202,235; 2037: 205,037; 2038: 207,840; 2039: 210,642; 2040: 213,445; 2041: 216,247; 2042: 219,050	6.00	Non-Traversable Median	26.00
120	10SC	Entrance	2132+94.000	2141+38.040	844.04	0.1599	2022: 163,000; 2023: 165,802; 2024: 168,605; 2025: 171,407; 2026: 174,210; 2027: 177,012; 2028: 179,815; 2029: 182,617; 2030: 185,420; 2031: 188,222; 2032: 191,025; 2033: 193,827; 2034: 196,630; 2035: 199,432; 2036: 202,235; 2037: 205,037; 2038: 207,840; 2039: 210,642; 2040: 213,445; 2041: 216,247; 2042: 219,050	6.00	Non-Traversable Median	26.00
122	10SC	Exit	2141+38.040	2141+44.000	5.96	0.0011	2022: 160,600; 2023: 163,360; 2024: 166,120; 2025: 168,880; 2026: 171,640; 2027: 174,400; 2028: 177,160; 2029: 179,920; 2030: 182,680; 2031: 185,440; 2032: 188,200; 2033: 190,960; 2034: 193,720; 2035: 196,480; 2036: 199,240; 2037: 202,000; 2038: 204,760; 2039: 207,520; 2040: 210,280; 2041: 213,040; 2042: 215,800	6.00	Non-Traversable Median	26.00
126	8SC	Exit	2159+38.930	2171+54.400	1,215.47	0.2302	2022: 142,500; 2023: 144,952; 2024: 147,405; 2025: 149,857; 2026: 152,310; 2027: 154,762; 2028: 157,215; 2029: 159,667; 2030: 162,120; 2031: 164,572; 2032: 167,025; 2033: 169,477; 2034: 171,930; 2035: 174,382; 2036: 176,835; 2037: 179,287; 2038: 181,740; 2039: 184,192; 2040: 186,645; 2041: 189,097; 2042: 191,550	6.00	Non-Traversable Median	26.00
128	7SC	Exit	2171+54.400	2171+68.930	14.53	0.0027	2022: 123,850; 2023: 125,980; 2024: 128,110; 2025: 130,240; 2026: 132,370; 2027: 134,500; 2028: 136,630; 2029: 138,760; 2030: 140,890; 2031: 143,020; 2032: 145,150; 2033: 147,280; 2034: 149,410; 2035: 151,540; 2036: 153,670; 2037: 155,800; 2038: 157,930; 2039: 160,060; 2040: 162,190; 2041: 164,320; 2042: 166,450	6.00	Non-Traversable Median	26.00
129	7SC	Exit	2183+61.760	2183+64.830	3.07	0.0006	2022: 123,850; 2023: 125,980; 2024: 128,110; 2025: 130,240; 2026: 132,370; 2027: 134,500; 2028: 136,630; 2029: 138,760; 2030: 140,890; 2031: 143,020; 2032: 145,150; 2033: 147,280; 2034: 149,410; 2035: 151,540; 2036: 153,670; 2037: 155,800; 2038: 157,930; 2039: 160,060; 2040: 162,190; 2041: 164,320; 2042: 166,450	6.00	Non-Traversable Median	26.00
131	8SC	Entrance	2183+64.830	2187+07.690	342.86	0.0649	2022: 130,200; 2023: 132,440; 2024: 134,680; 2025: 136,920; 2026: 139,160; 2027: 141,400; 2028: 143,640; 2029: 145,880; 2030: 148,120; 2031: 150,360; 2032: 152,600; 2033: 154,840; 2034: 157,080; 2035: 159,320; 2036: 161,560; 2037: 163,800; 2038: 166,040; 2039: 168,280; 2040: 170,520; 2041: 172,760; 2042: 175,000	6.00	Non-Traversable Median	26.00
132	8SC	Entrance	2187+06.440	2187+07.690	1.25	0.0002	2022: 130,200; 2023: 132,440; 2024: 134,680; 2025: 136,920; 2026: 139,160; 2027: 141,400; 2028: 143,640; 2029: 145,880; 2030: 148,120; 2031: 150,360; 2032: 152,600; 2033: 154,840; 2034: 157,080; 2035: 159,320; 2036: 161,560; 2037: 163,800; 2038: 166,040; 2039: 168,280; 2040: 170,520; 2041: 172,760; 2042: 175,000	6.00	Non-Traversable Median	26.00
133	8SC	Exit	2183+64.830	2187+07.690	342.86	0.0649	2022: 130,200; 2023: 132,440; 2024: 134,680; 2025: 136,920; 2026: 139,160; 2027: 141,400; 2028: 143,640; 2029: 145,880; 2030: 148,120; 2031: 150,360; 2032: 152,600; 2033: 154,840; 2034: 157,080; 2035: 159,320; 2036: 161,560; 2037: 163,800; 2038: 166,040; 2039: 168,280; 2040: 170,520; 2041: 172,760; 2042: 175,000	6.00	Non-Traversable Median	26.00
135	9SC	Entrance	2187+07.690	2197+66.440	1,058.75	0.2005	2022: 135,250; 2023: 137,577; 2024: 139,905; 2025: 142,232; 2026: 144,560; 2027: 146,887; 2028: 149,215; 2029: 151,542; 2030: 153,870; 2031: 156,197; 2032: 158,525; 2033: 160,852; 2034: 163,180; 2035: 165,507; 2036: 167,835; 2037: 170,162; 2038: 172,490; 2039: 174,817; 2040: 177,145; 2041: 179,472; 2042: 181,800	6.00	Non-Traversable Median	26.00
136	9SC	Exit	2187+07.690	2197+66.440	1,058.75	0.2005	2022: 135,250; 2023: 137,577; 2024: 139,905; 2025: 142,232; 2026: 144,560; 2027: 146,887; 2028: 149,215; 2029: 151,542; 2030: 153,870; 2031: 156,197; 2032: 158,525; 2033: 160,852; 2034: 163,180; 2035: 165,507; 2036: 167,835; 2037: 170,162; 2038: 172,490; 2039: 174,817; 2040: 177,145; 2041: 179,472; 2042: 181,800	6.00	Non-Traversable Median	26.00
137	9SC	Entrance	2187+07.690	2197+66.440	1,058.75	0.2005	2022: 135,250; 2023: 137,577; 2024: 139,905; 2025: 142,232; 2026: 144,560; 2027: 146,887; 2028: 149,215; 2029: 151,542; 2030: 153,870; 2031: 156,197; 2032: 158,525; 2033: 160,852; 2034: 163,180; 2035: 165,507; 2036: 167,835; 2037: 170,162; 2038: 172,490; 2039: 174,817; 2040: 177,145; 2041: 179,472; 2042: 181,800	6.00	Non-Traversable Median	26.00
138	9SC	Exit	2187+07.690	2197+66.440	1,058.75	0.2005	2022: 135,250; 2023: 137,577; 2024: 139,905; 2025: 142,232; 2026: 144,560; 2027: 146,887; 2028: 149,215; 2029: 151,542; 2030: 153,870; 2031: 156,197; 2032: 158,525; 2033: 160,852; 2034: 163,180; 2035: 165,507; 2036: 167,835; 2037: 170,162; 2038: 172,490; 2039: 174,817; 2040: 177,145; 2041: 179,472; 2042: 181,800	6.00	Non-Traversable Median	26.00
140	8SC	Entrance	2197+66.440	2198+41.760	75.32	0.0143	2022: 129,650; 2023: 131,880; 2024: 134,110; 2025: 136,340; 2026: 138,570; 2027: 140,800; 2028: 143,030; 2029: 145,260; 2030: 147,490; 2031: 149,720; 2032: 151,950; 2033: 154,180; 2034: 156,410; 2035: 158,640; 2036: 160,870; 2037: 163,100; 2038: 165,330; 2039: 167,560; 2040: 169,790; 2041: 172,020; 2042: 174,250	6.00	Non-Traversable Median	26.00
141	8SC	Exit	2197+66.440	2197+67.690	1.25	0.0002	2022: 129,650; 2023: 131,880; 2024: 134,110; 2025: 136,340; 2026: 138,570; 2027: 140,800; 2028: 143,030; 2029: 145,260; 2030: 147,490; 2031: 149,720; 2032: 151,950; 2033: 154,180; 2034: 156,410; 2035: 158,640; 2036: 160,870; 2037: 163,100; 2038: 165,330; 2039: 167,560; 2040: 169,790; 2041: 172,020; 2042: 174,250	6.00	Non-Traversable Median	26.00
142	8SC	Exit	2197+66.440	2198+41.760	75.32	0.0143	2022: 129,650; 2023: 131,880; 2024: 134,110; 2025: 136,340; 2026: 138,570; 2027: 140,800; 2028: 143,030; 2029: 145,260; 2030: 147,490; 2031: 149,720; 2032: 151,950; 2033: 154,180; 2034: 156,410; 2035: 158,640; 2036: 160,870; 2037: 163,100; 2038: 165,330; 2039: 167,560; 2040: 169,790; 2041: 172,020; 2042: 174,250	6.00	Non-Traversable Median	26.00
143	8SC	Entrance	2198+04.630	2198+41.760	37.13	0.0070	2022: 129,650; 2023: 131,880; 2024: 134,110; 2025: 136,340; 2026: 138,570; 2027: 140,800; 2028: 143,030; 2029: 145,260; 2030: 147,490; 2031: 149,720; 2032: 151,950; 2033: 154,180; 2034: 156,410; 2035: 158,640; 2036: 160,870; 2037: 163,100; 2038: 165,330; 2039: 167,560; 2040: 169,790; 2041: 172,020; 2042: 174,250	6.00	Non-Traversable Median	26.00

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
145	7SC	Entrance	2198+41.760	2198+44.830	3.07	0.0006	2022: 128,850; 2023: 131,065; 2024: 133,280; 2025: 135,495; 2026: 137,710; 2027: 139,925; 2028: 142,140; 2029: 144,355; 2030: 146,570; 2031: 148,785; 2032: 151,000; 2033: 153,215; 2034: 155,430; 2035: 157,645; 2036: 159,860; 2037: 162,075; 2038: 164,290; 2039: 166,505; 2040: 168,720; 2041: 170,935; 2042: 173,150	6.00	Non-Traversable Median	26.00
146	7SC	Entrance	2198+41.760	2201+64.630	322.87	0.0612	2022: 128,850; 2023: 131,065; 2024: 133,280; 2025: 135,495; 2026: 137,710; 2027: 139,925; 2028: 142,140; 2029: 144,355; 2030: 146,570; 2031: 148,785; 2032: 151,000; 2033: 153,215; 2034: 155,430; 2035: 157,645; 2036: 159,860; 2037: 162,075; 2038: 164,290; 2039: 166,505; 2040: 168,720; 2041: 170,935; 2042: 173,150	6.00	Non-Traversable Median	26.00
149	7SC	Exit	2216+63.010	2220+53.010	390.00	0.0739	2022: 142,150; 2023: 144,595; 2024: 147,040; 2025: 149,485; 2026: 151,930; 2027: 154,375; 2028: 156,820; 2029: 159,265; 2030: 161,710; 2031: 164,155; 2032: 166,600; 2033: 169,045; 2034: 171,490; 2035: 173,935; 2036: 176,380; 2037: 178,825; 2038: 181,270; 2039: 183,715; 2040: 186,160; 2041: 188,605; 2042: 191,050	6.00	Non-Traversable Median	26.00
151	9SC	Entrance	2221+59.740	2230+01.910	842.17	0.1595	2022: 161,650; 2023: 164,430; 2024: 167,210; 2025: 169,990; 2026: 172,770; 2027: 175,550; 2028: 178,330; 2029: 181,110; 2030: 183,890; 2031: 186,670; 2032: 189,450; 2033: 192,230; 2034: 195,010; 2035: 197,790; 2036: 200,570; 2037: 203,350; 2038: 206,130; 2039: 208,910; 2040: 211,690; 2041: 214,470; 2042: 217,250	6.00	Non-Traversable Median	26.00
152	9SC	Exit	2226+41.910	2230+01.910	360.00	0.0682	2022: 161,650; 2023: 164,430; 2024: 167,210; 2025: 169,990; 2026: 172,770; 2027: 175,550; 2028: 178,330; 2029: 181,110; 2030: 183,890; 2031: 186,670; 2032: 189,450; 2033: 192,230; 2034: 195,010; 2035: 197,790; 2036: 200,570; 2037: 203,350; 2038: 206,130; 2039: 208,910; 2040: 211,690; 2041: 214,470; 2042: 217,250	6.00	Non-Traversable Median	26.00
154	8SC	Entrance	2230+01.910	2230+09.740	7.83	0.0015	2022: 155,100; 2023: 157,767; 2024: 160,435; 2025: 163,102; 2026: 165,770; 2027: 168,437; 2028: 171,105; 2029: 173,772; 2030: 176,440; 2031: 179,107; 2032: 181,775; 2033: 184,442; 2034: 187,110; 2035: 189,777; 2036: 192,445; 2037: 195,112; 2038: 197,780; 2039: 200,447; 2040: 203,115; 2041: 205,782; 2042: 208,450	6.00	Non-Traversable Median	26.00
156	8SC	Exit	2234+63.570	2238+23.570	360.00	0.0682	2022: 159,550; 2023: 162,292; 2024: 165,035; 2025: 167,777; 2026: 170,520; 2027: 173,262; 2028: 176,005; 2029: 178,747; 2030: 181,490; 2031: 184,232; 2032: 186,975; 2033: 189,717; 2034: 192,460; 2035: 195,202; 2036: 197,945; 2037: 200,687; 2038: 203,430; 2039: 206,172; 2040: 208,915; 2041: 211,657; 2042: 214,400	6.00	Non-Traversable Median	26.00
158	8SC	Entrance	2240+93.000	2243+13.000	220.00	0.0417	2022: 164,350; 2023: 167,175; 2024: 170,000; 2025: 172,825; 2026: 175,650; 2027: 178,475; 2028: 181,300; 2029: 184,125; 2030: 186,950; 2031: 189,775; 2032: 192,600; 2033: 195,425; 2034: 198,250; 2035: 201,075; 2036: 203,900; 2037: 206,725; 2038: 209,550; 2039: 212,375; 2040: 215,200; 2041: 218,025; 2042: 220,850	6.00	Non-Traversable Median	26.00
159	8SC	Entrance	2241+51.310	2245+71.310	420.00	0.0795	2022: 164,350; 2023: 167,175; 2024: 170,000; 2025: 172,825; 2026: 175,650; 2027: 178,475; 2028: 181,300; 2029: 184,125; 2030: 186,950; 2031: 189,775; 2032: 192,600; 2033: 195,425; 2034: 198,250; 2035: 201,075; 2036: 203,900; 2037: 206,725; 2038: 209,550; 2039: 212,375; 2040: 215,200; 2041: 218,025; 2042: 220,850	6.00	Non-Traversable Median	26.00
161	8SC	Entrance	2253+90.450	2258+50.450	460.00	0.0871	2022: 157,550; 2023: 160,260; 2024: 162,970; 2025: 165,680; 2026: 168,390; 2027: 171,100; 2028: 173,810; 2029: 176,520; 2030: 179,230; 2031: 181,940; 2032: 184,650; 2033: 187,360; 2034: 190,070; 2035: 192,780; 2036: 195,490; 2037: 198,200; 2038: 200,910; 2039: 203,620; 2040: 206,330; 2041: 209,040; 2042: 211,750	6.00	Non-Traversable Median	26.00
162	8SC	Exit	2256+64.500	2258+50.450	185.95	0.0352	2022: 157,550; 2023: 160,260; 2024: 162,970; 2025: 165,680; 2026: 168,390; 2027: 171,100; 2028: 173,810; 2029: 176,520; 2030: 179,230; 2031: 181,940; 2032: 184,650; 2033: 187,360; 2034: 190,070; 2035: 192,780; 2036: 195,490; 2037: 198,200; 2038: 200,910; 2039: 203,620; 2040: 206,330; 2041: 209,040; 2042: 211,750	6.00	Non-Traversable Median	26.00
164	8SC	Exit	2258+50.450	2258+79.500	29.05	0.0055	2022: 152,000; 2023: 154,615; 2024: 157,230; 2025: 159,845; 2026: 162,460; 2027: 165,075; 2028: 167,690; 2029: 170,305; 2030: 172,920; 2031: 175,535; 2032: 178,150; 2033: 180,765; 2034: 183,380; 2035: 185,995; 2036: 188,610; 2037: 191,225; 2038: 193,840; 2039: 196,455; 2040: 199,070; 2041: 201,685; 2042: 204,300	6.00	Non-Traversable Median	26.00
167	8SC	Exit	2268+46.280	2271+96.280	350.00	0.0663	2022: 151,650; 2023: 154,260; 2024: 156,870; 2025: 159,480; 2026: 162,090; 2027: 164,700; 2028: 167,310; 2029: 169,920; 2030: 172,530; 2031: 175,140; 2032: 177,750; 2033: 180,360; 2034: 182,970; 2035: 185,580; 2036: 188,190; 2037: 190,800; 2038: 193,410; 2039: 196,020; 2040: 198,630; 2041: 201,240; 2042: 203,850	6.00	Non-Traversable Median	26.00
168	8SC	Exit	2272+92.630	2274+72.630	180.00	0.0341	2022: 151,650; 2023: 154,260; 2024: 156,870; 2025: 159,480; 2026: 162,090; 2027: 164,700; 2028: 167,310; 2029: 169,920; 2030: 172,530; 2031: 175,140; 2032: 177,750; 2033: 180,360; 2034: 182,970; 2035: 185,580; 2036: 188,190; 2037: 190,800; 2038: 193,410; 2039: 196,020; 2040: 198,630; 2041: 201,240; 2042: 203,850	6.00	Non-Traversable Median	26.00
170	8SC	Entrance	2279+80.230	2284+00.230	420.00	0.0795	2022: 142,750; 2023: 145,205; 2024: 147,660; 2025: 150,115; 2026: 152,570; 2027: 155,025; 2028: 157,480; 2029: 159,935; 2030: 162,390; 2031: 164,845; 2032: 167,300; 2033: 169,755; 2034: 172,210; 2035: 174,665; 2036: 177,120; 2037: 179,575; 2038: 182,030; 2039: 184,485; 2040: 186,940; 2041: 189,395; 2042: 191,850	6.00	Non-Traversable Median	26.00
173	8SC	Entrance	2289+18.000	2296+18.000	700.00	0.1326	2022: 144,400; 2023: 146,885; 2024: 149,370; 2025: 151,855; 2026: 154,340; 2027: 156,825; 2028: 159,310; 2029: 161,795; 2030: 164,280; 2031: 166,765; 2032: 169,250; 2033: 171,735; 2034: 174,220; 2035: 176,705; 2036: 179,190; 2037: 181,675; 2038: 184,160; 2039: 186,645; 2040: 189,130; 2041: 191,615; 2042: 194,100	6.00	Non-Traversable Median	26.00
178	8SC	Exit	2362+64.260	2365+64.260	300.00	0.0568	2022: 143,450; 2023: 145,917; 2024: 148,385; 2025: 150,852; 2026: 153,320; 2027: 155,787; 2028: 158,255; 2029: 160,722; 2030: 163,190; 2031: 165,657; 2032: 168,125; 2033: 170,592; 2034: 173,060; 2035: 175,527; 2036: 177,995; 2037: 180,462; 2038: 182,930; 2039: 185,397; 2040: 187,865; 2041: 190,332; 2042: 192,800	6.00	Non-Traversable Median	26.00
179	8SC	Entrance	2362+57.960	2365+64.260	306.30	0.0580	2022: 143,450; 2023: 145,917; 2024: 148,385; 2025: 150,852; 2026: 153,320; 2027: 155,787; 2028: 158,255; 2029: 160,722; 2030: 163,190; 2031: 165,657; 2032: 168,125; 2033: 170,592; 2034: 173,060; 2035: 175,527; 2036: 177,995; 2037: 180,462; 2038: 182,930; 2039: 185,397; 2040: 187,865; 2041: 190,332; 2042: 192,800	6.00	Non-Traversable Median	26.00
181	8SC	Entrance	2365+64.260	2366+17.960	53.70	0.0102	2022: 131,400; 2023: 133,660; 2024: 135,920; 2025: 138,180; 2026: 140,440; 2027: 142,700; 2028: 144,960; 2029: 147,220; 2030: 149,480; 2031: 151,740; 2032: 154,000; 2033: 156,260; 2034: 158,520; 2035: 160,780; 2036: 163,040; 2037: 165,300; 2038: 167,560; 2039: 169,820; 2040: 172,080; 2041: 174,340; 2042: 176,600	6.00	Non-Traversable Median	26.00
183	8SC	Entrance	2401+60.900	2401+60.950	0.05	0.0000	2022: 120,000; 2023: 122,065; 2024: 124,130; 2025: 126,195; 2026: 128,260; 2027: 130,325; 2028: 132,390; 2029: 134,455; 2030: 136,520; 2031: 138,585; 2032: 140,650; 2033: 142,715; 2034: 144,780; 2035: 146,845; 2036: 148,910; 2037: 150,975; 2038: 153,040; 2039: 155,105; 2040: 157,170; 2041: 159,235; 2042: 161,300	6.00	Non-Traversable Median	26.00

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
185	8SC	Entrance	2401+60.950	2402+12.440	51.49	0.0097	2022: 126,150; 2023: 128,322; 2024: 130,495; 2025: 132,667; 2026: 134,840; 2027: 137,012; 2028: 139,185; 2029: 141,357; 2030: 143,530; 2031: 145,702; 2032: 147,875; 2033: 150,047; 2034: 152,220; 2035: 154,392; 2036: 156,565; 2037: 158,737; 2038: 160,910; 2039: 163,082; 2040: 165,255; 2041: 167,427; 2042: 169,600	6.00	Non-Traversable Median	26.00
187	9SC	Entrance	2402+12.440	2406+30.900	418.46	0.0793	2022: 134,550; 2023: 136,865; 2024: 139,180; 2025: 141,495; 2026: 143,810; 2027: 146,125; 2028: 148,440; 2029: 150,755; 2030: 153,070; 2031: 155,385; 2032: 157,700; 2033: 160,015; 2034: 162,330; 2035: 164,645; 2036: 166,960; 2037: 169,275; 2038: 171,590; 2039: 173,905; 2040: 176,220; 2041: 178,535; 2042: 180,850	6.00	Non-Traversable Median	26.00
188	9SC	Exit	2411+57.230	2414+12.230	255.00	0.0483	2022: 134,550; 2023: 136,865; 2024: 139,180; 2025: 141,495; 2026: 143,810; 2027: 146,125; 2028: 148,440; 2029: 150,755; 2030: 153,070; 2031: 155,385; 2032: 157,700; 2033: 160,015; 2034: 162,330; 2035: 164,645; 2036: 166,960; 2037: 169,275; 2038: 171,590; 2039: 173,905; 2040: 176,220; 2041: 178,535; 2042: 180,850	6.00	Non-Traversable Median	26.00
193	8SC	Exit	2443+40.790	2447+40.790	400.00	0.0758	2022: 128,900; 2023: 131,117; 2024: 133,335; 2025: 135,552; 2026: 137,770; 2027: 139,987; 2028: 142,205; 2029: 144,422; 2030: 146,640; 2031: 148,857; 2032: 151,075; 2033: 153,292; 2034: 155,510; 2035: 157,727; 2036: 159,945; 2037: 162,162; 2038: 164,380; 2039: 166,597; 2040: 168,815; 2041: 171,032; 2042: 173,250	6.00	Non-Traversable Median	26.00
195	8SC	Entrance	2450+69.650	2455+14.650	445.00	0.0843	2022: 135,700; 2023: 138,032; 2024: 140,365; 2025: 142,697; 2026: 145,030; 2027: 147,362; 2028: 149,695; 2029: 152,027; 2030: 154,360; 2031: 156,692; 2032: 159,025; 2033: 161,357; 2034: 163,690; 2035: 166,022; 2036: 168,355; 2037: 170,687; 2038: 173,020; 2039: 175,352; 2040: 177,685; 2041: 180,017; 2042: 182,350	6.00	Non-Traversable Median	26.00
196	8SC	Exit	2463+46.300	2471+86.300	840.00	0.1591	2022: 135,700; 2023: 138,032; 2024: 140,365; 2025: 142,697; 2026: 145,030; 2027: 147,362; 2028: 149,695; 2029: 152,027; 2030: 154,360; 2031: 156,692; 2032: 159,025; 2033: 161,357; 2034: 163,690; 2035: 166,022; 2036: 168,355; 2037: 170,687; 2038: 173,020; 2039: 175,352; 2040: 177,685; 2041: 180,017; 2042: 182,350	6.00	Non-Traversable Median	26.00
200	6SC	Entrance	2501+93.380	2506+47.600	454.22	0.0860	2022: 122,650; 2023: 124,757; 2024: 126,865; 2025: 128,972; 2026: 131,080; 2027: 133,187; 2028: 135,295; 2029: 137,402; 2030: 139,510; 2031: 141,617; 2032: 143,725; 2033: 145,832; 2034: 147,940; 2035: 150,047; 2036: 152,155; 2037: 154,262; 2038: 156,370; 2039: 158,477; 2040: 160,585; 2041: 162,692; 2042: 164,800	6.00	Non-Traversable Median	26.00
202	6SC	Entrance	2506+47.600	2506+58.380	10.78	0.0020	2022: 129,350; 2023: 131,575; 2024: 133,800; 2025: 136,025; 2026: 138,250; 2027: 140,475; 2028: 142,700; 2029: 144,925; 2030: 147,150; 2031: 149,375; 2032: 151,600; 2033: 153,825; 2034: 156,050; 2035: 158,275; 2036: 160,500; 2037: 162,725; 2038: 164,950; 2039: 167,175; 2040: 169,400; 2041: 171,625; 2042: 173,850	6.00	Non-Traversable Median	26.00
203	6SC	Exit	2506+47.600	2508+27.600	180.00	0.0341	2022: 129,350; 2023: 131,575; 2024: 133,800; 2025: 136,025; 2026: 138,250; 2027: 140,475; 2028: 142,700; 2029: 144,925; 2030: 147,150; 2031: 149,375; 2032: 151,600; 2033: 153,825; 2034: 156,050; 2035: 158,275; 2036: 160,500; 2037: 162,725; 2038: 164,950; 2039: 167,175; 2040: 169,400; 2041: 171,625; 2042: 173,850	6.00	Non-Traversable Median	26.00
204	6SC	Exit	2517+24.560	2519+74.560	250.00	0.0474	2022: 129,350; 2023: 131,575; 2024: 133,800; 2025: 136,025; 2026: 138,250; 2027: 140,475; 2028: 142,700; 2029: 144,925; 2030: 147,150; 2031: 149,375; 2032: 151,600; 2033: 153,825; 2034: 156,050; 2035: 158,275; 2036: 160,500; 2037: 162,725; 2038: 164,950; 2039: 167,175; 2040: 169,400; 2041: 171,625; 2042: 173,850	6.00	Non-Traversable Median	26.00
205	6SC	Entrance	2516+89.240	2519+74.560	285.32	0.0540	2022: 129,350; 2023: 131,575; 2024: 133,800; 2025: 136,025; 2026: 138,250; 2027: 140,475; 2028: 142,700; 2029: 144,925; 2030: 147,150; 2031: 149,375; 2032: 151,600; 2033: 153,825; 2034: 156,050; 2035: 158,275; 2036: 160,500; 2037: 162,725; 2038: 164,950; 2039: 167,175; 2040: 169,400; 2041: 171,625; 2042: 173,850	6.00	Non-Traversable Median	26.00
207	6SC	Entrance	2519+74.560	2521+89.240	214.68	0.0407	2022: 122,300; 2023: 124,405; 2024: 126,510; 2025: 128,615; 2026: 130,720; 2027: 132,825; 2028: 134,930; 2029: 137,035; 2030: 139,140; 2031: 141,245; 2032: 143,350; 2033: 145,455; 2034: 147,560; 2035: 149,665; 2036: 151,770; 2037: 153,875; 2038: 155,980; 2039: 158,085; 2040: 160,190; 2041: 162,295; 2042: 164,400	6.00	Non-Traversable Median	26.00
211	7SC	Exit	2550+11.330	2552+71.330	260.00	0.0492	2022: 124,050; 2023: 126,182; 2024: 128,315; 2025: 130,447; 2026: 132,580; 2027: 134,712; 2028: 136,845; 2029: 138,977; 2030: 141,110; 2031: 143,242; 2032: 145,375; 2033: 147,507; 2034: 149,640; 2035: 151,772; 2036: 153,905; 2037: 156,037; 2038: 158,170; 2039: 160,302; 2040: 162,435; 2041: 164,567; 2042: 166,700	6.00	Non-Traversable Median	26.00
212	7SC	Entrance	2567+70.470	2569+42.420	171.95	0.0326	2022: 124,050; 2023: 126,182; 2024: 128,315; 2025: 130,447; 2026: 132,580; 2027: 134,712; 2028: 136,845; 2029: 138,977; 2030: 141,110; 2031: 143,242; 2032: 145,375; 2033: 147,507; 2034: 149,640; 2035: 151,772; 2036: 153,905; 2037: 156,037; 2038: 158,170; 2039: 160,302; 2040: 162,435; 2041: 164,567; 2042: 166,700	6.00	Non-Traversable Median	26.00
214	6SC	Entrance	2569+42.420	2572+70.470	328.05	0.0621	2022: 116,000; 2023: 117,995; 2024: 119,990; 2025: 121,985; 2026: 123,980; 2027: 125,975; 2028: 127,970; 2029: 129,965; 2030: 131,960; 2031: 133,955; 2032: 135,950; 2033: 137,945; 2034: 139,940; 2035: 141,935; 2036: 143,930; 2037: 145,925; 2038: 147,920; 2039: 149,915; 2040: 151,910; 2041: 153,905; 2042: 155,900	6.00	Non-Traversable Median	26.00
216	6SC	Exit	2582+32.570	2590+47.570	815.00	0.1544	2022: 108,000; 2023: 109,860; 2024: 111,720; 2025: 113,580; 2026: 115,440; 2027: 117,300; 2028: 119,160; 2029: 121,020; 2030: 122,880; 2031: 124,740; 2032: 126,600; 2033: 128,460; 2034: 130,320; 2035: 132,180; 2036: 134,040; 2037: 135,900; 2038: 137,760; 2039: 139,620; 2040: 141,480; 2041: 143,340; 2042: 145,200	6.00	Non-Traversable Median	26.00
218	6SC	Entrance	2594+31.640	2598+01.640	370.00	0.0701	2022: 94,700; 2023: 96,330; 2024: 97,960; 2025: 99,590; 2026: 101,220; 2027: 102,850; 2028: 104,480; 2029: 106,110; 2030: 107,740; 2031: 109,370; 2032: 111,000; 2033: 112,630; 2034: 114,260; 2035: 115,890; 2036: 117,520; 2037: 119,150; 2038: 120,780; 2039: 122,410; 2040: 124,040; 2041: 125,670; 2042: 127,300	6.00	Non-Traversable Median	26.00
220	6SC	Entrance	2617+69.470	2622+49.470	480.00	0.0909	2022: 84,550; 2023: 86,002; 2024: 87,455; 2025: 88,907; 2026: 90,360; 2027: 91,812; 2028: 93,265; 2029: 94,717; 2030: 96,170; 2031: 97,622; 2032: 99,075; 2033: 100,527; 2034: 101,980; 2035: 103,432; 2036: 104,885; 2037: 106,337; 2038: 107,790; 2039: 109,242; 2040: 110,695; 2041: 112,147; 2042: 113,600	6.00	Non-Traversable Median	26.00
224	6SC	Entrance	2622+98.790	2626+48.790	350.00	0.0663	2022: 85,150; 2023: 86,615; 2024: 88,080; 2025: 89,545; 2026: 91,010; 2027: 92,475; 2028: 93,940; 2029: 95,405; 2030: 96,870; 2031: 98,335; 2032: 99,800; 2033: 101,265; 2034: 102,730; 2035: 104,195; 2036: 105,660; 2037: 107,125; 2038: 108,590; 2039: 110,055; 2040: 111,520; 2041: 112,985; 2042: 114,450	6.00	Non-Traversable Median	26.00
227	6SC	Exit	2667+75.600	2670+20.600	245.00	0.0464	2022: 85,450; 2023: 86,920; 2024: 88,390; 2025: 89,860; 2026: 91,330; 2027: 92,800; 2028: 94,270; 2029: 95,740; 2030: 97,210; 2031: 98,680; 2032: 100,150; 2033: 101,620; 2034: 103,090; 2035: 104,560; 2036: 106,030; 2037: 107,500; 2038: 108,970; 2039: 110,440; 2040: 111,910; 2041: 113,380; 2042: 114,850	6.00	Non-Traversable Median	26.00

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
229	6SC	Entrance	2713+53.470	2716+03.470	250.00	0.0474	2022: 75,700; 2023: 77,002; 2024: 78,305; 2025: 79,607; 2026: 80,910; 2027: 82,212; 2028: 83,515; 2029: 84,817; 2030: 86,120; 2031: 87,422; 2032: 88,725; 2033: 90,027; 2034: 91,330; 2035: 92,632; 2036: 93,935; 2037: 95,237; 2038: 96,540; 2039: 97,842; 2040: 99,145; 2041: 100,447; 2042: 101,750	6.00	Non-Traversable Median	26.00
235	8SC	Exit	2768+72.500	2771+42.500	270.00	0.0511	2022: 58,850; 2023: 59,862; 2024: 60,875; 2025: 61,887; 2026: 62,900; 2027: 63,912; 2028: 64,925; 2029: 65,937; 2030: 66,950; 2031: 67,962; 2032: 68,975; 2033: 69,987; 2034: 71,000; 2035: 72,012; 2036: 73,025; 2037: 74,037; 2038: 75,050; 2039: 76,062; 2040: 77,075; 2041: 78,087; 2042: 79,100	6.00	Non-Traversable Median	26.00
238	8SC	Exit	2787+05.200	2788+65.200	160.00	0.0303	2022: 59,750; 2023: 60,777; 2024: 61,805; 2025: 62,832; 2026: 63,860; 2027: 64,887; 2028: 65,915; 2029: 66,942; 2030: 67,970; 2031: 68,997; 2032: 70,025; 2033: 71,052; 2034: 72,080; 2035: 73,107; 2036: 74,135; 2037: 75,162; 2038: 76,190; 2039: 77,217; 2040: 78,245; 2041: 79,272; 2042: 80,300	6.00	Non-Traversable Median	26.00
239	8SC	Exit	2803+51.170	2805+56.170	205.00	0.0388	2022: 59,750; 2023: 60,777; 2024: 61,805; 2025: 62,832; 2026: 63,860; 2027: 64,887; 2028: 65,915; 2029: 66,942; 2030: 67,970; 2031: 68,997; 2032: 70,025; 2033: 71,052; 2034: 72,080; 2035: 73,107; 2036: 74,135; 2037: 75,162; 2038: 76,190; 2039: 77,217; 2040: 78,245; 2041: 79,272; 2042: 80,300	6.00	Non-Traversable Median	26.00
241	8SC	Entrance	2814+77.790	2816+87.790	210.00	0.0398	2022: 56,950; 2023: 57,930; 2024: 58,910; 2025: 59,890; 2026: 60,870; 2027: 61,850; 2028: 62,830; 2029: 63,810; 2030: 64,790; 2031: 65,770; 2032: 66,750; 2033: 67,730; 2034: 68,710; 2035: 69,690; 2036: 70,670; 2037: 71,650; 2038: 72,630; 2039: 73,610; 2040: 74,590; 2041: 75,570; 2042: 76,550	6.00	Non-Traversable Median	26.00
245	10SC	Exit	2850+92.420	2852+52.420	160.00	0.0303	2022: 68,450; 2023: 69,627; 2024: 70,805; 2025: 71,982; 2026: 73,160; 2027: 74,337; 2028: 75,515; 2029: 76,692; 2030: 77,870; 2031: 79,047; 2032: 80,225; 2033: 81,402; 2034: 82,580; 2035: 83,757; 2036: 84,935; 2037: 86,112; 2038: 87,290; 2039: 88,467; 2040: 89,645; 2041: 90,822; 2042: 92,000	6.00	Non-Traversable Median	26.00
249	4SC	Entrance	2896+04.190	2896+24.130	19.94	0.0038	2022: 50,800; 2023: 51,672; 2024: 52,545; 2025: 53,417; 2026: 54,290; 2027: 55,162; 2028: 56,035; 2029: 56,907; 2030: 57,780; 2031: 58,652; 2032: 59,525; 2033: 60,397; 2034: 61,270; 2035: 62,142; 2036: 63,015; 2037: 63,887; 2038: 64,760; 2039: 65,632; 2040: 66,505; 2041: 67,377; 2042: 68,250	6.00	Non-Traversable Median	26.00
251	4SC	Entrance	2896+24.130	2901+84.190	560.06	0.1061	2022: 51,400; 2023: 52,282; 2024: 53,165; 2025: 54,047; 2026: 54,930; 2027: 55,812; 2028: 56,695; 2029: 57,577; 2030: 58,460; 2031: 59,342; 2032: 60,225; 2033: 61,107; 2034: 61,990; 2035: 62,872; 2036: 63,755; 2037: 64,637; 2038: 65,520; 2039: 66,402; 2040: 67,285; 2041: 68,167; 2042: 69,050	6.00	Non-Traversable Median	26.00
252	4SC	Exit	2896+24.130	2898+34.130	210.00	0.0398	2022: 51,400; 2023: 52,282; 2024: 53,165; 2025: 54,047; 2026: 54,930; 2027: 55,812; 2028: 56,695; 2029: 57,577; 2030: 58,460; 2031: 59,342; 2032: 60,225; 2033: 61,107; 2034: 61,990; 2035: 62,872; 2036: 63,755; 2037: 64,637; 2038: 65,520; 2039: 66,402; 2040: 67,285; 2041: 68,167; 2042: 69,050	6.00	Non-Traversable Median	26.00
253	4SC	Entrance	2924+26.050	2933+76.050	950.00	0.1799	2022: 51,400; 2023: 52,282; 2024: 53,165; 2025: 54,047; 2026: 54,930; 2027: 55,812; 2028: 56,695; 2029: 57,577; 2030: 58,460; 2031: 59,342; 2032: 60,225; 2033: 61,107; 2034: 61,990; 2035: 62,872; 2036: 63,755; 2037: 64,637; 2038: 65,520; 2039: 66,402; 2040: 67,285; 2041: 68,167; 2042: 69,050	6.00	Non-Traversable Median	26.00
255	4SC	Exit	2949+41.360	2952+01.360	260.00	0.0492	2022: 36,250; 2023: 36,872; 2024: 37,495; 2025: 38,117; 2026: 38,740; 2027: 39,362; 2028: 39,985; 2029: 40,607; 2030: 41,230; 2031: 41,852; 2032: 42,475; 2033: 43,097; 2034: 43,720; 2035: 44,342; 2036: 44,965; 2037: 45,587; 2038: 46,210; 2039: 46,832; 2040: 47,455; 2041: 48,077; 2042: 48,700	6.00	Non-Traversable Median	26.00
258	4SC	Exit	3035+33.800	3037+48.800	215.00	0.0407	2022: 22,750; 2023: 23,142; 2024: 23,535; 2025: 23,927; 2026: 24,320; 2027: 24,712; 2028: 25,105; 2029: 25,497; 2030: 25,890; 2031: 26,282; 2032: 26,675; 2033: 27,067; 2034: 27,460; 2035: 27,852; 2036: 28,245; 2037: 28,637; 2038: 29,030; 2039: 29,422; 2040: 29,815; 2041: 30,207; 2042: 30,600	6.00	Non-Traversable Median	26.00
260	4SC	Entrance	3041+43.060	3050+93.060	950.00	0.1799	2022: 25,500; 2023: 25,940; 2024: 26,380; 2025: 26,820; 2026: 27,260; 2027: 27,700; 2028: 28,140; 2029: 28,580; 2030: 29,020; 2031: 29,460; 2032: 29,900; 2033: 30,340; 2034: 30,780; 2035: 31,220; 2036: 31,660; 2037: 32,100; 2038: 32,540; 2039: 32,980; 2040: 33,420; 2041: 33,860; 2042: 34,300	6.00	Non-Traversable Median	26.00
261	4SC	Exit	3241+29.990	3244+29.990	300.00	0.0568	2022: 25,500; 2023: 25,940; 2024: 26,380; 2025: 26,820; 2026: 27,260; 2027: 27,700; 2028: 28,140; 2029: 28,580; 2030: 29,020; 2031: 29,460; 2032: 29,900; 2033: 30,340; 2034: 30,780; 2035: 31,220; 2036: 31,660; 2037: 32,100; 2038: 32,540; 2039: 32,980; 2040: 33,420; 2041: 33,860; 2042: 34,300	6.00	Non-Traversable Median	26.00
262	4SC	Entrance	3240+83.710	3244+29.990	346.28	0.0656	2022: 25,500; 2023: 25,940; 2024: 26,380; 2025: 26,820; 2026: 27,260; 2027: 27,700; 2028: 28,140; 2029: 28,580; 2030: 29,020; 2031: 29,460; 2032: 29,900; 2033: 30,340; 2034: 30,780; 2035: 31,220; 2036: 31,660; 2037: 32,100; 2038: 32,540; 2039: 32,980; 2040: 33,420; 2041: 33,860; 2042: 34,300	6.00	Non-Traversable Median	26.00
264	4SC	Entrance	3244+29.990	3248+03.710	373.72	0.0708	2022: 22,100; 2023: 22,480; 2024: 22,860; 2025: 23,240; 2026: 23,620; 2027: 24,000; 2028: 24,380; 2029: 24,760; 2030: 25,140; 2031: 25,520; 2032: 25,900; 2033: 26,280; 2034: 26,660; 2035: 27,040; 2036: 27,420; 2037: 27,800; 2038: 28,180; 2039: 28,560; 2040: 28,940; 2041: 29,320; 2042: 29,700	6.00	Non-Traversable Median	26.00
267	4SC	Entrance	3279+26.650	3281+21.530	194.88	0.0369	2022: 19,600; 2023: 19,937; 2024: 20,275; 2025: 20,612; 2026: 20,950; 2027: 21,287; 2028: 21,625; 2029: 21,962; 2030: 22,300; 2031: 22,637; 2032: 22,975; 2033: 23,312; 2034: 23,650; 2035: 23,987; 2036: 24,325; 2037: 24,662; 2038: 25,000; 2039: 25,337; 2040: 25,675; 2041: 26,012; 2042: 26,350	6.00	Non-Traversable Median	26.00
269	4SC	Entrance	3281+21.530	3283+26.650	205.12	0.0389	2022: 20,250; 2023: 20,597; 2024: 20,945; 2025: 21,292; 2026: 21,640; 2027: 21,987; 2028: 22,335; 2029: 22,682; 2030: 23,030; 2031: 23,377; 2032: 23,725; 2033: 24,072; 2034: 24,420; 2035: 24,767; 2036: 25,115; 2037: 25,462; 2038: 25,810; 2039: 26,157; 2040: 26,505; 2041: 26,852; 2042: 27,200	6.00	Non-Traversable Median	26.00
270	4SC	Exit	3281+21.530	3283+51.530	230.00	0.0436	2022: 20,250; 2023: 20,597; 2024: 20,945; 2025: 21,292; 2026: 21,640; 2027: 21,987; 2028: 22,335; 2029: 22,682; 2030: 23,030; 2031: 23,377; 2032: 23,725; 2033: 24,072; 2034: 24,420; 2035: 24,767; 2036: 25,115; 2037: 25,462; 2038: 25,810; 2039: 26,157; 2040: 26,505; 2041: 26,852; 2042: 27,200	6.00	Non-Traversable Median	26.00
271	4SC	Exit	3599+99.950	3603+79.950	380.00	0.0720	2022: 20,250; 2023: 20,597; 2024: 20,945; 2025: 21,292; 2026: 21,640; 2027: 21,987; 2028: 22,335; 2029: 22,682; 2030: 23,030; 2031: 23,377; 2032: 23,725; 2033: 24,072; 2034: 24,420; 2035: 24,767; 2036: 25,115; 2037: 25,462; 2038: 25,810; 2039: 26,157; 2040: 26,505; 2041: 26,852; 2042: 27,200	6.00	Non-Traversable Median	26.00

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
272	4SC	Entrance	3598+16.800	3603+79.950	563.15	0.1067	2022: 20,250; 2023: 20,597; 2024: 20,945; 2025: 21,292; 2026: 21,640; 2027: 21,987; 2028: 22,335; 2029: 22,682; 2030: 23,030; 2031: 23,377; 2032: 23,725; 2033: 24,072; 2034: 24,420; 2035: 24,767; 2036: 25,115; 2037: 25,462; 2038: 25,810; 2039: 26,157; 2040: 26,505; 2041: 26,852; 2042: 27,200	6.00	Non-Traversable Median	26.00
274	4SC	Entrance	3603+79.950	3606+16.800	236.85	0.0449	2022: 17,000; 2023: 17,290; 2024: 17,580; 2025: 17,870; 2026: 18,160; 2027: 18,450; 2028: 18,740; 2029: 19,030; 2030: 19,320; 2031: 19,610; 2032: 19,900; 2033: 20,190; 2034: 20,480; 2035: 20,770; 2036: 21,060; 2037: 21,350; 2038: 21,640; 2039: 21,930; 2040: 22,220; 2041: 22,510; 2042: 22,800	6.00	Non-Traversable Median	26.00
277	4SC	Exit	3624+73.190	3627+05.090	231.90	0.0439	2022: 14,750; 2023: 15,002; 2024: 15,255; 2025: 15,507; 2026: 15,760; 2027: 16,012; 2028: 16,265; 2029: 16,517; 2030: 16,770; 2031: 17,022; 2032: 17,275; 2033: 17,527; 2034: 17,780; 2035: 18,032; 2036: 18,285; 2037: 18,537; 2038: 18,790; 2039: 19,042; 2040: 19,295; 2041: 19,547; 2042: 19,800	6.00	Non-Traversable Median	26.00
279	4SC	Exit	3627+05.090	3628+43.190	138.10	0.0262	2022: 15,500; 2023: 15,767; 2024: 16,035; 2025: 16,302; 2026: 16,570; 2027: 16,837; 2028: 17,105; 2029: 17,372; 2030: 17,640; 2031: 17,907; 2032: 18,175; 2033: 18,442; 2034: 18,710; 2035: 18,977; 2036: 19,245; 2037: 19,512; 2038: 19,780; 2039: 20,047; 2040: 20,315; 2041: 20,582; 2042: 20,850	6.00	Non-Traversable Median	26.00
280	4SC	Entrance	3627+05.090	3633+05.090	600.00	0.1136	2022: 15,500; 2023: 15,767; 2024: 16,035; 2025: 16,302; 2026: 16,570; 2027: 16,837; 2028: 17,105; 2029: 17,372; 2030: 17,640; 2031: 17,907; 2032: 18,175; 2033: 18,442; 2034: 18,710; 2035: 18,977; 2036: 19,245; 2037: 19,512; 2038: 19,780; 2039: 20,047; 2040: 20,315; 2041: 20,582; 2042: 20,850	6.00	Non-Traversable Median	26.00
281	4SC	Exit	3659+77.630	3662+27.630	250.00	0.0474	2022: 15,500; 2023: 15,767; 2024: 16,035; 2025: 16,302; 2026: 16,570; 2027: 16,837; 2028: 17,105; 2029: 17,372; 2030: 17,640; 2031: 17,907; 2032: 18,175; 2033: 18,442; 2034: 18,710; 2035: 18,977; 2036: 19,245; 2037: 19,512; 2038: 19,780; 2039: 20,047; 2040: 20,315; 2041: 20,582; 2042: 20,850	6.00	Non-Traversable Median	26.00
282	4SC	Entrance	3661+76.010	3662+27.630	51.62	0.0098	2022: 15,500; 2023: 15,767; 2024: 16,035; 2025: 16,302; 2026: 16,570; 2027: 16,837; 2028: 17,105; 2029: 17,372; 2030: 17,640; 2031: 17,907; 2032: 18,175; 2033: 18,442; 2034: 18,710; 2035: 18,977; 2036: 19,245; 2037: 19,512; 2038: 19,780; 2039: 20,047; 2040: 20,315; 2041: 20,582; 2042: 20,850	6.00	Non-Traversable Median	26.00
284	4SC	Entrance	3662+27.630	3667+36.010	508.38	0.0963	2022: 15,450; 2023: 15,715; 2024: 15,980; 2025: 16,245; 2026: 16,510; 2027: 16,775; 2028: 17,040; 2029: 17,305; 2030: 17,570; 2031: 17,835; 2032: 18,100; 2033: 18,365; 2034: 18,630; 2035: 18,895; 2036: 19,160; 2037: 19,425; 2038: 19,690; 2039: 19,955; 2040: 20,220; 2041: 20,485; 2042: 20,750	6.00	Non-Traversable Median	26.00
287	4SC	Entrance	3690+73.620	3695+53.620	480.00	0.0909	2022: 15,450; 2023: 15,715; 2024: 15,980; 2025: 16,245; 2026: 16,510; 2027: 16,775; 2028: 17,040; 2029: 17,305; 2030: 17,570; 2031: 17,835; 2032: 18,100; 2033: 18,365; 2034: 18,630; 2035: 18,895; 2036: 19,160; 2037: 19,425; 2038: 19,690; 2039: 19,955; 2040: 20,220; 2041: 20,485; 2042: 20,750	6.00	Non-Traversable Median	26.00
289	4SC	Exit	3699+52.710	3703+22.710	370.00	0.0701	2022: 15,500; 2023: 15,767; 2024: 16,035; 2025: 16,302; 2026: 16,570; 2027: 16,837; 2028: 17,105; 2029: 17,372; 2030: 17,640; 2031: 17,907; 2032: 18,175; 2033: 18,442; 2034: 18,710; 2035: 18,977; 2036: 19,245; 2037: 19,512; 2038: 19,780; 2039: 20,047; 2040: 20,315; 2041: 20,582; 2042: 20,850	6.00	Non-Traversable Median	26.00
290	4SC	Entrance	3917+83.470	3923+33.470	550.00	0.1042	2022: 15,500; 2023: 15,767; 2024: 16,035; 2025: 16,302; 2026: 16,570; 2027: 16,837; 2028: 17,105; 2029: 17,372; 2030: 17,640; 2031: 17,907; 2032: 18,175; 2033: 18,442; 2034: 18,710; 2035: 18,977; 2036: 19,245; 2037: 19,512; 2038: 19,780; 2039: 20,047; 2040: 20,315; 2041: 20,582; 2042: 20,850	6.00	Non-Traversable Median	26.00
291	4SC	Exit	3917+65.300	3923+33.470	568.17	0.1076	2022: 15,500; 2023: 15,767; 2024: 16,035; 2025: 16,302; 2026: 16,570; 2027: 16,837; 2028: 17,105; 2029: 17,372; 2030: 17,640; 2031: 17,907; 2032: 18,175; 2033: 18,442; 2034: 18,710; 2035: 18,977; 2036: 19,245; 2037: 19,512; 2038: 19,780; 2039: 20,047; 2040: 20,315; 2041: 20,582; 2042: 20,850	6.00	Non-Traversable Median	26.00
293	4SC	Exit	3923+33.470	3924+35.300	101.83	0.0193	2022: 15,050; 2023: 15,310; 2024: 15,570; 2025: 15,830; 2026: 16,090; 2027: 16,350; 2028: 16,610; 2029: 16,870; 2030: 17,130; 2031: 17,390; 2032: 17,650; 2033: 17,910; 2034: 18,170; 2035: 18,430; 2036: 18,690; 2037: 18,950; 2038: 19,210; 2039: 19,470; 2040: 19,730; 2041: 19,990; 2042: 20,250	6.00	Non-Traversable Median	26.00
296	4SC	Exit	3943+28.330	3945+80.010	251.68	0.0477	2022: 14,850; 2023: 15,105; 2024: 15,360; 2025: 15,615; 2026: 15,870; 2027: 16,125; 2028: 16,380; 2029: 16,635; 2030: 16,890; 2031: 17,145; 2032: 17,400; 2033: 17,655; 2034: 17,910; 2035: 18,165; 2036: 18,420; 2037: 18,675; 2038: 18,930; 2039: 19,185; 2040: 19,440; 2041: 19,695; 2042: 19,950	6.00	Non-Traversable Median	26.00
298	4SC	Exit	3945+80.010	3947+88.330	208.32	0.0394	2022: 15,250; 2023: 15,510; 2024: 15,770; 2025: 16,030; 2026: 16,290; 2027: 16,550; 2028: 16,810; 2029: 17,070; 2030: 17,330; 2031: 17,590; 2032: 17,850; 2033: 18,110; 2034: 18,370; 2035: 18,630; 2036: 18,890; 2037: 19,150; 2038: 19,410; 2039: 19,670; 2040: 19,930; 2041: 20,190; 2042: 20,450	6.00	Non-Traversable Median	26.00
299	4SC	Entrance	3945+80.010	3949+10.010	330.00	0.0625	2022: 15,250; 2023: 15,510; 2024: 15,770; 2025: 16,030; 2026: 16,290; 2027: 16,550; 2028: 16,810; 2029: 17,070; 2030: 17,330; 2031: 17,590; 2032: 17,850; 2033: 18,110; 2034: 18,370; 2035: 18,630; 2036: 18,890; 2037: 19,150; 2038: 19,410; 2039: 19,670; 2040: 19,930; 2041: 20,190; 2042: 20,450	6.00	Non-Traversable Median	26.00

Table 3. Predicted Freeway Crash Rates and Frequencies (Section 1)

First Year of Analysis	**2022**
Last Year of Analysis	**2042**
Evaluated Length (mi)	**57.4982**
Average Future Road AADT (vpd)	**71,596**
Predicted Crashes	
Total Crashes	**18,168.99**
Fatal and Injury Crashes	**5,531.68**
Property-Damage-Only Crashes	**12,637.30**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**30**
Percent Property-Damage-Only Crashes (%)	**70**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**15.0472**
FI Crash Rate (crashes/mi/yr)	**4.5812**
PDO Crash Rate (crashes/mi/yr)	**10.4660**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**31,554.03**
Travel Crash Rate (crashes/million veh-mi)	**0.58**
Travel FI Crash Rate (crashes/million veh-mi)	**0.17**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.40**

Table 4. Predicted Freeway Speed Change Lane Crash Rates and Frequencies (Speed Change)

First Year of Analysis	**2022**
Last Year of Analysis	**2042**
Evaluated Length (mi)	**10.4300**
Average Future Road AADT (vpd)	**54,376**
Predicted Crashes	
Total Crashes	**2,590.17**
Fatal and Injury Crashes	**791.82**
Property-Damage-Only Crashes	**1,798.36**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**31**
Percent Property-Damage-Only Crashes (%)	**69**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**11.8256**
FI Crash Rate (crashes/mi/yr)	**3.6151**
PDO Crash Rate (crashes/mi/yr)	**8.2105**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**4,347.13**
Travel Crash Rate (crashes/million veh-mi)	**0.60**
Travel FI Crash Rate (crashes/million veh-mi)	**0.18**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.41**

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 5. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	1000+00.000	1001+07.510	0.0102	1.681	0.0800	0.0279	0.0521	7.8603	0.65
3	1001+07.510	1001+30.470	0.0022	0.293	0.0139	0.0049	0.0090	6.4125	0.58
5	1001+30.470	1018+93.610	0.3339	36.090	1.7186	0.6024	1.1162	5.1465	0.51
6	1018+93.610	1035+88.900	0.3211	45.636	2.1731	0.7440	1.4292	6.7682	0.55
7	1035+88.900	1081+93.610	0.8721	115.612	5.5053	1.8739	3.6314	6.3127	0.52
8	1081+93.610	1084+46.040	0.0478	6.880	0.3276	0.1127	0.2149	6.8522	0.56

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
9	1084+46.040	1108+25.790	0.4232	68.801	3.2762	1.0932	2.1830	7.7407	0.55
11	1108+25.790	1141+21.180	0.5224	91.169	4.3414	1.4435	2.8979	8.3101	0.57
15	1141+21.180	1142+97.170	0.0167	2.940	0.1400	0.0472	0.0928	8.3999	0.61
17	1142+97.170	1171+25.410	0.5357	78.289	3.7281	1.2511	2.4769	6.9599	0.53
18	1171+25.410	1181+76.080	0.1280	23.010	1.0957	0.3612	0.7345	8.5625	0.57
20	1181+76.080	1310+09.960	2.3238	467.069	22.2414	7.1406	15.1008	9.5711	0.56
24	1310+09.960	1311+36.670	0.0120	2.421	0.1153	0.0380	0.0773	9.6091	0.62
26	1311+36.670	1353+89.440	0.8054	120.634	5.7445	1.9209	3.8236	7.1320	0.53
27	1353+89.440	1355+18.280	0.0122	2.163	0.1030	0.0345	0.0685	8.4417	0.60
29	1355+18.280	1365+82.620	0.1238	25.272	1.2034	0.3929	0.8105	9.7192	0.60
32	1365+82.620	1366+63.080	0.0076	1.973	0.0940	0.0299	0.0640	12.3321	0.66
34	1366+63.080	1387+72.400	0.2367	60.242	2.8687	0.9049	1.9637	12.1216	0.63
38	1387+72.400	1401+83.800	0.2470	53.646	2.5546	0.8163	1.7383	10.3444	0.59
40	1401+83.800	1448+14.880	0.8771	181.227	8.6299	2.7523	5.8776	9.8391	0.57
41	1448+14.880	1448+51.680	-0.0001	-0.026	-0.0012	-0.0004	-0.0008	12.3444	0.56
45	1448+51.680	1461+68.620	-0.2494	-88.421	-4.2105	-1.3652	-2.8453	16.8812	0.61
50	1461+68.620	1463+36.890	-0.0001	-0.031	-0.0015	-0.0005	-0.0010	14.9998	0.59
54	1463+36.890	1532+41.010	1.3076	394.344	18.7783	5.6276	13.1508	14.3609	0.61
55	1532+41.010	1542+72.380	0.1196	47.838	2.2780	0.6589	1.6191	19.0505	0.69
57	1542+72.380	1571+03.740	0.4493	225.430	10.7347	2.9999	7.7349	23.8906	0.75
61	1571+03.740	1571+65.940	0.0059	2.759	0.1314	0.0376	0.0938	22.3070	0.77
63	1571+65.940	1616+96.040	0.8580	312.390	14.8757	4.3271	10.5487	17.3382	0.66
64	1616+96.040	1620+37.170	0.0646	25.317	1.2056	0.4052	0.8004	18.6596	0.62
65	1620+37.170	1641+82.890	0.4064	183.393	8.7330	2.8488	5.8842	21.4894	0.61
66	1641+82.890	1752+45.780	2.0952	554.769	26.4176	8.6707	17.7469	12.6083	0.57
67	1752+45.780	1774+96.080	0.4262	161.959	7.7123	2.5617	5.1506	18.0959	0.57
68	1774+96.080	1802+00.210	0.4942	327.074	15.5749	5.0047	10.5702	31.5184	0.73
70	1802+00.210	1802+34.860	0.0066	4.003	0.1906	0.0622	0.1284	29.0433	0.70
71	1802+34.860	1858+89.680	1.0710	574.319	27.3485	8.5507	18.7978	25.5358	0.63
72	1858+89.680	1862+31.360	0.0434	29.178	1.3894	0.4256	0.9638	32.0104	0.70
74	1862+31.360	1937+57.720	1.3071	973.962	46.3791	13.7702	32.6089	35.4831	0.70
77	1937+57.720	1945+10.160	0.1264	96.291	4.5853	1.3726	3.2127	36.2733	0.74
79	1945+10.160	1962+27.940	0.3253	206.856	9.8503	2.9869	6.8633	30.2771	0.65
80	1962+27.940	1969+25.480	0.1070	79.077	3.7656	1.1369	2.6287	35.1872	0.73
82	1969+25.480	1983+70.120	0.2196	226.614	10.7912	3.1165	7.6747	49.1337	0.94
85	1983+70.120	1992+04.960	0.1581	147.814	7.0388	2.0265	5.0123	44.5172	0.86
86	1992+04.960	1993+20.390	0.0109	12.017	0.5722	0.1651	0.4071	52.3501	0.99
88	1993+20.390	2006+55.130	0.2080	280.892	13.3758	3.7484	9.6274	64.3209	1.15
92	2006+55.130	2006+91.220	0.0034	4.038	0.1923	0.0547	0.1376	56.2602	1.08
94	2006+91.220	2045+17.910	0.7248	574.500	27.3572	7.4345	19.9227	37.7469	0.78
95	2045+17.910	2046+03.220	0.0081	7.803	0.3715	0.1082	0.2634	45.9916	0.89
97	2046+03.220	2049+38.400	0.0507	59.233	2.8206	0.8003	2.0203	55.6049	0.97
99	2049+38.400	2051+11.970	0.0164	18.737	0.8922	0.2601	0.6321	54.2841	0.85
101	2051+11.970	2067+62.740	0.2372	252.054	12.0025	3.5018	8.5008	50.5953	0.75
104	2067+62.740	2072+80.530	0.0777	78.504	3.7383	1.0942	2.6440	48.1075	0.72
106	2072+80.530	2096+65.070	0.4514	393.742	18.7496	5.5105	13.2391	41.5357	0.64
108	2096+65.070	2108+05.270	-0.0492	-49.676	-2.3655	-0.6970	-1.6685	48.0383	0.69
112	2108+05.270	2112+02.880	0.0000	0.000	0.0000	0.0000	0.0000	45.4324	0.67
115	2112+02.880	2132+94.000	0.3953	413.464	19.6888	5.6883	14.0005	49.8105	0.76

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
118	2132+94.000	2141+38.040	0.0000	0.000	0.0000	0.0000	0.0000		
121	2141+38.040	2142+01.770	0.0115	13.056	0.6217	0.1800	0.4417	54.0345	0.79
123	2142+01.770	2156+10.790	0.2669	250.944	11.9497	3.4943	8.4554	44.7790	0.67
124	2156+10.790	2159+38.930	0.0621	46.473	2.2130	0.6697	1.5433	35.6085	0.61
125	2159+38.930	2171+54.400	0.1151	105.926	5.0441	1.5056	3.5386	43.8233	0.72
127	2171+54.400	2183+64.830	0.2276	182.924	8.7107	2.5463	6.1644	38.2750	0.72
130	2183+64.830	2187+07.690	-0.0001	-0.102	-0.0049	-0.0014	-0.0034	41.0804	0.74
134	2187+07.690	2197+66.440	-0.2005	-171.125	-8.1488	-2.5304	-5.6184	40.6382	0.70
139	2197+66.440	2198+41.760	-0.0036	-3.807	-0.1813	-0.0538	-0.1275	49.8784	0.90
144	2198+41.760	2201+64.630	0.0303	27.907	1.3289	0.3889	0.9400	43.8811	0.80
147	2201+64.630	2216+63.010	0.2838	215.011	10.2386	3.0122	7.2264	36.0788	0.68
148	2216+63.010	2221+59.740	0.0571	57.979	2.7609	0.7862	1.9747	48.3133	0.80
150	2221+59.740	2230+01.910	0.0457	50.397	2.3999	0.6978	1.7021	52.5594	0.76
153	2230+01.910	2234+63.570	0.0867	93.430	4.4490	1.2348	3.2142	51.3189	0.77
155	2234+63.570	2240+93.000	0.0851	108.228	5.1537	1.4250	3.7287	60.5468	0.89
157	2240+93.000	2245+71.310	0.0300	44.419	2.1152	0.5810	1.5342	70.5469	1.00
160	2245+71.310	2258+50.450	0.1811	257.948	12.2832	3.3309	8.9523	67.8288	1.01
163	2258+50.450	2258+79.500	0.0028	4.553	0.2168	0.0576	0.1592	78.8101	1.21
165	2258+79.500	2268+46.280	0.1831	201.337	9.5875	2.6586	6.9288	52.3612	0.84
166	2268+46.280	2274+72.630	0.0684	84.217	4.0103	1.1249	2.8855	58.5983	0.90
169	2274+72.630	2284+00.230	0.1359	170.852	8.1358	2.2438	5.8920	59.8622	0.98
171	2284+00.230	2289+18.000	0.0981	115.263	5.4887	1.5195	3.9692	55.9715	0.97
172	2289+18.000	2319+47.290	0.5074	527.314	25.1102	7.0233	18.0869	49.4839	0.80
174	2319+47.290	2324+20.370	0.0896	119.302	5.6810	1.6084	4.0727	63.4056	0.96
175	2324+20.370	2342+71.190	0.3505	422.459	20.1171	5.7568	14.3603	57.3898	0.83
176	2342+71.190	2343+28.110	0.0108	10.858	0.5170	0.1519	0.3651	47.9610	0.73
177	2343+28.110	2365+64.260	0.3661	362.512	17.2625	4.8961	12.3664	47.1526	0.77
180	2365+64.260	2366+17.960	0.0051	4.818	0.2294	0.0666	0.1628	45.1164	0.80
182	2366+17.960	2401+60.950	0.6710	485.292	23.1091	6.8472	16.2619	34.4390	0.67
184	2401+60.950	2402+12.440	0.0049	4.501	0.2143	0.0630	0.1513	43.9605	0.81
186	2402+12.440	2414+12.230	0.1635	138.615	6.6007	2.0186	4.5821	40.3815	0.70
189	2414+12.230	2424+35.910	0.1939	139.386	6.6374	2.0558	4.5816	34.2350	0.63
190	2424+35.910	2427+01.170	0.0502	37.936	1.8065	0.5608	1.2457	35.9578	0.68
191	2427+01.170	2443+40.790	0.3105	227.246	10.8213	3.2013	7.6200	34.8472	0.68
192	2443+40.790	2450+69.650	0.1002	86.585	4.1231	1.2036	2.9194	41.1638	0.75
194	2450+69.650	2471+86.300	0.2792	264.685	12.6040	3.6404	8.9636	45.1442	0.78
197	2471+86.300	2473+42.600	0.0296	26.003	1.2382	0.3637	0.8745	41.8283	0.78
198	2473+42.600	2501+93.380	0.5399	408.410	19.4481	5.3063	14.1418	36.0203	0.73
199	2501+93.380	2506+47.600	0.0430	39.693	1.8902	0.5100	1.3801	43.9435	0.84
201	2506+47.600	2519+74.560	0.1826	189.742	9.0353	2.4139	6.6214	49.4927	0.89
206	2519+74.560	2521+89.240	0.0203	18.924	0.9011	0.2433	0.6579	44.3268	0.85
208	2521+89.240	2545+80.950	0.4530	320.064	15.2411	4.2114	11.0297	33.6467	0.71
209	2545+80.950	2550+11.330	0.0815	62.836	2.9922	0.8972	2.0950	36.7088	0.74
210	2550+11.330	2569+42.420	0.3248	271.694	12.9378	3.8302	9.1076	39.8292	0.75
213	2569+42.420	2572+70.470	0.0311	26.500	1.2619	0.3455	0.9164	40.6205	0.82
215	2572+70.470	2590+47.570	0.2594	184.244	8.7735	2.4457	6.3278	33.8231	0.73
217	2590+47.570	2598+01.640	0.1078	65.172	3.1034	0.8958	2.2076	28.7944	0.71
219	2598+01.640	2622+49.470	0.4181	212.168	10.1032	2.9858	7.1174	24.1618	0.67
221	2622+49.470	2622+79.700	0.0057	2.491	0.1186	0.0357	0.0829	20.7215	0.62

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
222	2622+79.700	2622+98.790	0.0036	1.760	0.0838	0.0247	0.0591	23.1784	0.64
223	2622+98.790	2666+50.570	0.7911	396.126	18.8631	5.5814	13.2817	23.8455	0.66
225	2666+50.570	2667+75.600	0.0237	9.226	0.4393	0.1347	0.3046	18.5530	0.60
226	2667+75.600	2689+23.280	0.3836	198.068	9.4318	2.7946	6.6372	24.5904	0.67
228	2689+23.280	2716+03.470	0.4839	205.299	9.7761	2.9738	6.8024	20.2012	0.62
230	2716+03.470	2723+97.650	0.1504	46.410	2.2100	0.7787	1.4312	14.6928	0.49
231	2723+97.650	2741+43.420	0.3306	109.809	5.2290	1.8388	3.3902	15.8149	0.51
232	2741+43.420	2758+30.970	0.3196	123.907	5.9004	2.0333	3.8671	18.4610	0.54
233	2758+30.970	2768+12.430	0.1859	63.790	3.0376	1.0703	1.9674	16.3417	0.53
234	2768+12.430	2771+42.500	0.0369	11.386	0.5422	0.1899	0.3523	14.6752	0.58
236	2771+42.500	2787+05.200	0.2960	77.237	3.6779	1.2880	2.3899	12.4269	0.52
237	2787+05.200	2805+56.170	0.3160	95.361	4.5410	1.5841	2.9569	14.3704	0.56
240	2805+56.170	2816+87.790	0.1944	53.739	2.5590	0.8983	1.6607	13.1611	0.54
242	2816+87.790	2821+10.420	0.0800	17.937	0.8541	0.3059	0.5483	10.6710	0.50
243	2821+10.420	2835+32.750	0.2694	65.861	3.1362	1.1559	1.9803	11.6423	0.48
244	2835+32.750	2852+52.420	0.3105	98.948	4.7118	1.6802	3.0316	15.1728	0.52
246	2852+52.420	2856+90.300	0.0829	24.680	1.1752	0.4223	0.7529	14.1709	0.51
247	2856+90.300	2896+04.190	0.7413	197.429	9.4014	2.8753	6.5260	12.6828	0.59
248	2896+04.190	2896+24.130	0.0019	0.659	0.0314	0.0096	0.0217	16.6079	0.76
250	2896+24.130	2933+76.050	0.5477	162.438	7.7351	2.3657	5.3695	14.1228	0.64
254	2933+76.050	2952+01.360	0.3211	58.214	2.7721	0.9064	1.8657	8.6336	0.56
256	2952+01.360	3035+33.800	1.5781	144.975	6.9036	2.4752	4.4284	4.3746	0.50
257	3035+33.800	3041+43.060	0.0950	10.411	0.4958	0.1766	0.3191	5.2169	0.54
259	3041+43.060	3244+29.990	3.6911	435.283	20.7278	7.1894	13.5383	5.6157	0.52
263	3244+29.990	3248+03.710	0.0354	3.779	0.1799	0.0645	0.1155	5.0845	0.54
265	3248+03.710	3279+26.650	0.5915	48.985	2.3326	0.8474	1.4852	3.9438	0.50
266	3279+26.650	3281+21.530	0.0185	1.798	0.0856	0.0314	0.0542	4.6382	0.55
268	3281+21.530	3603+79.950	5.9790	544.108	25.9099	9.3115	16.5984	4.3335	0.50
273	3603+79.950	3606+16.800	0.0224	1.804	0.0859	0.0320	0.0539	3.8302	0.53
275	3606+16.800	3624+73.190	0.3516	21.718	1.0342	0.3905	0.6437	2.9414	0.49
276	3624+73.190	3627+05.090	0.0220	1.563	0.0745	0.0285	0.0460	3.3902	0.54
278	3627+05.090	3662+27.630	0.5687	41.644	1.9831	0.7504	1.2327	3.4871	0.53
283	3662+27.630	3667+36.010	0.0481	3.803	0.1811	0.0691	0.1119	3.7615	0.57
285	3667+36.010	3690+73.620	0.4427	30.710	1.4624	0.5456	0.9168	3.3031	0.50
286	3690+73.620	3699+52.710	0.1210	9.152	0.4358	0.1656	0.2702	3.6005	0.55
288	3699+52.710	3923+33.470	4.0979	283.158	13.4837	5.0369	8.4468	3.2904	0.50
292	3923+33.470	3924+35.300	0.0096	0.716	0.0341	0.0130	0.0211	3.5331	0.55
294	3924+35.300	3943+28.330	0.3585	22.763	1.0839	0.4078	0.6762	3.0233	0.49
295	3943+28.330	3945+80.010	0.0238	1.735	0.0826	0.0316	0.0510	3.4657	0.55
297	3945+80.010	4035+90.691	1.6556	112.061	5.3363	1.9989	3.3373	3.2232	0.50
Total			52.2832	18,168.987	865.1898	263.4135	601.7764	16.5481	

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Table 6. Predicted Crash Frequencies and Rates by Freeway Speed Change Lane (Speed Change)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
2	1000+00.000	1001+07.510	0.0204	1.675	0.0797	0.0258	0.0540	3.9166	0.64
4	1001+07.510	1001+30.470	0.0043	0.327	0.0156	0.0050	0.0105	3.5792	0.65
10	1084+46.040	1087+36.040	0.0549	5.100	0.2428	0.0765	0.1664	4.4213	0.63
12	1108+25.790	1113+55.790	0.1004	10.215	0.4864	0.1381	0.3483	4.8459	0.67
13	1138+01.180	1141+21.180	0.0606	5.787	0.2756	0.0855	0.1900	4.5468	0.62
14	1138+97.170	1141+21.180	0.0424	4.773	0.2273	0.0675	0.1597	5.3568	0.74
16	1141+21.180	1142+97.170	0.0333	3.527	0.1680	0.0500	0.1180	5.0395	0.73
19	1171+25.410	1178+75.410	0.1420	15.033	0.7158	0.2383	0.4775	5.0395	0.67
21	1181+76.080	1184+86.080	0.0587	6.463	0.3077	0.0956	0.2121	5.2416	0.62
22	1307+34.960	1310+09.960	0.0521	5.778	0.2752	0.0870	0.1882	5.2831	0.62
23	1304+66.670	1310+09.960	0.1029	12.572	0.5987	0.1911	0.4075	5.8182	0.69
25	1310+09.960	1311+36.670	0.0240	2.650	0.1262	0.0404	0.0858	5.2585	0.68
28	1353+89.440	1355+18.280	0.0244	2.280	0.1086	0.0340	0.0745	4.4486	0.63
30	1355+18.280	1356+89.440	0.0324	3.437	0.1637	0.0511	0.1125	5.0485	0.62
31	1355+18.280	1361+68.280	0.1231	14.779	0.7038	0.2381	0.4657	5.7166	0.70
33	1365+82.620	1366+63.080	0.0152	1.800	0.0857	0.0257	0.0600	5.6253	0.60
35	1366+63.080	1369+92.620	0.0624	7.630	0.3633	0.1089	0.2544	5.8212	0.60
36	1366+63.080	1374+93.080	0.1572	22.261	1.0600	0.3586	0.7014	6.7433	0.70
37	1382+12.400	1387+72.400	0.1061	15.987	0.7613	0.2500	0.5112	7.1779	0.74
39	1399+68.800	1401+83.800	0.0407	4.783	0.2278	0.0751	0.1527	5.5933	0.63
42	1448+14.880	1448+51.680	0.0070	0.939	0.0447	0.0124	0.0323	6.4154	0.58
43	1448+48.620	1448+51.680	0.0006	0.078	0.0037	0.0010	0.0027	6.4263	0.58
44	1448+16.890	1448+51.680	0.0066	0.814	0.0387	0.0123	0.0265	5.8798	0.53
46	1448+51.680	1461+68.620	0.2494	40.999	1.9523	0.5375	1.4148	7.8275	0.57
47	1448+51.680	1461+68.620	0.2494	42.994	2.0473	0.7292	1.3181	8.2083	0.60
48	1448+51.680	1461+68.620	0.2494	41.068	1.9556	0.5408	1.4148	7.8407	0.57
49	1448+51.680	1461+68.620	0.2494	39.891	1.8996	0.5988	1.3007	7.6159	0.55
51	1461+68.620	1463+34.880	0.0315	4.836	0.2303	0.0635	0.1668	7.3127	0.57
52	1461+68.620	1461+71.680	0.0006	0.091	0.0044	0.0016	0.0028	7.5142	0.59
53	1461+68.620	1463+36.890	0.0319	4.665	0.2222	0.0702	0.1520	6.9710	0.55
56	1532+41.010	1540+41.010	0.1515	34.967	1.6651	0.6065	1.0585	10.9895	0.79
58	1542+72.380	1545+72.380	0.0568	11.270	0.5367	0.1654	0.3713	9.4457	0.59
59	1568+23.740	1571+03.740	0.0530	10.567	0.5032	0.1567	0.3465	9.4884	0.59
60	1567+65.940	1571+03.740	0.0640	20.355	0.9693	0.3419	0.6274	15.1504	0.95
62	1571+03.740	1571+65.940	0.0118	3.343	0.1592	0.0563	0.1029	13.5128	0.93
69	1800+10.210	1802+00.210	0.0360	12.059	0.5742	0.1711	0.4032	15.9577	0.74
73	1858+89.680	1861+14.680	0.0426	11.993	0.5711	0.1831	0.3880	13.4021	0.59
75	1862+31.360	1871+31.360	0.1705	51.077	2.4322	0.8166	1.6157	14.2691	0.56
76	1934+07.720	1937+57.720	0.0663	24.834	1.1826	0.3478	0.8348	17.8397	0.71
78	1943+40.160	1945+10.160	0.0322	10.020	0.4771	0.1617	0.3155	14.8193	0.60
81	1962+27.940	1964+92.940	0.0502	20.405	0.9717	0.2973	0.6744	19.3605	0.80
83	1969+25.480	1973+25.480	0.0758	23.275	1.1083	0.3264	0.7819	14.6302	0.56
84	1982+00.120	1983+70.120	0.0322	13.253	0.6311	0.1971	0.4340	19.6009	0.75
87	1992+04.960	1993+20.390	0.0219	7.987	0.3804	0.1207	0.2596	17.3980	0.66
89	1993+20.390	1993+94.960	0.0141	5.405	0.2574	0.0816	0.1758	18.2254	0.65
90	1993+20.390	1995+45.390	0.0426	26.885	1.2802	0.4015	0.8788	30.0430	1.08

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
91	2004+81.220	2006+55.130	0.0329	14.086	0.6707	0.1994	0.4713	20.3642	0.73
93	2006+55.130	2006+91.220	0.0068	2.748	0.1309	0.0390	0.0919	19.1454	0.73
96	2045+17.910	2046+03.220	0.0162	5.628	0.2680	0.0829	0.1851	16.5863	0.64
98	2046+03.220	2047+37.910	0.0255	9.787	0.4660	0.1438	0.3222	18.2688	0.64
100	2049+38.400	2051+11.970	0.0329	12.800	0.6095	0.1878	0.4217	18.5419	0.58
102	2051+11.970	2054+58.400	0.0656	27.081	1.2896	0.3992	0.8903	19.6549	0.58
103	2063+12.740	2067+62.740	0.0852	31.643	1.5068	0.4140	1.0928	17.6800	0.52
105	2070+65.530	2072+80.530	0.0407	16.256	0.7741	0.2485	0.5255	19.0102	0.57
107	2096+62.880	2096+65.070	0.0004	0.151	0.0072	0.0019	0.0053	17.3690	0.53
109	2096+65.070	2108+05.270	0.2159	70.464	3.3554	1.0430	2.3124	15.5382	0.45
110	2102+85.270	2108+05.270	0.0985	36.646	1.7450	0.4957	1.2494	17.7190	0.51
111	2096+65.070	2108+05.270	0.2159	83.483	3.9754	1.0729	2.9025	18.4091	0.53
113	2108+05.270	2112+02.880	0.0753	23.821	1.1343	0.3529	0.7815	15.0632	0.45
114	2108+05.270	2112+02.880	0.0753	28.425	1.3536	0.3655	0.9881	17.9748	0.53
116	2112+02.880	2112+05.070	0.0004	0.126	0.0060	0.0019	0.0041	14.4524	0.44
117	2132+88.040	2132+94.000	0.0011	0.351	0.0167	0.0043	0.0125	14.8192	0.45
119	2132+94.000	2141+38.040	0.1599	63.102	3.0049	0.8274	2.1775	18.7974	0.54
120	2132+94.000	2141+38.040	0.1599	52.650	2.5072	0.6440	1.8631	15.6838	0.45
122	2141+38.040	2141+44.000	0.0011	0.436	0.0208	0.0057	0.0150	18.3916	0.54
126	2159+38.930	2171+54.400	0.2302	82.165	3.9126	1.0503	2.8623	16.9965	0.56
128	2171+54.400	2171+68.930	0.0028	0.831	0.0396	0.0108	0.0288	14.3790	0.54
129	2183+61.760	2183+64.830	0.0006	0.175	0.0083	0.0023	0.0061	14.3461	0.54
131	2183+64.830	2187+07.690	0.0649	19.793	0.9425	0.2891	0.6535	14.5149	0.52
132	2187+06.440	2187+07.690	0.0002	0.074	0.0035	0.0011	0.0025	14.9707	0.54
133	2183+64.830	2187+07.690	0.0649	20.489	0.9757	0.2649	0.7108	15.0252	0.54
135	2187+07.690	2197+66.440	0.2005	51.379	2.4466	0.7197	1.7269	12.2014	0.42
136	2187+07.690	2197+66.440	0.2005	65.831	3.1348	0.8605	2.2743	15.6333	0.54
137	2187+07.690	2197+66.440	0.2005	53.003	2.5240	0.7344	1.7896	12.5870	0.43
138	2187+07.690	2197+66.440	0.2005	65.537	3.1208	0.8465	2.2743	15.5635	0.54
140	2197+66.440	2198+41.760	0.0143	4.326	0.2060	0.0632	0.1428	14.4406	0.52
141	2197+66.440	2197+67.690	0.0002	0.075	0.0036	0.0010	0.0026	15.0332	0.54
142	2197+66.440	2198+41.760	0.0143	4.483	0.2135	0.0580	0.1555	14.9661	0.54
143	2198+04.630	2198+41.760	0.0070	2.848	0.1356	0.0425	0.0931	19.2867	0.69
145	2198+41.760	2198+44.830	0.0006	0.175	0.0083	0.0026	0.0058	14.3321	0.52
146	2198+41.760	2201+64.630	0.0611	24.581	1.1705	0.3669	0.8036	19.1418	0.69
149	2216+63.010	2220+53.010	0.0739	26.115	1.2436	0.3661	0.8775	16.8362	0.55
151	2221+59.740	2230+01.910	0.1595	58.410	2.7815	0.9582	1.8233	17.4384	0.50
152	2226+41.910	2230+01.910	0.0682	27.249	1.2976	0.3846	0.9130	19.0313	0.55
154	2230+01.910	2230+09.740	0.0015	0.645	0.0307	0.0110	0.0197	20.7264	0.62
156	2234+63.570	2238+23.570	0.0682	26.921	1.2819	0.3800	0.9019	18.8016	0.55
158	2240+93.000	2243+13.000	0.0417	28.824	1.3726	0.4415	0.9311	32.9412	0.94
159	2241+51.310	2245+71.310	0.0795	41.189	1.9614	0.6274	1.3339	24.6575	0.70
161	2253+90.450	2258+50.450	0.0871	51.723	2.4630	0.7011	1.7619	28.2709	0.84
162	2256+64.500	2258+50.450	0.0352	17.908	0.8527	0.2514	0.6014	24.2133	0.72
164	2258+50.450	2258+79.500	0.0055	2.707	0.1289	0.0380	0.0909	23.4252	0.72
167	2268+46.280	2271+96.280	0.0663	25.014	1.1911	0.3547	0.8365	17.9693	0.55
168	2272+92.630	2274+72.630	0.0341	13.553	0.6454	0.2152	0.4302	18.9309	0.58
170	2279+80.230	2284+00.230	0.0795	44.146	2.1022	0.6354	1.4668	26.4276	0.87
173	2289+18.000	2296+18.000	0.1326	54.681	2.6038	0.8440	1.7598	19.6404	0.64

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
178	2362+64.260	2365+64.260	0.0568	20.546	0.9784	0.2977	0.6807	17.2196	0.56
179	2362+57.960	2365+64.260	0.0580	27.948	1.3308	0.4622	0.8687	22.9412	0.75
181	2365+64.260	2366+17.960	0.0102	4.410	0.2100	0.0731	0.1369	20.6475	0.73
183	2401+60.900	2401+60.950	0.0000	0.003	0.0002	0.0000	0.0001	16.1910	0.63
185	2401+60.950	2402+12.440	0.0098	3.522	0.1677	0.0531	0.1146	17.1956	0.64
187	2402+12.440	2406+30.900	0.0793	24.814	1.1816	0.3588	0.8228	14.9093	0.52
188	2411+57.230	2414+12.230	0.0483	16.646	0.7927	0.2476	0.5451	16.4129	0.57
193	2443+40.790	2447+40.790	0.0758	24.443	1.1640	0.3424	0.8215	15.3642	0.56
195	2450+69.650	2455+14.650	0.0843	33.980	1.6181	0.5190	1.0991	19.1989	0.66
196	2463+46.300	2471+86.300	0.1591	52.601	2.5048	0.6951	1.8097	15.7445	0.54
200	2501+93.380	2506+47.600	0.0860	37.850	1.8024	0.6037	1.1987	20.9513	0.80
202	2506+47.600	2506+58.380	0.0020	0.958	0.0456	0.0153	0.0304	22.3375	0.81
203	2506+47.600	2508+27.600	0.0341	11.703	0.5573	0.1864	0.3709	16.3467	0.59
204	2517+24.560	2519+74.560	0.0473	15.760	0.7505	0.2353	0.5151	15.8498	0.57
205	2516+89.240	2519+74.560	0.0540	25.730	1.2253	0.4378	0.7875	22.6741	0.82
207	2519+74.560	2521+89.240	0.0407	18.103	0.8620	0.3085	0.5536	21.2016	0.81
211	2550+11.330	2552+71.330	0.0492	15.722	0.7486	0.2334	0.5152	15.2033	0.57
212	2567+70.470	2569+42.420	0.0326	11.494	0.5473	0.1788	0.3685	16.8067	0.63
214	2569+42.420	2572+70.470	0.0621	25.245	1.2021	0.4090	0.7931	19.3486	0.78
216	2582+32.570	2590+47.570	0.1544	41.366	1.9698	0.5501	1.4197	12.7615	0.55
218	2594+31.640	2598+01.640	0.0701	25.149	1.1976	0.4298	0.7678	17.0897	0.84
220	2617+69.470	2622+49.470	0.0909	25.091	1.1948	0.3959	0.7989	13.1427	0.73
224	2622+98.790	2626+48.790	0.0663	20.780	0.9895	0.3381	0.6515	14.9276	0.82
227	2667+75.600	2670+20.600	0.0464	10.551	0.5024	0.1594	0.3430	10.8281	0.59
229	2713+53.470	2716+03.470	0.0473	14.982	0.7134	0.2438	0.4696	15.0677	0.93
235	2768+72.500	2771+42.500	0.0511	8.182	0.3896	0.1226	0.2670	7.6193	0.60
238	2787+05.200	2788+65.200	0.0303	5.178	0.2466	0.0861	0.1605	8.1364	0.64
239	2803+51.170	2805+56.170	0.0388	6.447	0.3070	0.1014	0.2056	7.9075	0.62
241	2814+77.790	2816+87.790	0.0398	8.146	0.3879	0.1364	0.2515	9.7526	0.80
245	2850+92.420	2852+52.420	0.0303	5.869	0.2795	0.0973	0.1822	9.2230	0.63
249	2896+04.190	2896+24.130	0.0038	0.585	0.0278	0.0070	0.0209	7.3739	0.68
251	2896+24.130	2901+84.190	0.1061	16.658	0.7933	0.1992	0.5940	7.4785	0.68
252	2896+24.130	2898+34.130	0.0398	5.734	0.2730	0.0900	0.1830	6.8647	0.62
253	2924+26.050	2933+76.050	0.1799	31.378	1.4942	0.5727	0.9215	8.3044	0.76
255	2949+41.360	2952+01.360	0.0492	5.051	0.2405	0.0769	0.1637	4.8844	0.63
258	3035+33.800	3037+48.800	0.0407	2.763	0.1316	0.0439	0.0877	3.2316	0.66
260	3041+43.060	3050+93.060	0.1799	12.038	0.5733	0.1797	0.3935	3.1861	0.58
261	3241+29.990	3244+29.990	0.0568	4.173	0.1987	0.0626	0.1361	3.4978	0.64
262	3240+83.710	3244+29.990	0.0656	4.673	0.2225	0.0725	0.1500	3.3930	0.62
264	3244+29.990	3248+03.710	0.0708	4.244	0.2021	0.0661	0.1360	2.8553	0.60
267	3279+26.650	3281+21.530	0.0369	2.081	0.0991	0.0280	0.0711	2.6844	0.64
269	3281+21.530	3283+26.650	0.0388	2.276	0.1084	0.0306	0.0778	2.7902	0.64
270	3281+21.530	3283+51.530	0.0436	2.637	0.1256	0.0414	0.0841	2.8827	0.67
271	3599+99.950	3603+79.950	0.0720	4.213	0.2006	0.0616	0.1390	2.7878	0.64
272	3598+16.800	3603+79.950	0.1067	5.579	0.2656	0.0848	0.1808	2.4906	0.57
274	3603+79.950	3606+16.800	0.0449	1.899	0.0904	0.0290	0.0614	2.0163	0.56
277	3624+73.190	3627+05.090	0.0439	1.921	0.0915	0.0284	0.0631	2.0828	0.66
279	3627+05.090	3628+43.190	0.0262	1.199	0.0571	0.0177	0.0394	2.1828	0.66
280	3627+05.090	3633+05.090	0.1136	4.075	0.1941	0.0467	0.1473	1.7077	0.52

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
281	3659+77.630	3662+27.630	0.0473	2.242	0.1068	0.0348	0.0719	2.2546	0.68
282	3661+76.010	3662+27.630	0.0098	0.334	0.0159	0.0029	0.0130	1.6283	0.49
284	3662+27.630	3667+36.010	0.0963	3.276	0.1560	0.0288	0.1272	1.6202	0.49
287	3690+73.620	3695+53.620	0.0909	3.224	0.1535	0.0285	0.1250	1.6889	0.51
289	3699+52.710	3703+22.710	0.0701	3.212	0.1530	0.0474	0.1056	2.1828	0.66
290	3917+83.470	3923+33.470	0.1042	3.861	0.1838	0.0461	0.1378	1.7648	0.53
291	3917+65.300	3923+33.470	0.1076	4.823	0.2297	0.0676	0.1621	2.1345	0.64
293	3923+33.470	3924+35.300	0.0193	0.841	0.0401	0.0118	0.0283	2.0775	0.65
296	3943+28.330	3945+80.010	0.0477	2.078	0.0990	0.0300	0.0690	2.0760	0.65
298	3945+80.010	3947+88.330	0.0395	1.761	0.0839	0.0254	0.0585	2.1256	0.65
299	3945+80.010	3949+10.010	0.0625	2.663	0.1268	0.0318	0.0950	2.0293	0.62
Total			10.4300	2,590.173	123.3416	37.7055	85.6360	11.8256	

Note: *Travel Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 7. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	1000+00.000	1409+23.502	7.7507	1,379.620	65.6962	21.5222	44.1740	8.4762	0.67
Simple Curve 1	1409+23.502	1421+10.395	0.2248	46.446	2.2117	0.7054	1.5064	9.8391	0.57
Tangent	1421+10.395	1561+19.905	2.6533	829.249	39.4880	11.8245	27.6636	14.8825	0.92
Simple Curve 2	1561+19.905	1566+61.681	0.1026	43.136	2.0541	0.5740	1.4801	20.0184	0.75
Tangent	1566+61.681	1602+83.668	0.6860	287.215	13.6769	4.0389	9.6380	19.9377	0.82
Simple Curve 3	1602+83.668	1618+07.981	0.2887	105.703	5.0335	1.4820	3.5515	17.4353	0.66
Tangent	1618+07.981	1719+40.788	1.9191	589.436	28.0684	9.2013	18.8671	14.6259	0.58
Simple Curve 4	1719+40.788	1737+48.636	0.3424	90.658	4.3170	1.4169	2.9001	12.6083	0.57
Tangent	1737+48.636	1772+70.380	0.6670	220.792	10.5139	3.4782	7.0357	15.7630	0.57
Simple Curve 5	1772+70.380	1776+88.158	0.0791	39.477	1.8798	0.6124	1.2674	23.7579	0.64
Simple Curve 6	1776+88.158	1799+26.404	0.4239	270.723	12.8916	4.1425	8.7491	30.4111	0.73
Simple Curve 7	1799+26.404	1803+44.182	0.0791	60.282	2.8706	0.9053	1.9653	36.2793	1.03
Tangent	1803+44.182	1812+87.343	0.1786	95.790	4.5614	1.4262	3.1353	25.5358	0.63
Simple Curve 8	1812+87.343	1830+64.062	0.3365	180.448	8.5928	2.6866	5.9062	25.5358	0.63
Tangent	1830+64.062	1846+79.699	0.3060	164.089	7.8137	2.4430	5.3707	25.5358	0.63
Simple Curve 9	1846+79.699	1854+83.526	0.1522	81.639	3.8876	1.2155	2.6721	25.5358	0.63
Tangent	1854+83.526	1893+55.838	0.7334	537.827	25.6108	7.7560	17.8548	34.9210	0.86
Simple Curve 10	1893+55.838	1909+05.868	0.2936	200.584	9.5516	2.8359	6.7157	32.5366	0.70
Tangent	1909+05.868	1914+34.235	0.1001	68.374	3.2559	0.9667	2.2892	32.5366	0.70
Simple Curve 11	1914+34.235	1925+74.417	0.2159	147.547	7.0261	2.0861	4.9400	32.5366	0.70
Tangent	1925+74.417	1932+04.692	0.1194	81.562	3.8839	1.1531	2.7307	32.5366	0.70
Simple Curve 12	1932+04.692	1941+63.531	0.1816	148.332	7.0634	2.0999	4.9635	38.8958	0.98
Tangent	1941+63.531	1944+36.167	0.0516	40.548	1.9309	0.5886	1.3422	37.3942	0.95
Simple Curve 13	1944+36.167	1948+05.795	0.0700	49.431	2.3538	0.7194	1.6344	33.6237	0.79
Tangent	1948+05.795	1960+08.580	0.2278	144.840	6.8971	2.0915	4.8057	30.2771	0.65

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 14	1960+08.580	1965+01.283	0.0933	77.809	3.7052	1.1242	2.5810	39.7061	1.13
Tangent	1965+01.283	1975+74.400	0.2032	173.158	8.2456	2.4177	5.8279	40.5705	1.06
Simple Curve 15	1975+74.400	1987+72.055	0.2268	209.240	9.9638	2.8893	7.0744	43.9265	1.02
Simple Curve 16	1987+72.055	1994+08.228	0.1205	131.040	6.2400	1.8217	4.4183	51.7895	1.27
Simple Curve 17	1994+08.228	2008+79.931	0.2787	327.999	15.6190	4.4061	11.2129	56.0360	1.31
Simple Curve 18	2008+79.931	2010+30.922	0.0286	22.668	1.0794	0.2933	0.7861	37.7469	0.78
Simple Curve 19	2010+30.922	2021+45.567	0.2111	167.341	7.9686	2.1655	5.8031	37.7469	0.78
Tangent	2021+45.567	2026+31.406	0.0920	72.939	3.4733	0.9439	2.5294	37.7469	0.78
Simple Curve 20	2026+31.406	2036+97.557	0.2019	160.061	7.6220	2.0713	5.5506	37.7469	0.78
Tangent	2036+97.557	2043+28.631	0.1195	94.743	4.5116	1.2261	3.2855	37.7469	0.78
Simple Curve 21	2043+28.631	2053+94.781	0.2019	207.694	9.8902	2.8766	7.0136	48.9801	1.23
Tangent	2053+94.781	2118+32.023	1.2192	1,051.827	50.0870	14.5907	35.4963	41.0827	1.03
Simple Curve 22	2118+32.023	2120+32.013	0.0379	39.543	1.8830	0.5440	1.3390	49.7134	0.76
Simple Curve 23	2120+32.013	2122+97.150	0.0502	52.424	2.4964	0.7212	1.7751	49.7134	0.76
Simple Curve 24	2122+97.150	2131+09.403	0.1538	160.602	7.6477	2.2095	5.4382	49.7134	0.76
Simple Curve 25	2131+09.403	2132+62.803	0.0291	30.331	1.4443	0.4173	1.0270	49.7134	0.76
Simple Curve 26	2132+62.803	2135+26.639	0.0500	38.424	1.8297	0.4947	1.3350	36.6171	
Tangent	2135+26.639	2163+57.275	0.5361	459.495	21.8807	6.2954	15.5853	40.8142	
Simple Curve 27	2163+57.275	2170+59.314	0.1330	108.639	5.1733	1.4763	3.6970	38.9081	1.28
Tangent	2170+59.314	2174+50.136	0.0740	60.238	2.8685	0.8329	2.0356	38.7530	0.88
Simple Curve 28	2174+50.136	2181+54.565	0.1334	106.456	5.0693	1.4818	3.5875	37.9967	0.72
Tangent	2181+54.565	2243+49.277	1.1732	933.842	44.4687	12.8023	31.6664	37.9024	1.43
Simple Curve 29	2243+49.277	2245+32.759	0.0348	35.033	1.6683	0.4970	1.1713	48.0069	1.71
Tangent	2245+32.759	2249+27.518	0.0748	79.193	3.7711	1.0320	2.7391	50.4392	1.07
Simple Curve 30	2249+27.518	2251+57.465	0.0436	46.370	2.2081	0.5988	1.6093	50.7024	1.01
Simple Curve 31	2251+57.465	2261+54.922	0.1889	273.993	13.0473	3.6100	9.4373	69.0654	1.51
Simple Curve 32	2261+54.922	2263+91.306	0.0448	49.228	2.3442	0.6500	1.6941	52.3612	0.84
Tangent	2263+91.306	2275+61.181	0.2216	233.844	11.1354	3.1601	7.9753	50.2576	1.14
Simple Curve 33	2275+61.181	2277+47.707	0.0353	34.356	1.6360	0.4512	1.1848	46.3100	0.98
Simple Curve 34	2277+47.707	2290+05.115	0.2381	301.565	14.3602	4.0404	10.3199	60.3002	1.30
Simple Curve 35	2290+05.115	2291+91.641	0.0353	47.039	2.2400	0.6574	1.5826	63.4070	1.44
Tangent	2291+91.641	2297+39.982	0.1039	128.756	6.1312	1.7854	4.3458	59.0378	1.29
Simple Curve 36	2297+39.982	2303+83.624	0.1219	112.040	5.3352	1.4923	3.8430	43.7666	0.80
Tangent	2303+83.624	2318+47.152	0.2772	254.759	12.1314	3.3931	8.7382	43.7666	0.80
Simple Curve 37	2318+47.152	2319+51.135	0.0197	18.401	0.8762	0.2452	0.6310	44.4928	0.81
Simple Curve 38	2319+51.135	2331+24.292	0.2222	279.006	13.2860	3.7848	9.5012	59.7959	0.88
Simple Curve 39	2331+24.292	2332+28.275	0.0197	23.735	1.1302	0.3234	0.8068	57.3898	0.83
Tangent	2332+28.275	2425+50.523	1.7656	1,498.312	71.3482	21.0779	50.2703	40.4107	0.80
Simple Curve 40	2425+50.523	2433+04.127	0.1427	105.113	5.0054	1.4957	3.5096	35.0692	0.68
Tangent	2433+04.127	2601+34.280	3.1875	2,477.163	117.9601	33.8816	84.0786	37.0068	0.95
Simple Curve 41	2601+34.280	2613+82.583	0.2364	108.198	5.1523	1.5227	3.6296	21.7928	0.67
Tangent	2613+82.583	2763+45.367	2.8339	1,273.072	60.6225	18.9514	41.6711	21.3922	0.68
Simple Curve 42	2763+45.367	2768+12.454	0.0885	30.358	1.4456	0.5093	0.9363	16.3413	0.53
Tangent	2768+12.454	2966+00.096	3.7477	981.450	46.7357	15.5866	31.1491	12.4706	0.67
Simple Curve 43	2966+00.096	2976+37.562	0.1965	18.051	0.8596	0.3082	0.5514	4.3746	0.50
Tangent	2976+37.562	3656+26.983	12.8768	1,260.352	60.0167	21.2389	38.7778	4.6608	0.55
Simple Curve 44	3656+26.983	3668+38.707	0.2295	18.105	0.8622	0.2876	0.5746	3.7568	0.91
Simple Curve 45	3668+38.707	3683+98.876	0.2955	20.497	0.9760	0.3641	0.6119	3.3031	0.50
Simple Curve 46	3683+98.876	3696+25.301	0.2323	17.832	0.8491	0.2900	0.5592	3.6557	0.72

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	3696+25.301	3884+30.225	3.5615	240.396	11.4474	4.2675	7.1799	3.2142	0.51
Simple Curve 47	3884+30.225	3904+19.402	0.3767	25.167	1.1984	0.4477	0.7507	3.1810	0.50
Tangent	3904+19.402	4035+90.691	2.4946	177.519	8.4533	3.0947	5.3586	3.3887	0.59

Table 8. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2022	806.93	253.12	0.314	553.82	0.686
2023	824.94	257.90	0.313	567.04	0.687
2024	843.15	262.73	0.312	580.42	0.688
2025	861.52	267.57	0.311	593.95	0.689
2026	880.07	272.44	0.310	607.62	0.690
2027	898.77	277.34	0.309	621.43	0.691
2028	917.62	282.25	0.308	635.37	0.692
2029	936.63	287.19	0.307	649.44	0.693
2030	955.79	292.15	0.306	663.64	0.694
2031	975.10	297.13	0.305	677.98	0.695
2032	994.57	302.12	0.304	692.45	0.696
2033	1,014.18	307.14	0.303	707.04	0.697
2034	1,033.95	312.18	0.302	721.77	0.698
2035	1,053.86	317.24	0.301	736.62	0.699
2036	1,073.93	322.32	0.300	751.61	0.700
2037	1,094.14	327.42	0.299	766.73	0.701
2038	1,114.51	332.54	0.298	781.98	0.702
2039	1,135.02	337.67	0.297	797.35	0.703
2040	1,155.69	342.83	0.297	812.86	0.703
2041	1,176.50	348.00	0.296	828.50	0.704
2042	1,197.46	353.20	0.295	844.26	0.705
Total	20,944.35	6,352.48	0.303	14,591.88	0.697
Average	997.35	302.50	0.303	694.85	0.697

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 9. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0107	0.0275	0.1928	0.3544	1.0950
3	0.0019	0.0048	0.0339	0.0622	0.1900
5	0.2319	0.5946	4.1662	7.6568	23.4402
6	0.2864	0.7344	5.1456	9.4568	30.0126
7	0.7215	1.8497	12.9610	23.8205	76.2588
8	0.0434	0.1112	0.7794	1.4324	4.5131
9	0.4209	1.0791	7.5611	13.8963	45.8432
11	0.5558	1.4249	9.9842	18.3496	60.8549
15	0.0182	0.0466	0.3264	0.5999	1.9488
17	0.4817	1.2350	8.6533	15.9035	52.0157
18	0.1391	0.3566	2.4985	4.5919	15.4242
20	2.7492	7.0484	49.3879	90.7679	317.1158
24	0.0146	0.0375	0.2625	0.4825	1.6241
26	0.7396	1.8961	13.2860	24.4177	80.2949
27	0.0133	0.0341	0.2387	0.4387	1.4381
29	0.1513	0.3879	2.7177	4.9947	17.0202
32	0.0115	0.0295	0.2069	0.3803	1.3450
34	0.3484	0.8932	6.2589	11.5029	41.2386
38	0.3143	0.8057	5.6458	10.3761	36.5038
40	1.1009	2.8478	19.3899	34.4592	123.4292
41	-0.0002	-0.0005	-0.0031	-0.0050	-0.0171
45	-0.6042	-1.5011	-10.1312	-16.4318	-59.7522
50	-0.0002	-0.0005	-0.0036	-0.0059	-0.0211
54	2.1666	5.5549	38.9227	71.5344	276.1658
55	0.2537	0.6504	4.5574	8.3758	34.0009
57	1.1949	3.0882	21.0923	37.6221	162.4320
61	0.0145	0.0371	0.2603	0.4783	1.9690
63	1.7450	4.5230	30.6045	53.9957	221.5220
64	0.1638	0.4248	2.8689	5.0507	16.8086
65	1.0968	2.8120	19.7034	36.2120	123.5691
66	3.4206	8.8202	60.6815	109.1618	372.6848
67	1.0012	2.5758	17.8471	32.3723	108.1627
68	2.2312	5.9242	37.1120	59.8320	221.9742
70	0.0277	0.0736	0.4611	0.7434	2.6968
71	3.5326	9.2089	61.1785	105.6447	394.7541
72	0.1639	0.4201	2.9438	5.4103	20.2397
74	5.6630	14.7466	98.3090	170.4557	684.7876
77	0.5829	1.5294	9.9492	16.7631	67.4662
79	1.2024	3.1153	21.1082	37.2998	144.1299
80	0.4543	1.1748	8.0054	14.2401	55.2023
82	1.3136	3.4410	22.5113	38.1806	161.1680
85	0.9035	2.3988	15.0274	24.2273	105.2574
86	0.0736	0.1954	1.2243	1.9738	8.5497
88	1.6711	4.4370	27.7957	44.8122	202.1763

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
92	0.0244	0.0647	0.4053	0.6535	2.8899
94	3.1775	8.3511	54.0538	90.5422	418.3759
95	0.0482	0.1280	0.8020	1.2930	5.5312
97	0.3568	0.9474	5.9347	9.5680	42.4264
99	0.1160	0.3079	1.9288	3.1096	13.2748
101	1.3711	3.5292	24.4183	44.2185	178.5163
104	0.4213	1.0801	7.5683	13.9095	55.5244
106	2.1216	5.4394	38.1133	70.0467	278.0211
108	-0.3085	-0.7665	-5.1729	-8.3900	-35.0381
112					0.0000
115	2.4280	6.3792	41.3322	69.3151	294.0099
118					0.0000
121	0.0693	0.1777	1.2453	2.2887	9.2748
123	1.3453	3.4492	24.1685	44.4182	177.5629
124	0.2579	0.6611	4.6322	8.5134	32.4083
125	0.6314	1.6517	10.8486	18.4852	74.3096
127	1.0691	2.7979	18.3586	31.2463	129.4523
130	-0.0006	-0.0016	-0.0107	-0.0174	-0.0718
134	-1.1200	-2.7825	-18.7791	-30.4579	-117.9856
139	-0.0238	-0.0592	-0.3994	-0.6478	-2.6768
144	0.1497	0.3839	2.6897	4.9433	19.7402
147	1.1597	2.9733	20.8336	38.2892	151.7549
148	0.3027	0.7761	5.4378	9.9938	41.4686
150	0.2686	0.6887	4.8260	8.8695	35.7442
153	0.4754	1.2189	8.5406	15.6963	67.4988
155	0.5486	1.4066	9.8561	18.1141	78.3023
157	0.2437	0.6376	4.1868	7.1322	32.2191
160	1.4070	3.6874	24.0841	40.7704	187.9992
163	0.0257	0.0682	0.4271	0.6885	3.3434
165	1.1070	2.8913	19.0931	32.7393	145.5058
166	0.4331	1.1103	7.7801	14.2987	60.5946
169	0.9827	2.5980	16.5018	27.0377	123.7319
171	0.6774	1.7987	11.2679	18.1661	83.3527
172	2.8394	7.3640	49.7340	87.5521	379.8241
174	0.7170	1.9038	11.9267	19.2282	85.5262
175	2.3647	6.1559	41.0758	71.2957	301.5665
176	0.0585	0.1500	1.0509	1.9313	7.6670
177	1.8850	4.8329	33.8636	62.2364	259.6945
180	0.0256	0.0657	0.4605	0.8463	3.4198
182	2.6362	6.7588	47.3587	87.0384	341.4996
184	0.0243	0.0622	0.4357	0.8008	3.1783
186	0.7772	1.9925	13.9613	25.6590	96.2246
189	0.7915	2.0293	14.2189	26.1323	96.2143
190	0.2348	0.6141	4.0381	6.8893	26.1596
191	1.3017	3.3806	22.7317	39.8126	160.0198
192	0.4634	1.1881	8.3250	15.3001	61.3081
194	1.4016	3.5934	25.1787	46.2748	188.2364
197	0.1400	0.3590	2.5156	4.6232	18.3647
198	2.0429	5.2377	36.7005	67.4502	296.9785
199	0.1964	0.5034	3.5275	6.4831	28.9828
201	0.9294	2.3827	16.6956	30.6842	139.0498

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
206	0.0937	0.2401	1.6827	3.0926	13.8149
208	1.6214	4.1570	29.1281	53.5332	231.6239
209	0.3454	0.8856	6.2056	11.4050	43.9941
210	1.4747	3.7807	26.4914	48.6874	191.2601
213	0.1330	0.3410	2.3897	4.3919	19.2441
215	0.9416	2.4141	16.9158	31.0887	132.8834
217	0.3449	0.8842	6.1958	11.3870	46.3598
219	1.2499	3.2685	21.4968	36.6875	149.4654
221	0.0137	0.0352	0.2469	0.4538	1.7417
222	0.0095	0.0244	0.1711	0.3144	1.2404
223	2.1489	5.5093	38.6035	70.9477	278.9163
225	0.0519	0.1330	0.9319	1.7128	6.3965
226	1.0760	2.7586	19.3290	35.5240	139.3805
228	1.1449	2.9354	20.5679	37.8008	142.8496
230	0.2998	0.7687	5.3862	9.8990	30.0558
231	0.7080	1.8151	12.7181	23.3740	71.1944
232	0.7828	2.0070	14.0631	25.8460	81.2086
233	0.4422	1.1527	7.6577	13.2231	41.3146
234	0.0731	0.1874	1.3131	2.4133	7.3988
236	0.4959	1.2714	8.9086	16.3728	50.1880
237	0.6099	1.5637	10.9566	20.1367	62.0943
240	0.3458	0.8867	6.2128	11.4182	34.8752
242	0.1178	0.3019	2.1157	3.8883	11.5134
243	0.4450	1.1410	7.9946	14.6929	41.5871
244	0.6469	1.6585	11.6211	21.3579	63.6639
246	0.1626	0.4169	2.9209	5.3683	15.8110
247	1.1070	2.8382	19.8871	36.5497	137.0469
248	0.0037	0.0095	0.0667	0.1226	0.4561
250	0.9108	2.3351	16.3620	30.0709	112.7592
254	0.3490	0.8947	6.2691	11.5217	39.1794
256	0.9709	2.5000	17.2745	31.2345	92.9954
257	0.0680	0.1743	1.2216	2.2451	6.7019
259	2.7680	7.0966	49.7254	91.3882	284.3048
263	0.0248	0.0636	0.4458	0.8194	2.4251
265	0.3263	0.8365	5.8613	10.7722	31.1883
266	0.0121	0.0310	0.2171	0.3991	1.1382
268	3.5850	9.1913	64.4026	118.3628	348.5663
273	0.0123	0.0316	0.2216	0.4073	1.1312
275	0.1503	0.3854	2.7006	4.9633	13.5179
276	0.0110	0.0281	0.1968	0.3616	0.9660
278	0.2954	0.7614	5.2465	9.4550	25.8859
283	0.0308	0.0819	0.5128	0.8267	2.3507
285	0.2432	0.6458	4.0457	6.5225	19.2530
286	0.0685	0.1787	1.1859	2.0446	5.6741
288	1.9661	5.0569	35.0701	63.6823	177.3829
292	0.0050	0.0128	0.0900	0.1654	0.4422
294	0.1570	0.4025	2.8205	5.1837	14.1992
295	0.0122	0.0312	0.2186	0.4017	1.0709
297	0.7696	1.9731	13.8254	25.4092	70.0840
Total					12,637.3041

Table 10. Predicted Crash Severity by Speed Change Lane (Speed Change)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
2	0.0099	0.0254	0.1782	0.3276	1.1336
4	0.0019	0.0050	0.0349	0.0641	0.2210
10	0.0294	0.0755	0.5289	0.9720	3.4938
12	0.0532	0.1363	0.9551	1.7554	7.3149
13	0.0329	0.0844	0.5916	1.0873	3.9906
14	0.0260	0.0667	0.4670	0.8584	3.3545
16	0.0192	0.0493	0.3457	0.6354	2.4778
19	0.0918	0.2352	1.6484	3.0294	10.0278
21	0.0368	0.0944	0.6615	1.2157	4.4542
22	0.0335	0.0859	0.6018	1.1059	3.9513
23	0.0736	0.1887	1.3220	2.4296	8.5583
25	0.0155	0.0399	0.2793	0.5134	1.8020
28	0.0131	0.0336	0.2352	0.4323	1.5654
30	0.0197	0.0505	0.3537	0.6500	2.3629
31	0.0917	0.2350	1.6467	3.0264	9.7790
33	0.0099	0.0254	0.1779	0.3269	1.2601
35	0.0419	0.1075	0.7533	1.3844	5.3426
36	0.1381	0.3540	2.4806	4.5589	14.7289
37	0.0963	0.2468	1.7294	3.1785	10.7361
39	0.0289	0.0741	0.5191	0.9540	3.2068
42	0.0048	0.0122	0.0855	0.1572	0.6793
43	0.0004	0.0010	0.0072	0.0132	0.0565
44	0.0047	0.0121	0.0850	0.1562	0.5555
46	0.2069	0.5306	3.7177	6.8325	29.7113
47	0.2808	0.7198	5.0436	9.2694	27.6801
48	0.2082	0.5338	3.7404	6.8744	29.7113
49	0.2306	0.5911	4.1419	7.6121	27.3154
51	0.0244	0.0627	0.4392	0.8071	3.5022
52	0.0006	0.0015	0.0107	0.0198	0.0588
53	0.0270	0.0693	0.4854	0.8922	3.1915
56	0.2335	0.5987	4.1951	7.7099	22.2292
58	0.0637	0.1633	1.1442	2.1028	7.7964
59	0.0603	0.1546	1.0836	1.9915	7.2766
60	0.1316	0.3375	2.3649	4.3463	13.1746
62	0.0217	0.0556	0.3894	0.7156	2.1606
69	0.0763	0.2025	1.2686	2.0452	8.4665
73	0.0705	0.1808	1.2667	2.3281	8.1472
75	0.3144	0.8060	5.6477	10.3796	33.9293
76	0.1551	0.4117	2.5791	4.1581	17.5298
78	0.0664	0.1728	1.1533	2.0022	6.6252
81	0.1325	0.3519	2.2044	3.5539	14.1627
83	0.1257	0.3222	2.2576	4.1492	16.4207
84	0.0879	0.2333	1.4614	2.3561	9.1143
87	0.0538	0.1429	0.8952	1.4433	5.4522

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
89	0.0364	0.0966	0.6052	0.9757	3.6914
90	0.1790	0.4752	2.9769	4.7994	18.4545
91	0.0889	0.2361	1.4789	2.3844	9.8974
93	0.0174	0.0461	0.2889	0.4658	1.9299
96	0.0369	0.0981	0.6144	0.9905	3.8878
98	0.0641	0.1702	1.0662	1.7189	6.7672
100	0.0837	0.2223	1.3927	2.2452	8.8562
102	0.1733	0.4573	2.9243	4.8293	18.6971
103	0.1594	0.4086	2.8634	5.2625	22.9493
105	0.0957	0.2453	1.7190	3.1594	11.0364
107	0.0007	0.0019	0.0135	0.0247	0.1104
109	0.4016	1.0296	7.2140	13.2583	48.5605
110	0.1908	0.4893	3.4284	6.3009	26.2366
111	0.4131	1.0591	7.4208	13.6384	60.9518
113	0.1359	0.3483	2.4406	4.4855	16.4108
114	0.1407	0.3608	2.5281	4.6463	20.7495
116	0.0007	0.0018	0.0129	0.0237	0.0867
117	0.0019	0.0051	0.0316	0.0510	0.2617
119	0.3319	0.8592	5.8372	10.3474	45.7268
120	0.2583	0.6688	4.5435	8.0542	39.1254
122	0.0022	0.0057	0.0397	0.0729	0.3155
126	0.4405	1.1523	7.5684	12.8959	60.1083
128	0.0042	0.0107	0.0748	0.1375	0.6038
129	0.0009	0.0022	0.0157	0.0288	0.1276
131	0.1113	0.2853	1.9993	3.6744	13.7229
132	0.0004	0.0011	0.0074	0.0137	0.0518
133	0.1020	0.2614	1.8319	3.3668	14.9269
135	0.2771	0.7104	4.9778	9.1485	36.2656
136	0.3313	0.8494	5.9518	10.9385	47.7601
137	0.2827	0.7249	5.0794	9.3352	37.5807
138	0.3259	0.8356	5.8550	10.7606	47.7601
140	0.0243	0.0624	0.4370	0.8032	2.9991
141	0.0004	0.0010	0.0068	0.0124	0.0542
142	0.0223	0.0572	0.4009	0.7368	3.2662
143	0.0164	0.0420	0.2940	0.5403	1.9556
145	0.0010	0.0025	0.0177	0.0325	0.1213
146	0.1413	0.3622	2.5377	4.6639	16.8759
149	0.1410	0.3614	2.5323	4.6540	18.4267
151	0.3689	0.9458	6.6270	12.1795	38.2893
152	0.1481	0.3796	2.6597	4.8882	19.1738
154	0.0042	0.0109	0.0761	0.1399	0.4143
156	0.1463	0.3751	2.6283	4.8305	18.9402
158	0.1700	0.4358	3.0534	5.6117	19.5527
159	0.2577	0.6710	4.4771	7.7706	28.0128
161	0.3126	0.8299	5.1988	8.3816	37.0000
162	0.1121	0.2976	1.8640	3.0052	12.6287
164	0.0170	0.0450	0.2819	0.4545	1.9081
167	0.1366	0.3501	2.4531	4.5084	17.5659
168	0.0828	0.2124	1.4883	2.7353	9.0339
170	0.2833	0.7521	4.7117	7.5962	30.8028
173	0.3444	0.8950	6.0029	10.4817	36.9566

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
178	0.1146	0.2938	2.0587	3.7837	14.2952
179	0.1779	0.4562	3.1967	5.8750	18.2419
181	0.0281	0.0722	0.5056	0.9293	2.8747
183	0.0000	0.0000	0.0003	0.0006	0.0022
185	0.0204	0.0524	0.3673	0.6750	2.4064
187	0.1382	0.3542	2.4818	4.5613	17.2785
188	0.0953	0.2444	1.7122	3.1468	11.4472
193	0.1318	0.3380	2.3683	4.3526	17.2523
195	0.1998	0.5123	3.5895	6.5969	23.0813
196	0.2676	0.6861	4.8077	8.8359	38.0037
200	0.2324	0.5959	4.1752	7.6735	25.1727
202	0.0059	0.0151	0.1055	0.1939	0.6374
203	0.0718	0.1840	1.2891	2.3692	7.7887
204	0.0906	0.2323	1.6277	2.9915	10.8176
205	0.1686	0.4321	3.0280	5.5651	16.5366
207	0.1188	0.3045	2.1336	3.9213	11.6247
211	0.0899	0.2304	1.6146	2.9675	10.8192
212	0.0688	0.1765	1.2369	2.2732	7.7386
214	0.1575	0.4037	2.8290	5.1992	16.6556
216	0.2118	0.5430	3.8051	6.9932	29.8131
218	0.1655	0.4243	2.9728	5.4636	16.1228
220	0.1524	0.3908	2.7381	5.0323	16.7770
224	0.1302	0.3337	2.3382	4.2972	13.6807
227	0.0614	0.1573	1.1025	2.0263	7.2037
229	0.0939	0.2407	1.6864	3.0994	9.8617
235	0.0472	0.1210	0.8478	1.5581	5.6079
238	0.0331	0.0850	0.5953	1.0940	3.3704
239	0.0390	0.1001	0.7012	1.2887	4.3183
241	0.0525	0.1346	0.9431	1.7334	5.2820
245	0.0375	0.0961	0.6730	1.2369	3.8257
249	0.0027	0.0069	0.0484	0.0889	0.4379
251	0.0767	0.1967	1.3781	2.5327	12.4742
252	0.0346	0.0888	0.6224	1.1439	3.8437
253	0.2205	0.5653	3.9611	7.2799	19.3507
255	0.0296	0.0759	0.5316	0.9769	3.4369
258	0.0169	0.0433	0.3034	0.5576	1.8422
260	0.0692	0.1774	1.2429	2.2844	8.2645
261	0.0241	0.0618	0.4329	0.7956	2.8591
262	0.0279	0.0716	0.5015	0.9217	3.1503
264	0.0255	0.0653	0.4573	0.8405	2.8555
267	0.0108	0.0277	0.1938	0.3561	1.4924
269	0.0118	0.0302	0.2118	0.3892	1.6333
270	0.0160	0.0409	0.2866	0.5267	1.7668
271	0.0237	0.0608	0.4262	0.7834	2.9191
272	0.0327	0.0837	0.5867	1.0783	3.7970
274	0.0112	0.0287	0.2008	0.3690	1.2898
277	0.0109	0.0280	0.1962	0.3605	1.3254
279	0.0068	0.0175	0.1223	0.2248	0.8276
280	0.0180	0.0461	0.3233	0.5942	3.0934
281	0.0155	0.0412	0.2581	0.4161	1.5109
282	0.0013	0.0035	0.0218	0.0351	0.2727

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
284	0.0128	0.0340	0.2133	0.3438	2.6721
287	0.0127	0.0338	0.2117	0.3413	2.6248
289	0.0182	0.0468	0.3277	0.6022	2.2172
290	0.0177	0.0455	0.3185	0.5854	2.8934
291	0.0260	0.0667	0.4672	0.8587	3.4047
293	0.0045	0.0116	0.0816	0.1499	0.5938
296	0.0115	0.0296	0.2075	0.3813	1.4482
298	0.0098	0.0251	0.1757	0.3230	1.2276
299	0.0122	0.0314	0.2200	0.4043	1.9956
Total	14.8790	38.3853	263.7901	474.7622	1,798.3565

Table 11. Predicted Freeway Segment Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	9.37	0.1	117.62	0.6	126.99	0.7
Highway Segment	Collision with Fixed Object	1,692.03	9.2	3,827.99	20.9	5,520.02	30.1
Highway Segment	Collision with Other Object	119.52	0.7	743.14	4.1	862.66	4.7
Highway Segment	Other Single-vehicle Collision	487.45	2.7	572.06	3.1	1,059.51	5.8
Highway Segment	Collision with Parked Vehicle	35.15	0.2	85.54	0.5	120.69	0.7
Highway Segment	Total Single Vehicle Crashes	2,343.53	12.8	5,346.35	29.2	7,689.88	42.0
Highway Segment	Right-Angle Collision	99.37	0.5	133.70	0.7	233.06	1.3
Highway Segment	Head-on Collision	25.64	0.1	14.86	0.1	40.50	0.2
Highway Segment	Other Multi-vehicle Collision	99.37	0.5	178.26	1.0	277.63	1.5
Highway Segment	Rear-end Collision	2,404.05	13.1	5,125.01	28.0	7,529.06	41.1
Highway Segment	Sideswipe, Same Direction Collision	576.97	3.1	1,975.73	10.8	2,552.70	13.9
Highway Segment	Total Multiple Vehicle Crashes	3,205.40	17.5	7,427.55	40.5	10,632.95	58.0
Highway Segment	Total Highway Segment Crashes	5,548.93	30.3	12,773.90	69.7	18,322.83	100.0
	Total Crashes	5,548.93	30.3	12,773.90	69.7	18,322.83	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 12. Predicted Exit Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	5.51	0.5	5.51	0.5
Highway Segment	Collision with Fixed Object	62.91	5.7	162.83	14.7	225.74	20.4
Highway Segment	Collision with Other Object	5.13	0.5	23.60	2.1	28.73	2.6
Highway Segment	Other Single-vehicle Collision	15.73	1.4	18.09	1.6	33.82	3.1
Highway Segment	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Total Single Vehicle Crashes	83.77	7.6	210.03	19.0	293.80	26.5
Highway Segment	Right-Angle Collision	3.53	0.3	9.44	0.9	12.97	1.2
Highway Segment	Head-on Collision	1.60	0.1	1.57	0.1	3.18	0.3
Highway Segment	Other Multi-vehicle Collision	5.13	0.5	12.59	1.1	17.72	1.6
Highway Segment	Rear-end Collision	176.21	15.9	444.44	40.1	620.64	56.0
Highway Segment	Sideswipe, Same Direction Collision	50.71	4.6	108.55	9.8	159.26	14.4
Highway Segment	Total Multiple Vehicle Crashes	237.19	21.4	576.59	52.1	813.77	73.5
Highway Segment	Total Highway Segment Crashes	320.96	29.0	786.61	71.0	1,107.57	100.0
	Total Crashes	320.96	29.0	786.61	71.0	1,107.57	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 13. Predicted Entrance Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	2.06	0.1	2.06	0.1
Highway Segment	Collision with Fixed Object	93.62	6.2	133.05	8.8	226.67	15.0
Highway Segment	Collision with Other Object	9.17	0.6	37.13	2.5	46.30	3.1
Highway Segment	Other Single-vehicle Collision	32.33	2.1	16.50	1.1	48.84	3.2
Highway Segment	Collision with Parked Vehicle	1.93	0.1	3.09	0.2	5.02	0.3
Highway Segment	Total Single Vehicle Crashes	137.06	9.1	191.83	12.7	328.89	21.7
Highway Segment	Right-Angle Collision	9.17	0.6	16.50	1.1	25.67	1.7
Highway Segment	Head-on Collision	1.93	0.1	1.03	0.1	2.96	0.2
Highway Segment	Other Multi-vehicle Collision	8.20	0.5	15.47	1.0	23.67	1.6
Highway Segment	Rear-end Collision	262.05	17.3	546.62	36.1	808.67	53.4
Highway Segment	Sideswipe, Same Direction Collision	64.18	4.2	259.90	17.2	324.09	21.4
Highway Segment	Total Multiple Vehicle Crashes	345.53	22.8	839.53	55.5	1,185.06	78.3
Highway Segment	Total Highway Segment Crashes	482.59	31.9	1,031.36	68.1	1,513.95	100.0
	Total Crashes	482.59	31.9	1,031.36	68.1	1,513.95	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 14. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1800+10.210	1802+00.210	for segment #69 (1800+10.210 to 1802+00.210), distance to taper is less than 0.04, adjusted in CMF calculations
1943+40.160	1945+10.160	for segment #78 (1943+40.160 to 1945+10.160), distance to taper is less than 0.04, adjusted in CMF calculations
1982+00.120	1983+70.120	for segment #84 (1982+00.120 to 1983+70.120), distance to taper is less than 0.04, adjusted in CMF calculations
1992+04.960	1993+20.390	for segment #87 (1992+04.960 to 1993+20.390), distance to taper is less than 0.04, adjusted in CMF calculations
1993+20.390	1993+94.960	for segment #89 (1993+20.390 to 1993+94.960), distance to taper is less than 0.04, adjusted in CMF calculations
2004+81.220	2006+55.130	for segment #91 (2004+81.220 to 2006+55.130), distance to taper is less than 0.04, adjusted in CMF calculations
2006+55.130	2006+91.220	for segment #93 (2006+55.130 to 2006+91.220), distance to taper is less than 0.04, adjusted in CMF calculations
2272+92.630	2274+72.630	for segment #168 (2272+92.630 to 2274+72.630), distance to taper is less than 0.04, adjusted in CMF calculations
2506+47.600	2508+27.600	for segment #203 (2506+47.600 to 2508+27.600), distance to taper is less than 0.04, adjusted in CMF calculations
2787+05.200	2788+65.200	for segment #238 (2787+05.200 to 2788+65.200), distance to taper is less than 0.04, adjusted in CMF calculations
2803+51.170	2805+56.170	for segment #239 (2803+51.170 to 2805+56.170), distance to taper is less than 0.04, adjusted in CMF calculations
2814+77.790	2816+87.790	for segment #241 (2814+77.790 to 2816+87.790), distance to taper is less than 0.04, adjusted in CMF calculations
2850+92.420	2852+52.420	for segment #245 (2850+92.420 to 2852+52.420), distance to taper is less than 0.04, adjusted in CMF calculations
2896+24.130	2898+34.130	for segment #252 (2896+24.130 to 2898+34.130), distance to taper is less than 0.04, adjusted in CMF calculations
1448+14.880	1448+51.680	for segment #41 (1448+14.880 to 1448+51.680), Freeway Segment of type Five-lane Freeway is using unbalanced lane processing with types Four-lane Freeway and Six-lane Freeway
1461+68.620	1463+36.890	for segment #50 (1461+68.620 to 1463+36.890), Freeway Segment of type Five-lane Freeway is using unbalanced lane processing with types Four-lane Freeway and Six-lane Freeway
1616+96.040	1620+37.170	for segment #64 (1616+96.040 to 1620+37.170), Freeway Segment of type Six-lane Freeway is using unbalanced lane processing with types Four-lane Freeway and Eight-lane Freeway
1752+45.780	1774+96.080	for segment #67 (1752+45.780 to 1774+96.080), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1774+96.080	1802+00.210	for segment #68 (1774+96.080 to 1802+00.210), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1802+00.210	1802+34.860	for segment #70 (1802+00.210 to 1802+34.860), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
2006+55.130	2006+91.220	for segment #92 (2006+55.130 to 2006+91.220), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
2045+17.910	2046+03.220	for segment #95 (2045+17.910 to 2046+03.220), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
2049+38.400	2051+11.970	for segment #99 (2049+38.400 to 2051+11.970), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
2156+10.790	2159+38.930	for segment #124 (2156+10.790 to 2159+38.930), traffic volume (181,350 vpd) for 2041 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
2156+10.790	2159+38.930	for segment #124 (2156+10.790 to 2159+38.930), traffic volume (183,700 vpd) for 2042 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
2156+10.790	2159+38.930	for segment #124 (2156+10.790 to 2159+38.930), Freeway Segment of type Eight-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Ten-lane Freeway
2159+38.930	2171+54.400	for segment #125 (2159+38.930 to 2171+54.400), traffic volume (181,740 vpd) for 2038 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
2159+38.930	2171+54.400	for segment #125 (2159+38.930 to 2171+54.400), traffic volume (184,192 vpd) for 2039 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
2159+38.930	2171+54.400	for segment #125 (2159+38.930 to 2171+54.400), traffic volume (186,645 vpd) for 2040 exceeds model limit (180,000 vpd) for reliable results for segment type 6F

Start Location (Sta. ft)	End Location (Sta. ft)	Message
2159+38.930	2171+54.400	for segment #125 (2159+38.930 to 2171+54.400), traffic volume (189,097 vpd) for 2041 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
2159+38.930	2171+54.400	for segment #125 (2159+38.930 to 2171+54.400), traffic volume (191,550 vpd) for 2042 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
2159+38.930	2171+54.400	for segment #125 (2159+38.930 to 2171+54.400), Freeway Segment of type Eight-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Ten-lane Freeway
2171+54.400	2183+64.830	for segment #127 (2171+54.400 to 2183+64.830), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
2187+07.690	2197+66.440	for segment #134 (2187+07.690 to 2197+66.440), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
2198+41.760	2201+64.630	for segment #144 (2198+41.760 to 2201+64.630), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
2201+64.630	2216+63.010	for segment #147 (2201+64.630 to 2216+63.010), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
2216+63.010	2221+59.740	for segment #148 (2216+63.010 to 2221+59.740), traffic volume (181,270 vpd) for 2038 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
2216+63.010	2221+59.740	for segment #148 (2216+63.010 to 2221+59.740), traffic volume (183,715 vpd) for 2039 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
2216+63.010	2221+59.740	for segment #148 (2216+63.010 to 2221+59.740), traffic volume (186,160 vpd) for 2040 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
2216+63.010	2221+59.740	for segment #148 (2216+63.010 to 2221+59.740), traffic volume (188,605 vpd) for 2041 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
2216+63.010	2221+59.740	for segment #148 (2216+63.010 to 2221+59.740), traffic volume (191,050 vpd) for 2042 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
2216+63.010	2221+59.740	for segment #148 (2216+63.010 to 2221+59.740), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
2221+59.740	2230+01.910	for segment #150 (2221+59.740 to 2230+01.910), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
2319+47.290	2324+20.370	for segment #174 (2319+47.290 to 2324+20.370), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
2342+71.190	2343+28.110	for segment #176 (2342+71.190 to 2343+28.110), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
2402+12.440	2414+12.230	for segment #186 (2402+12.440 to 2414+12.230), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
2414+12.230	2424+35.910	for segment #189 (2414+12.230 to 2424+35.910), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
2424+35.910	2427+01.170	for segment #190 (2424+35.910 to 2427+01.170), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
2471+86.300	2473+42.600	for segment #197 (2471+86.300 to 2473+42.600), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
2545+80.950	2550+11.330	for segment #209 (2545+80.950 to 2550+11.330), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
2550+11.330	2569+42.420	for segment #210 (2550+11.330 to 2569+42.420), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
2716+03.470	2723+97.650	for segment #230 (2716+03.470 to 2723+97.650), Freeway Segment of type Eight-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Ten-lane Freeway
2758+30.970	2768+12.430	for segment #233 (2758+30.970 to 2768+12.430), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
2821+10.420	2835+32.750	for segment #243 (2821+10.420 to 2835+32.750), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
2852+52.420	2856+90.300	for segment #246 (2852+52.420 to 2856+90.300), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Four-lane Freeway and Ten-lane Freeway

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1448+14.880	1448+51.680	for segment #42 (1448+14.880 to 1448+51.680), Speed Change Segment of type Five-lane Freeway Speed Change is using unbalanced lane processing with types Four-lane Freeway Speed Change and Six-lane Freeway Speed Change
1448+48.620	1448+51.680	for segment #43 (1448+48.620 to 1448+51.680), Speed Change Segment of type Five-lane Freeway Speed Change is using unbalanced lane processing with types Four-lane Freeway Speed Change and Six-lane Freeway Speed Change
1448+16.890	1448+51.680	for segment #44 (1448+16.890 to 1448+51.680), Speed Change Segment of type Five-lane Freeway Speed Change is using unbalanced lane processing with types Four-lane Freeway Speed Change and Six-lane Freeway Speed Change
1461+68.620	1463+34.880	for segment #51 (1461+68.620 to 1463+34.880), Speed Change Segment of type Five-lane Freeway Speed Change is using unbalanced lane processing with types Four-lane Freeway Speed Change and Six-lane Freeway Speed Change
1461+68.620	1461+71.680	for segment #52 (1461+68.620 to 1461+71.680), Speed Change Segment of type Five-lane Freeway Speed Change is using unbalanced lane processing with types Four-lane Freeway Speed Change and Six-lane Freeway Speed Change
1461+68.620	1463+36.890	for segment #53 (1461+68.620 to 1463+36.890), Speed Change Segment of type Five-lane Freeway Speed Change is using unbalanced lane processing with types Four-lane Freeway Speed Change and Six-lane Freeway Speed Change
1800+10.210	1802+00.210	for segment #69 (1800+10.210 to 1802+00.210), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
2006+55.130	2006+91.220	for segment #93 (2006+55.130 to 2006+91.220), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
2045+17.910	2046+03.220	for segment #96 (2045+17.910 to 2046+03.220), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
2049+38.400	2051+11.970	for segment #100 (2049+38.400 to 2051+11.970), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
2159+38.930	2171+54.400	for segment #126 (2159+38.930 to 2171+54.400), traffic volume (181,740 vpd) for 2038 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
2159+38.930	2171+54.400	for segment #126 (2159+38.930 to 2171+54.400), traffic volume (184,192 vpd) for 2039 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
2159+38.930	2171+54.400	for segment #126 (2159+38.930 to 2171+54.400), traffic volume (186,645 vpd) for 2040 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
2159+38.930	2171+54.400	for segment #126 (2159+38.930 to 2171+54.400), traffic volume (189,097 vpd) for 2041 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
2159+38.930	2171+54.400	for segment #126 (2159+38.930 to 2171+54.400), traffic volume (191,550 vpd) for 2042 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
2159+38.930	2171+54.400	for segment #126 (2159+38.930 to 2171+54.400), Speed Change Segment of type Eight-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Ten-lane Freeway Speed Change
2171+54.400	2171+68.930	for segment #128 (2171+54.400 to 2171+68.930), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
2183+61.760	2183+64.830	for segment #129 (2183+61.760 to 2183+64.830), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
2187+07.690	2197+66.440	for segment #135 (2187+07.690 to 2197+66.440), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
2187+07.690	2197+66.440	for segment #136 (2187+07.690 to 2197+66.440), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
2187+07.690	2197+66.440	for segment #137 (2187+07.690 to 2197+66.440), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
2187+07.690	2197+66.440	for segment #138 (2187+07.690 to 2197+66.440), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
2198+41.760	2198+44.830	for segment #145 (2198+41.760 to 2198+44.830), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
2198+41.760	2201+64.630	for segment #146 (2198+41.760 to 2201+64.630), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
2216+63.010	2220+53.010	for segment #149 (2216+63.010 to 2220+53.010), traffic volume (181,270 vpd) for 2038 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
2216+63.010	2220+53.010	for segment #149 (2216+63.010 to 2220+53.010), traffic volume (183,715 vpd) for 2039 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC

Start Location (Sta. ft)	End Location (Sta. ft)	Message
2216+63.010	2220+53.010	for segment #149 (2216+63.010 to 2220+53.010), traffic volume (186,160 vpd) for 2040 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
2216+63.010	2220+53.010	for segment #149 (2216+63.010 to 2220+53.010), traffic volume (188,605 vpd) for 2041 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
2216+63.010	2220+53.010	for segment #149 (2216+63.010 to 2220+53.010), traffic volume (191,050 vpd) for 2042 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
2216+63.010	2220+53.010	for segment #149 (2216+63.010 to 2220+53.010), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
2221+59.740	2230+01.910	for segment #151 (2221+59.740 to 2230+01.910), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
2226+41.910	2230+01.910	for segment #152 (2226+41.910 to 2230+01.910), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
2402+12.440	2406+30.900	for segment #187 (2402+12.440 to 2406+30.900), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
2411+57.230	2414+12.230	for segment #188 (2411+57.230 to 2414+12.230), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
2550+11.330	2552+71.330	for segment #211 (2550+11.330 to 2552+71.330), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
2567+70.470	2569+42.420	for segment #212 (2567+70.470 to 2569+42.420), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change

Build

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

September 17, 2019

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Table of Contents

List of Tables

List of Figures

Report Overview

Report Generated: Sep 17, 2019 12:45 PM
Report Template: System: Multi-Page, 508 Compliant [System] (mlcpm4, Jun 18, 2019 9:17 AM)

Evaluation Date: Mon Feb 18 10:09:31 CST 2019
IHSDM Version: v14.0.0 (Sep 26, 2018)
Crash Prediction Module: v9.0.0 (Sep 26, 2018)

User Name: chmeyer
Organization Name:
Phone:
E-Mail:

Project Title: Reimagine I-10 Proposed
Project Comment: Created Wed Jan 16 13:52:06 CST 2019
Project Unit System: U.S. Customary

Highway Title: Alignment I10P
Highway Comment: Imported from I10P.xml
Highway Version: 1

Evaluation Title: Evaluation 8
Evaluation Comment: Created Mon Feb 18 09:50:39 CST 2019

Minimum Location: 10+00.000
Maximum Location: 3044+67.123
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: HSM Configuration
Crash Distribution: HSM Configuration
Model/CMF: HSM Configuration
Empirical-Bayes Analysis: None
First Year of Analysis: 2022
Last Year of Analysis: 2042

Section Types

Section 1 Evaluation

Section: Section 1
Evaluation Start Location: 10+00.000
Evaluation End Location: 3044+67.123
Functional Class: Freeway
Type of Alignment: Divided, Multilane
Model Category: Freeway Segment
Calibration Factor: FI_EN=1.0; FI_EX=1.0; FI_MV=1.0; FI_SV=1.0; PDO_EN=1.0; PDO_EX=1.0; PDO_MV=1.0; PDO_SV=1.0;

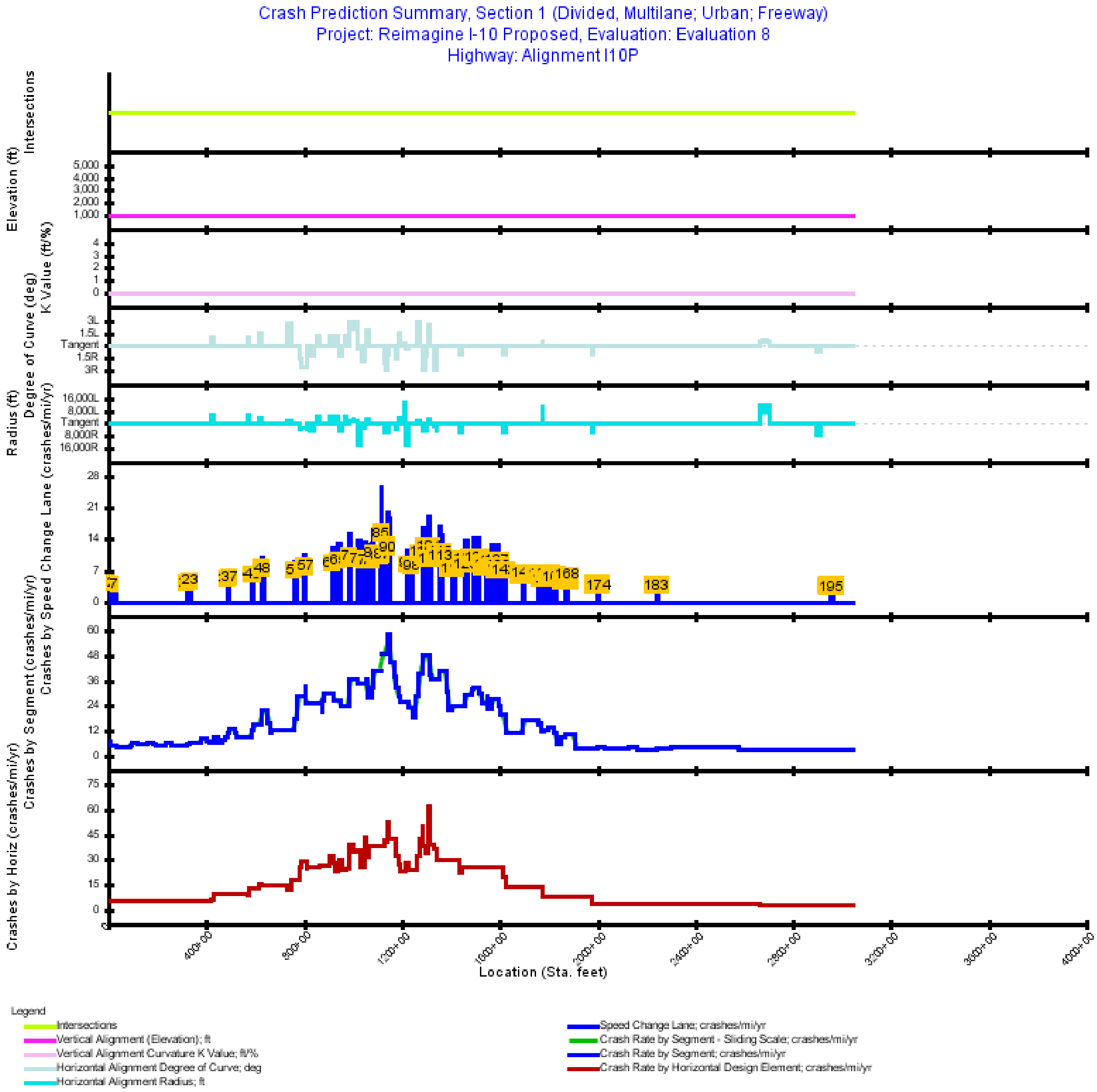

Figure 1. Crash Prediction Summary (Section 1)

Table 1. Evaluation Freeway - Homogeneous Segments (Section 1)

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
1	6F	Urban	10+00.000	10+06.360	6.36	0.0012	2022: 28,450; 2023: 28,937; 2024: 29,425; 2025: 29,912; 2026: 30,400; 2027: 30,887; 2028: 31,375; 2029: 31,862; 2030: 32,350; 2031: 32,837; 2032: 33,325; 2033: 33,812; 2034: 34,300; 2035: 34,787; 2036: 35,275; 2037: 35,762; 2038: 36,250; 2039: 36,737; 2040: 37,225; 2041: 37,712; 2042: 38,200	6.00	Non-Traversable Median	14.00
3	6F	Urban	10+06.360	11+02.460	96.10	0.0182	2022: 25,800; 2023: 26,242; 2024: 26,685; 2025: 27,127; 2026: 27,570; 2027: 28,012; 2028: 28,455; 2029: 28,897; 2030: 29,340; 2031: 29,782; 2032: 30,225; 2033: 30,667; 2034: 31,110; 2035: 31,552; 2036: 31,995; 2037: 32,437; 2038: 32,880; 2039: 33,322; 2040: 33,765; 2041: 34,207; 2042: 34,650	6.00	Non-Traversable Median	14.00
4	6F	Urban	11+02.460	24+17.550	1,315.09	0.2491	2022: 23,750; 2023: 24,157; 2024: 24,565; 2025: 24,972; 2026: 25,380; 2027: 25,787; 2028: 26,195; 2029: 26,602; 2030: 27,010; 2031: 27,417; 2032: 27,825; 2033: 28,232; 2034: 28,640; 2035: 29,047; 2036: 29,455; 2037: 29,862; 2038: 30,270; 2039: 30,677; 2040: 31,085; 2041: 31,492; 2042: 31,900	6.00	Non-Traversable Median	14.00
6	6F	Urban	24+17.550	31+58.860	741.31	0.1404	2022: 23,400; 2023: 23,802; 2024: 24,205; 2025: 24,607; 2026: 25,010; 2027: 25,412; 2028: 25,815; 2029: 26,217; 2030: 26,620; 2031: 27,022; 2032: 27,425; 2033: 27,827; 2034: 28,230; 2035: 28,632; 2036: 29,035; 2037: 29,437; 2038: 29,840; 2039: 30,242; 2040: 30,645; 2041: 31,047; 2042: 31,450	6.00	Non-Traversable Median	14.00
8	6F	Urban	31+58.860	88+50.570	5,691.71	1.0780	2022: 22,600; 2023: 22,990; 2024: 23,380; 2025: 23,770; 2026: 24,160; 2027: 24,550; 2028: 24,940; 2029: 25,330; 2030: 25,720; 2031: 26,110; 2032: 26,500; 2033: 26,890; 2034: 27,280; 2035: 27,670; 2036: 28,060; 2037: 28,450; 2038: 28,840; 2039: 29,230; 2040: 29,620; 2041: 30,010; 2042: 30,400	6.00	Non-Traversable Median	14.00
9	7F	Urban	88+50.570	92+73.870	423.30	0.0802	2022: 24,850; 2023: 25,277; 2024: 25,705; 2025: 26,132; 2026: 26,560; 2027: 26,987; 2028: 27,415; 2029: 27,842; 2030: 28,270; 2031: 28,697; 2032: 29,125; 2033: 29,552; 2034: 29,980; 2035: 30,407; 2036: 30,835; 2037: 31,262; 2038: 31,690; 2039: 32,117; 2040: 32,545; 2041: 32,972; 2042: 33,400	6.00	Non-Traversable Median	14.00
10	8F	Urban	92+73.870	114+92.280	2,218.41	0.4202	2022: 29,850; 2023: 30,362; 2024: 30,875; 2025: 31,387; 2026: 31,900; 2027: 32,412; 2028: 32,925; 2029: 33,437; 2030: 33,950; 2031: 34,462; 2032: 34,975; 2033: 35,487; 2034: 36,000; 2035: 36,512; 2036: 37,025; 2037: 37,537; 2038: 38,050; 2039: 38,562; 2040: 39,075; 2041: 39,587; 2042: 40,100	6.00	Non-Traversable Median	14.00
11	7F	Urban	114+92.280	116+12.410	120.13	0.0227	2022: 28,150; 2023: 28,635; 2024: 29,120; 2025: 29,605; 2026: 30,090; 2027: 30,575; 2028: 31,060; 2029: 31,545; 2030: 32,030; 2031: 32,515; 2032: 33,000; 2033: 33,485; 2034: 33,970; 2035: 34,455; 2036: 34,940; 2037: 35,425; 2038: 35,910; 2039: 36,395; 2040: 36,880; 2041: 37,365; 2042: 37,850	6.00	Non-Traversable Median	14.00
12	6F	Urban	116+12.410	159+52.850	4,340.44	0.8220	2022: 27,350; 2023: 27,822; 2024: 28,295; 2025: 28,767; 2026: 29,240; 2027: 29,712; 2028: 30,185; 2029: 30,657; 2030: 31,130; 2031: 31,602; 2032: 32,075; 2033: 32,547; 2034: 33,020; 2035: 33,492; 2036: 33,965; 2037: 34,437; 2038: 34,910; 2039: 35,382; 2040: 35,855; 2041: 36,327; 2042: 36,800	6.00	Non-Traversable Median	14.00
13	7F	Urban	159+52.850	160+55.670	102.82	0.0195	2022: 29,600; 2023: 30,110; 2024: 30,620; 2025: 31,130; 2026: 31,640; 2027: 32,150; 2028: 32,660; 2029: 33,170; 2030: 33,680; 2031: 34,190; 2032: 34,700; 2033: 35,210; 2034: 35,720; 2035: 36,230; 2036: 36,740; 2037: 37,250; 2038: 37,760; 2039: 38,270; 2040: 38,780; 2041: 39,290; 2042: 39,800	6.00	Non-Traversable Median	14.00
14	8F	Urban	160+55.670	182+04.980	2,149.31	0.4071	2022: 30,850; 2023: 31,380; 2024: 31,910; 2025: 32,440; 2026: 32,970; 2027: 33,500; 2028: 34,030; 2029: 34,560; 2030: 35,090; 2031: 35,620; 2032: 36,150; 2033: 36,680; 2034: 37,210; 2035: 37,740; 2036: 38,270; 2037: 38,800; 2038: 39,330; 2039: 39,860; 2040: 40,390; 2041: 40,920; 2042: 41,450	6.00	Non-Traversable Median	14.00
15	7F	Urban	182+04.980	190+78.150	873.17	0.1654	2022: 28,350; 2023: 28,837; 2024: 29,325; 2025: 29,812; 2026: 30,300; 2027: 30,787; 2028: 31,275; 2029: 31,762; 2030: 32,250; 2031: 32,737; 2032: 33,225; 2033: 33,712; 2034: 34,200; 2035: 34,687; 2036: 35,175; 2037: 35,662; 2038: 36,150; 2039: 36,637; 2040: 37,125; 2041: 37,612; 2042: 38,100	6.00	Non-Traversable Median	14.00
16	6F	Urban	190+78.150	234+73.270	4,395.12	0.8324	2022: 25,700; 2023: 26,142; 2024: 26,585; 2025: 27,027; 2026: 27,470; 2027: 27,912; 2028: 28,355; 2029: 28,797; 2030: 29,240; 2031: 29,682; 2032: 30,125; 2033: 30,567; 2034: 31,010; 2035: 31,452; 2036: 31,895; 2037: 32,337; 2038: 32,780; 2039: 33,222; 2040: 33,665; 2041: 34,107; 2042: 34,550	6.00	Non-Traversable Median	14.00
17	7F	Urban	234+73.270	235+38.500	65.23	0.0123	2022: 27,950; 2023: 28,430; 2024: 28,910; 2025: 29,390; 2026: 29,870; 2027: 30,350; 2028: 30,830; 2029: 31,310; 2030: 31,790; 2031: 32,270; 2032: 32,750; 2033: 33,230; 2034: 33,710; 2035: 34,190; 2036: 34,670; 2037: 35,150; 2038: 35,630; 2039: 36,110; 2040: 36,590; 2041: 37,070; 2042: 37,550	6.00	Non-Traversable Median	14.00
18	8F	Urban	235+38.500	256+53.490	2,114.99	0.4006	2022: 30,150; 2023: 30,667; 2024: 31,185; 2025: 31,702; 2026: 32,220; 2027: 32,737; 2028: 33,255; 2029: 33,772; 2030: 34,290; 2031: 34,807; 2032: 35,325; 2033: 35,842; 2034: 36,360; 2035: 36,877; 2036: 37,395; 2037: 37,912; 2038: 38,430; 2039: 38,947; 2040: 39,465; 2041: 39,982; 2042: 40,500	6.00	Non-Traversable Median	14.00
19	6F	Urban	256+53.490	320+43.950	6,390.46	1.2103	2022: 25,600; 2023: 26,042; 2024: 26,485; 2025: 26,927; 2026: 27,370; 2027: 27,812; 2028: 28,255; 2029: 28,697; 2030: 29,140; 2031: 29,582; 2032: 30,025; 2033: 30,467; 2034: 30,910; 2035: 31,352; 2036: 31,795; 2037: 32,237; 2038: 32,680; 2039: 33,122; 2040: 33,565; 2041: 34,007; 2042: 34,450	6.00	Non-Traversable Median	14.00
20	6F	Urban	320+43.950	333+03.670	1,259.72	0.2386	2022: 27,800; 2023: 28,280; 2024: 28,760; 2025: 29,240; 2026: 29,720; 2027: 30,200; 2028: 30,680; 2029: 31,160; 2030: 31,640; 2031: 32,120; 2032: 32,600; 2033: 33,080; 2034: 33,560; 2035: 34,040; 2036: 34,520; 2037: 35,000; 2038: 35,480; 2039: 35,960; 2040: 36,440; 2041: 36,920; 2042: 37,400	6.00	Non-Traversable Median	14.00
22	6F	Urban	333+03.670	376+84.690	4,381.02	0.8297	2022: 30,050; 2023: 30,567; 2024: 31,085; 2025: 31,602; 2026: 32,120; 2027: 32,637; 2028: 33,155; 2029: 33,672; 2030: 34,190; 2031: 34,707; 2032: 35,225; 2033: 35,742; 2034: 36,260; 2035: 36,777; 2036: 37,295; 2037: 37,812; 2038: 38,330; 2039: 38,847; 2040: 39,365; 2041: 39,882; 2042: 40,400	6.00	Non-Traversable Median	14.00
24	7F	Urban	376+84.690	377+09.150	24.46	0.0046	2022: 34,350; 2023: 34,940; 2024: 35,530; 2025: 36,120; 2026: 36,710; 2027: 37,300; 2028: 37,890; 2029: 38,480; 2030: 39,070; 2031: 39,660; 2032: 40,250; 2033: 40,840; 2034: 41,430; 2035: 42,020; 2036: 42,610; 2037: 43,200; 2038: 43,790; 2039: 44,380; 2040: 44,970; 2041: 45,560; 2042: 46,150	6.00	Non-Traversable Median	14.00

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
25	8F	Urban	377+09.150	401+43.300	2,434.15	0.4610	2022: 37,450; 2023: 38,095; 2024: 38,740; 2025: 39,385; 2026: 40,030; 2027: 40,675; 2028: 41,320; 2029: 41,965; 2030: 42,610; 2031: 43,255; 2032: 43,900; 2033: 44,545; 2034: 45,190; 2035: 45,835; 2036: 46,480; 2037: 47,125; 2038: 47,770; 2039: 48,415; 2040: 49,060; 2041: 49,705; 2042: 50,350	6.00	Non-Traversable Median	14.00
26	7F	Urban	401+43.300	410+45.320	902.02	0.1708	2022: 33,850; 2023: 34,435; 2024: 35,020; 2025: 35,605; 2026: 36,190; 2027: 36,775; 2028: 37,360; 2029: 37,945; 2030: 38,530; 2031: 39,115; 2032: 39,700; 2033: 40,285; 2034: 40,870; 2035: 41,455; 2036: 42,040; 2037: 42,625; 2038: 43,210; 2039: 43,795; 2040: 44,380; 2041: 44,965; 2042: 45,550	6.00	Non-Traversable Median	14.00
27	6F	Urban	410+45.320	430+10.320	1,965.00	0.3722	2022: 29,200; 2023: 29,702; 2024: 30,205; 2025: 30,707; 2026: 31,210; 2027: 31,712; 2028: 32,215; 2029: 32,717; 2030: 33,220; 2031: 33,722; 2032: 34,225; 2033: 34,727; 2034: 35,230; 2035: 35,732; 2036: 36,235; 2037: 36,737; 2038: 37,240; 2039: 37,742; 2040: 38,245; 2041: 38,747; 2042: 39,250	6.00	Non-Traversable Median	14.00
28	7F	Urban	430+10.320	431+12.710	102.39	0.0194	2022: 34,100; 2023: 34,685; 2024: 35,270; 2025: 35,855; 2026: 36,440; 2027: 37,025; 2028: 37,610; 2029: 38,195; 2030: 38,780; 2031: 39,365; 2032: 39,950; 2033: 40,535; 2034: 41,120; 2035: 41,705; 2036: 42,290; 2037: 42,875; 2038: 43,460; 2039: 44,045; 2040: 44,630; 2041: 45,215; 2042: 45,800	6.00	Non-Traversable Median	14.00
29	8F	Urban	431+12.710	444+62.420	1,349.71	0.2556	2022: 39,400; 2023: 40,077; 2024: 40,755; 2025: 41,432; 2026: 42,110; 2027: 42,787; 2028: 43,465; 2029: 44,142; 2030: 44,820; 2031: 45,497; 2032: 46,175; 2033: 46,852; 2034: 47,530; 2035: 48,207; 2036: 48,885; 2037: 49,562; 2038: 50,240; 2039: 50,917; 2040: 51,595; 2041: 52,272; 2042: 52,950	6.00	Non-Traversable Median	14.00
30	7F	Urban	444+62.420	446+92.250	229.83	0.0435	2022: 35,900; 2023: 36,517; 2024: 37,135; 2025: 37,752; 2026: 38,370; 2027: 38,987; 2028: 39,605; 2029: 40,222; 2030: 40,840; 2031: 41,457; 2032: 42,075; 2033: 42,692; 2034: 43,310; 2035: 43,927; 2036: 44,545; 2037: 45,162; 2038: 45,780; 2039: 46,397; 2040: 47,015; 2041: 47,632; 2042: 48,250	6.00	Non-Traversable Median	14.00
31	6F	Urban	446+92.250	466+93.140	2,000.89	0.3790	2022: 30,900; 2023: 31,430; 2024: 31,960; 2025: 32,490; 2026: 33,020; 2027: 33,550; 2028: 34,080; 2029: 34,610; 2030: 35,140; 2031: 35,670; 2032: 36,200; 2033: 36,730; 2034: 37,260; 2035: 37,790; 2036: 38,320; 2037: 38,850; 2038: 39,380; 2039: 39,910; 2040: 40,440; 2041: 40,970; 2042: 41,500	6.00	Non-Traversable Median	14.00
32	7F	Urban	466+93.140	473+45.480	652.34	0.1235	2022: 36,500; 2023: 37,127; 2024: 37,755; 2025: 38,382; 2026: 39,010; 2027: 39,637; 2028: 40,265; 2029: 40,892; 2030: 41,520; 2031: 42,147; 2032: 42,775; 2033: 43,402; 2034: 44,030; 2035: 44,657; 2036: 45,285; 2037: 45,912; 2038: 46,540; 2039: 47,167; 2040: 47,795; 2041: 48,422; 2042: 49,050	6.00	Non-Traversable Median	14.00
33	7F	Urban	473+45.480	487+68.410	1,422.93	0.2695	2022: 42,750; 2023: 43,485; 2024: 44,220; 2025: 44,955; 2026: 45,690; 2027: 46,425; 2028: 47,160; 2029: 47,895; 2030: 48,630; 2031: 49,365; 2032: 50,100; 2033: 50,835; 2034: 51,570; 2035: 52,305; 2036: 53,040; 2037: 53,775; 2038: 54,510; 2039: 55,245; 2040: 55,980; 2041: 56,715; 2042: 57,450	6.00	Non-Traversable Median	14.00
34	7F	Urban	487+68.410	494+75.370	706.96	0.1339	2022: 49,600; 2023: 50,452; 2024: 51,305; 2025: 52,157; 2026: 53,010; 2027: 53,862; 2028: 54,715; 2029: 55,567; 2030: 56,420; 2031: 57,272; 2032: 58,125; 2033: 58,977; 2034: 59,830; 2035: 60,682; 2036: 61,535; 2037: 62,387; 2038: 63,240; 2039: 64,092; 2040: 64,945; 2041: 65,797; 2042: 66,650	6.00	Non-Traversable Median	14.00
36	8F	Urban	494+75.370	518+49.370	2,374.00	0.4496	2022: 54,700; 2023: 55,640; 2024: 56,580; 2025: 57,520; 2026: 58,460; 2027: 59,400; 2028: 60,340; 2029: 61,280; 2030: 62,220; 2031: 63,160; 2032: 64,100; 2033: 65,040; 2034: 65,980; 2035: 66,920; 2036: 67,860; 2037: 68,800; 2038: 69,740; 2039: 70,680; 2040: 71,620; 2041: 72,560; 2042: 73,500	6.00	Non-Traversable Median	14.00
38	7F	Urban	518+49.370	522+06.730	357.36	0.0677	2022: 47,900; 2023: 48,722; 2024: 49,545; 2025: 50,367; 2026: 51,190; 2027: 52,012; 2028: 52,835; 2029: 53,657; 2030: 54,480; 2031: 55,302; 2032: 56,125; 2033: 56,947; 2034: 57,770; 2035: 58,592; 2036: 59,415; 2037: 60,237; 2038: 61,060; 2039: 61,882; 2040: 62,705; 2041: 63,527; 2042: 64,350	6.00	Non-Traversable Median	14.00
39	6F	Urban	522+06.730	585+36.090	6,329.36	1.1987	2022: 41,350; 2023: 42,060; 2024: 42,770; 2025: 43,480; 2026: 44,190; 2027: 44,900; 2028: 45,610; 2029: 46,320; 2030: 47,030; 2031: 47,740; 2032: 48,450; 2033: 49,160; 2034: 49,870; 2035: 50,580; 2036: 51,290; 2037: 52,000; 2038: 52,710; 2039: 53,420; 2040: 54,130; 2041: 54,840; 2042: 55,550	6.00	Non-Traversable Median	14.00
40	6F	Urban	585+36.090	590+45.470	509.38	0.0965	2022: 51,550; 2023: 52,435; 2024: 53,320; 2025: 54,205; 2026: 55,090; 2027: 55,975; 2028: 56,860; 2029: 57,745; 2030: 58,630; 2031: 59,515; 2032: 60,400; 2033: 61,285; 2034: 62,170; 2035: 63,055; 2036: 63,940; 2037: 64,825; 2038: 65,710; 2039: 66,595; 2040: 67,480; 2041: 68,365; 2042: 69,250	6.00	Non-Traversable Median	14.00
42	7F	Urban	590+45.470	624+72.020	3,426.55	0.6490	2022: 61,450; 2023: 62,507; 2024: 63,565; 2025: 64,622; 2026: 65,680; 2027: 66,737; 2028: 67,795; 2029: 68,852; 2030: 69,910; 2031: 70,967; 2032: 72,025; 2033: 73,082; 2034: 74,140; 2035: 75,197; 2036: 76,255; 2037: 77,312; 2038: 78,370; 2039: 79,427; 2040: 80,485; 2041: 81,542; 2042: 82,600	6.00	Non-Traversable Median	14.00
44	7F	Urban	624+72.020	628+07.980	335.96	0.0636	2022: 73,050; 2023: 74,305; 2024: 75,560; 2025: 76,815; 2026: 78,070; 2027: 79,325; 2028: 80,580; 2029: 81,835; 2030: 83,090; 2031: 84,345; 2032: 85,600; 2033: 86,855; 2034: 88,110; 2035: 89,365; 2036: 90,620; 2037: 91,875; 2038: 93,130; 2039: 94,385; 2040: 95,640; 2041: 96,895; 2042: 98,150	6.00	Non-Traversable Median	14.00
46	8F	Urban	628+07.980	651+65.010	2,357.03	0.4464	2022: 82,100; 2023: 83,510; 2024: 84,920; 2025: 86,330; 2026: 87,740; 2027: 89,150; 2028: 90,560; 2029: 91,970; 2030: 93,380; 2031: 94,790; 2032: 96,200; 2033: 97,610; 2034: 99,020; 2035: 100,430; 2036: 101,840; 2037: 103,250; 2038: 104,660; 2039: 106,070; 2040: 107,480; 2041: 108,890; 2042: 110,300	6.00	Non-Traversable Median	14.00
49	7F	Urban	651+65.010	660+88.730	923.72	0.1749	2022: 64,500; 2023: 65,607; 2024: 66,715; 2025: 67,822; 2026: 68,930; 2027: 70,037; 2028: 71,145; 2029: 72,252; 2030: 73,360; 2031: 74,467; 2032: 75,575; 2033: 76,682; 2034: 77,790; 2035: 78,897; 2036: 80,005; 2037: 81,112; 2038: 82,220; 2039: 83,327; 2040: 84,435; 2041: 85,542; 2042: 86,650	6.00	Non-Traversable Median	14.00
50	7F	Urban	660+88.730	667+93.530	704.80	0.1335	2022: 50,800; 2023: 51,672; 2024: 52,545; 2025: 53,417; 2026: 54,290; 2027: 55,162; 2028: 56,035; 2029: 56,907; 2030: 57,780; 2031: 58,652; 2032: 59,525; 2033: 60,397; 2034: 61,270; 2035: 62,142; 2036: 63,015; 2037: 63,887; 2038: 64,760; 2039: 65,632; 2040: 66,505; 2041: 67,377; 2042: 68,250	6.00	Non-Traversable Median	14.00
51	6F	Urban	667+93.530	761+78.560	9,385.03	1.7775	2022: 50,800; 2023: 51,672; 2024: 52,545; 2025: 53,417; 2026: 54,290; 2027: 55,162; 2028: 56,035; 2029: 56,907; 2030: 57,780; 2031: 58,652; 2032: 59,525; 2033: 60,397; 2034: 61,270; 2035: 62,142; 2036: 63,015; 2037: 63,887; 2038: 64,760; 2039: 65,632; 2040: 66,505; 2041: 67,377; 2042: 68,250	6.00	Non-Traversable Median	14.00

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
52	7F	Urban	761+78.560	773+07.600	1,129.04	0.2138	2022: 73,000; 2023: 74,255; 2024: 75,510; 2025: 76,765; 2026: 78,020; 2027: 79,275; 2028: 80,530; 2029: 81,785; 2030: 83,040; 2031: 84,295; 2032: 85,550; 2033: 86,805; 2034: 88,060; 2035: 89,315; 2036: 90,570; 2037: 91,825; 2038: 93,080; 2039: 94,335; 2040: 95,590; 2041: 96,845; 2042: 98,100	6.00	Non-Traversable Median	14.00
54	9F	Urban	773+07.600	806+52.740	3,345.14	0.6335	2022: 99,850; 2023: 101,567; 2024: 103,285; 2025: 105,002; 2026: 106,720; 2027: 108,437; 2028: 110,155; 2029: 111,872; 2030: 113,590; 2031: 115,307; 2032: 117,025; 2033: 118,742; 2034: 120,460; 2035: 122,177; 2036: 123,895; 2037: 125,612; 2038: 127,330; 2039: 129,047; 2040: 130,765; 2041: 132,482; 2042: 134,200	6.00	Non-Traversable Median	14.00
56	9F	Urban	806+52.740	807+42.600	89.86	0.0170	2022: 97,300; 2023: 98,975; 2024: 100,650; 2025: 102,325; 2026: 104,000; 2027: 105,675; 2028: 107,350; 2029: 109,025; 2030: 110,700; 2031: 112,375; 2032: 114,050; 2033: 115,725; 2034: 117,400; 2035: 119,075; 2036: 120,750; 2037: 122,425; 2038: 124,100; 2039: 125,775; 2040: 127,450; 2041: 129,125; 2042: 130,800	6.00	Non-Traversable Median	14.00
58	9F	Urban	807+42.600	813+44.180	601.58	0.1139	2022: 94,200; 2023: 95,822; 2024: 97,445; 2025: 99,067; 2026: 100,690; 2027: 102,312; 2028: 103,935; 2029: 105,557; 2030: 107,180; 2031: 108,802; 2032: 110,425; 2033: 112,047; 2034: 113,670; 2035: 115,292; 2036: 116,915; 2037: 118,537; 2038: 120,160; 2039: 121,782; 2040: 123,405; 2041: 125,027; 2042: 126,650	6.00	Non-Traversable Median	14.00
59	8F	Urban	813+44.180	872+94.110	5,949.93	1.1269	2022: 94,200; 2023: 95,822; 2024: 97,445; 2025: 99,067; 2026: 100,690; 2027: 102,312; 2028: 103,935; 2029: 105,557; 2030: 107,180; 2031: 108,802; 2032: 110,425; 2033: 112,047; 2034: 113,670; 2035: 115,292; 2036: 116,915; 2037: 118,537; 2038: 120,160; 2039: 121,782; 2040: 123,405; 2041: 125,027; 2042: 126,650	6.00	Non-Traversable Median	14.00
60	9F	Urban	872+94.110	873+42.940	48.83	0.0092	2022: 94,200; 2023: 95,822; 2024: 97,445; 2025: 99,067; 2026: 100,690; 2027: 102,312; 2028: 103,935; 2029: 105,557; 2030: 107,180; 2031: 108,802; 2032: 110,425; 2033: 112,047; 2034: 113,670; 2035: 115,292; 2036: 116,915; 2037: 118,537; 2038: 120,160; 2039: 121,782; 2040: 123,405; 2041: 125,027; 2042: 126,650	6.00	Non-Traversable Median	14.00
61	10F	Urban	873+42.940	879+94.370	651.43	0.1234	2022: 106,300; 2023: 108,127; 2024: 109,955; 2025: 111,782; 2026: 113,610; 2027: 115,437; 2028: 117,265; 2029: 119,092; 2030: 120,920; 2031: 122,747; 2032: 124,575; 2033: 126,402; 2034: 128,230; 2035: 130,057; 2036: 131,885; 2037: 133,712; 2038: 135,540; 2039: 137,367; 2040: 139,195; 2041: 141,022; 2042: 142,850	6.00	Non-Traversable Median	14.00
62	10F	Urban	879+94.370	921+17.280	4,122.91	0.7809	2022: 116,450; 2023: 118,452; 2024: 120,455; 2025: 122,457; 2026: 124,460; 2027: 126,462; 2028: 128,465; 2029: 130,467; 2030: 132,470; 2031: 134,472; 2032: 136,475; 2033: 138,477; 2034: 140,480; 2035: 142,482; 2036: 144,485; 2037: 146,487; 2038: 148,490; 2039: 150,492; 2040: 152,495; 2041: 154,497; 2042: 156,500	6.00	Non-Traversable Median	14.00
64	9F	Urban	921+17.280	946+88.890	2,571.61	0.4870	2022: 105,950; 2023: 107,770; 2024: 109,590; 2025: 111,410; 2026: 113,230; 2027: 115,050; 2028: 116,870; 2029: 118,690; 2030: 120,510; 2031: 122,330; 2032: 124,150; 2033: 125,970; 2034: 127,790; 2035: 129,610; 2036: 131,430; 2037: 133,250; 2038: 135,070; 2039: 136,890; 2040: 138,710; 2041: 140,530; 2042: 142,350	6.00	Non-Traversable Median	14.00
66	9F	Urban	946+88.890	983+35.310	3,646.42	0.6906	2022: 100,100; 2023: 101,822; 2024: 103,545; 2025: 105,267; 2026: 106,990; 2027: 108,712; 2028: 110,435; 2029: 112,157; 2030: 113,880; 2031: 115,602; 2032: 117,325; 2033: 119,047; 2034: 120,770; 2035: 122,492; 2036: 124,215; 2037: 125,937; 2038: 127,660; 2039: 129,382; 2040: 131,105; 2041: 132,827; 2042: 134,550	6.00	Non-Traversable Median	14.00
67	9F	Urban	983+35.310	986+82.810	347.50	0.0658	2022: 111,200; 2023: 113,115; 2024: 115,030; 2025: 116,945; 2026: 118,860; 2027: 120,775; 2028: 122,690; 2029: 124,605; 2030: 126,520; 2031: 128,435; 2032: 130,350; 2033: 132,265; 2034: 134,180; 2035: 136,095; 2036: 138,010; 2037: 139,925; 2038: 141,840; 2039: 143,755; 2040: 145,670; 2041: 147,585; 2042: 149,500	6.00	Non-Traversable Median	14.00
69	8F	Urban	986+82.810	1021+08.260	3,425.45	0.6488	2022: 100,800; 2023: 102,535; 2024: 104,270; 2025: 106,005; 2026: 107,740; 2027: 109,475; 2028: 111,210; 2029: 112,945; 2030: 114,680; 2031: 116,415; 2032: 118,150; 2033: 119,885; 2034: 121,620; 2035: 123,355; 2036: 125,090; 2037: 126,825; 2038: 128,560; 2039: 130,295; 2040: 132,030; 2041: 133,765; 2042: 135,500	6.00	Non-Traversable Median	14.00
71	8F	Urban	1021+08.260	1053+94.350	3,286.09	0.6224	2022: 111,500; 2023: 113,420; 2024: 115,340; 2025: 117,260; 2026: 119,180; 2027: 121,100; 2028: 123,020; 2029: 124,940; 2030: 126,860; 2031: 128,780; 2032: 130,700; 2033: 132,620; 2034: 134,540; 2035: 136,460; 2036: 138,380; 2037: 140,300; 2038: 142,220; 2039: 144,140; 2040: 146,060; 2041: 147,980; 2042: 149,900	6.00	Non-Traversable Median	14.00
75	8F	Urban	1053+94.350	1058+21.360	427.01	0.0809	2022: 103,500; 2023: 105,280; 2024: 107,060; 2025: 108,840; 2026: 110,620; 2027: 112,400; 2028: 114,180; 2029: 115,960; 2030: 117,740; 2031: 119,520; 2032: 121,300; 2033: 123,080; 2034: 124,860; 2035: 126,640; 2036: 128,420; 2037: 130,200; 2038: 131,980; 2039: 133,760; 2040: 135,540; 2041: 137,320; 2042: 139,100	6.00	Non-Traversable Median	14.00
77	8F	Urban	1058+21.360	1075+52.580	1,731.22	0.3279	2022: 100,250; 2023: 101,972; 2024: 103,695; 2025: 105,417; 2026: 107,140; 2027: 108,862; 2028: 110,585; 2029: 112,307; 2030: 114,030; 2031: 115,752; 2032: 117,475; 2033: 119,197; 2034: 120,920; 2035: 122,642; 2036: 124,365; 2037: 126,087; 2038: 127,810; 2039: 129,532; 2040: 131,255; 2041: 132,977; 2042: 134,700	6.00	Non-Traversable Median	14.00
78	9F	Urban	1075+52.580	1079+97.540	444.96	0.0843	2022: 122,700; 2023: 124,810; 2024: 126,920; 2025: 129,030; 2026: 131,140; 2027: 133,250; 2028: 135,360; 2029: 137,470; 2030: 139,580; 2031: 141,690; 2032: 143,800; 2033: 145,910; 2034: 148,020; 2035: 150,130; 2036: 152,240; 2037: 154,350; 2038: 156,460; 2039: 158,570; 2040: 160,680; 2041: 162,790; 2042: 164,900	6.00	Non-Traversable Median	14.00
80	10F	Urban	1079+97.540	1116+60.530	3,662.99	0.6937	2022: 146,650; 2023: 149,172; 2024: 151,695; 2025: 154,217; 2026: 156,740; 2027: 159,262; 2028: 161,785; 2029: 164,307; 2030: 166,830; 2031: 169,352; 2032: 171,875; 2033: 174,397; 2034: 176,920; 2035: 179,442; 2036: 181,965; 2037: 184,487; 2038: 187,010; 2039: 189,532; 2040: 192,055; 2041: 194,577; 2042: 197,100	6.00	Non-Traversable Median	14.00
83	6F	Urban	1116+60.530	1118+47.190	186.66	0.0353	2022: 156,550; 2023: 159,242; 2024: 161,935; 2025: 164,627; 2026: 167,320; 2027: 170,012; 2028: 172,705; 2029: 175,397; 2030: 178,090; 2031: 180,782; 2032: 183,475; 2033: 186,167; 2034: 188,860; 2035: 191,552; 2036: 194,245; 2037: 196,937; 2038: 199,630; 2039: 202,322; 2040: 205,015; 2041: 207,707; 2042: 210,400	6.00	Non-Traversable Median	14.00
86	10F	Urban	1118+47.190	1139+16.750	2,069.56	0.3920	2022: 150,000; 2023: 152,580; 2024: 155,160; 2025: 157,740; 2026: 160,320; 2027: 162,900; 2028: 165,480; 2029: 168,060; 2030: 170,640; 2031: 173,220; 2032: 175,800; 2033: 178,380; 2034: 180,960; 2035: 183,540; 2036: 186,120; 2037: 188,700; 2038: 191,280; 2039: 193,860; 2040: 196,440; 2041: 199,020; 2042: 201,600	6.00	Non-Traversable Median	14.00
88	10F	Urban	1139+16.750	1149+08.590	991.84	0.1878	2022: 159,800; 2023: 162,550; 2024: 165,300; 2025: 168,050; 2026: 170,800; 2027: 173,550; 2028: 176,300; 2029: 179,050; 2030: 181,800; 2031: 184,550; 2032: 187,300; 2033: 190,050; 2034: 192,800; 2035: 195,550; 2036: 198,300; 2037: 201,050; 2038: 203,800; 2039: 206,550; 2040: 209,300; 2041: 212,050; 2042: 214,800	6.00	Non-Traversable Median	14.00

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
91	10F	Urban	1149+08.590	1168+08.900	1,900.31	0.3599	2022: 155,500; 2023: 158,177; 2024: 160,855; 2025: 163,532; 2026: 166,210; 2027: 168,887; 2028: 171,565; 2029: 174,242; 2030: 176,920; 2031: 179,597; 2032: 182,275; 2033: 184,952; 2034: 187,630; 2035: 190,307; 2036: 192,985; 2037: 195,662; 2038: 198,340; 2039: 201,017; 2040: 203,695; 2041: 206,372; 2042: 209,050	6.00	Non-Traversable Median	14.00
92	10F	Urban	1168+08.900	1173+14.860	505.96	0.0958	2022: 135,750; 2023: 138,087; 2024: 140,425; 2025: 142,762; 2026: 145,100; 2027: 147,437; 2028: 149,775; 2029: 152,112; 2030: 154,450; 2031: 156,787; 2032: 159,125; 2033: 161,462; 2034: 163,800; 2035: 166,137; 2036: 168,475; 2037: 170,812; 2038: 173,150; 2039: 175,487; 2040: 177,825; 2041: 180,162; 2042: 182,500	6.00	Non-Traversable Median	14.00
93	9F	Urban	1173+14.860	1184+67.050	1,152.19	0.2182	2022: 117,100; 2023: 119,115; 2024: 121,130; 2025: 123,145; 2026: 125,160; 2027: 127,175; 2028: 129,190; 2029: 131,205; 2030: 133,220; 2031: 135,235; 2032: 137,250; 2033: 139,265; 2034: 141,280; 2035: 143,295; 2036: 145,310; 2037: 147,325; 2038: 149,340; 2039: 151,355; 2040: 153,370; 2041: 155,385; 2042: 157,400	6.00	Non-Traversable Median	14.00
94	8F	Urban	1184+67.050	1189+27.220	460.17	0.0872	2022: 102,650; 2023: 104,417; 2024: 106,185; 2025: 107,952; 2026: 109,720; 2027: 111,487; 2028: 113,255; 2029: 115,022; 2030: 116,790; 2031: 118,557; 2032: 120,325; 2033: 122,092; 2034: 123,860; 2035: 125,627; 2036: 127,395; 2037: 129,162; 2038: 130,930; 2039: 132,697; 2040: 134,465; 2041: 136,232; 2042: 138,000	6.00	Non-Traversable Median	14.00
95	7F	Urban	1189+27.220	1229+20.230	3,993.01	0.7562	2022: 96,100; 2023: 97,755; 2024: 99,410; 2025: 101,065; 2026: 102,720; 2027: 104,375; 2028: 106,030; 2029: 107,685; 2030: 109,340; 2031: 110,995; 2032: 112,650; 2033: 114,305; 2034: 115,960; 2035: 117,615; 2036: 119,270; 2037: 120,925; 2038: 122,580; 2039: 124,235; 2040: 125,890; 2041: 127,545; 2042: 129,200	6.00	Non-Traversable Median	14.00
97	7F	Urban	1229+20.230	1246+54.550	1,734.32	0.3285	2022: 89,150; 2023: 90,685; 2024: 92,220; 2025: 93,755; 2026: 95,290; 2027: 96,825; 2028: 98,360; 2029: 99,895; 2030: 101,430; 2031: 102,965; 2032: 104,500; 2033: 106,035; 2034: 107,570; 2035: 109,105; 2036: 110,640; 2037: 112,175; 2038: 113,710; 2039: 115,245; 2040: 116,780; 2041: 118,315; 2042: 119,850	6.00	Non-Traversable Median	14.00
99	7F	Urban	1246+54.550	1257+20.070	1,065.52	0.2018	2022: 76,500; 2023: 77,817; 2024: 79,135; 2025: 80,452; 2026: 81,770; 2027: 83,087; 2028: 84,405; 2029: 85,722; 2030: 87,040; 2031: 88,357; 2032: 89,675; 2033: 90,992; 2034: 92,310; 2035: 93,627; 2036: 94,945; 2037: 96,262; 2038: 97,580; 2039: 98,897; 2040: 100,215; 2041: 101,532; 2042: 102,850	6.00	Non-Traversable Median	14.00
100	8F	Urban	1257+20.070	1268+72.230	1,152.16	0.2182	2022: 94,150; 2023: 95,770; 2024: 97,390; 2025: 99,010; 2026: 100,630; 2027: 102,250; 2028: 103,870; 2029: 105,490; 2030: 107,110; 2031: 108,730; 2032: 110,350; 2033: 111,970; 2034: 113,590; 2035: 115,210; 2036: 116,830; 2037: 118,450; 2038: 120,070; 2039: 121,690; 2040: 123,310; 2041: 124,930; 2042: 126,550	6.00	Non-Traversable Median	14.00
101	10F	Urban	1268+72.230	1281+75.860	1,303.63	0.2469	2022: 133,200; 2023: 135,492; 2024: 137,785; 2025: 140,077; 2026: 142,370; 2027: 144,662; 2028: 146,955; 2029: 149,247; 2030: 151,540; 2031: 153,832; 2032: 156,125; 2033: 158,417; 2034: 160,710; 2035: 163,002; 2036: 165,295; 2037: 167,587; 2038: 169,880; 2039: 172,172; 2040: 174,465; 2041: 176,757; 2042: 179,050	6.00	Non-Traversable Median	14.00
102	10F	Urban	1281+75.860	1315+93.800	3,417.94	0.6473	2022: 143,350; 2023: 145,817; 2024: 148,285; 2025: 150,752; 2026: 153,220; 2027: 155,687; 2028: 158,155; 2029: 160,622; 2030: 163,090; 2031: 165,557; 2032: 168,025; 2033: 170,492; 2034: 172,960; 2035: 175,427; 2036: 177,895; 2037: 180,362; 2038: 182,830; 2039: 185,297; 2040: 187,765; 2041: 190,232; 2042: 192,700	6.00	Non-Traversable Median	14.00
106	10F	Urban	1315+93.800	1318+49.560	255.76	0.0484	2022: 134,300; 2023: 136,612; 2024: 138,925; 2025: 141,237; 2026: 143,550; 2027: 145,862; 2028: 148,175; 2029: 150,487; 2030: 152,800; 2031: 155,112; 2032: 157,425; 2033: 159,737; 2034: 162,050; 2035: 164,362; 2036: 166,675; 2037: 168,987; 2038: 171,300; 2039: 173,612; 2040: 175,925; 2041: 178,237; 2042: 180,550	6.00	Non-Traversable Median	14.00
108	10F	Urban	1318+49.560	1352+31.030	3,381.47	0.6404	2022: 126,250; 2023: 128,422; 2024: 130,595; 2025: 132,767; 2026: 134,940; 2027: 137,112; 2028: 139,285; 2029: 141,457; 2030: 143,630; 2031: 145,802; 2032: 147,975; 2033: 150,147; 2034: 152,320; 2035: 154,492; 2036: 156,665; 2037: 158,837; 2038: 161,010; 2039: 163,182; 2040: 165,355; 2041: 167,527; 2042: 169,700	6.00	Non-Traversable Median	14.00
109	10F	Urban	1352+31.030	1355+24.530	293.50	0.0556	2022: 133,900; 2023: 136,205; 2024: 138,510; 2025: 140,815; 2026: 143,120; 2027: 145,425; 2028: 147,730; 2029: 150,035; 2030: 152,340; 2031: 154,645; 2032: 156,950; 2033: 159,255; 2034: 161,560; 2035: 163,865; 2036: 166,170; 2037: 168,475; 2038: 170,780; 2039: 173,085; 2040: 175,390; 2041: 177,695; 2042: 180,000	6.00	Non-Traversable Median	14.00
111	10F	Urban	1355+24.530	1384+38.980	2,914.45	0.5520	2022: 144,300; 2023: 146,782; 2024: 149,265; 2025: 151,747; 2026: 154,230; 2027: 156,712; 2028: 159,195; 2029: 161,677; 2030: 164,160; 2031: 166,642; 2032: 169,125; 2033: 171,607; 2034: 174,090; 2035: 176,572; 2036: 179,055; 2037: 181,537; 2038: 184,020; 2039: 186,502; 2040: 188,985; 2041: 191,467; 2042: 193,950	6.00	Non-Traversable Median	14.00
114	9F	Urban	1384+38.980	1388+36.180	397.20	0.0752	2022: 116,300; 2023: 118,300; 2024: 120,300; 2025: 122,300; 2026: 124,300; 2027: 126,300; 2028: 128,300; 2029: 130,300; 2030: 132,300; 2031: 134,300; 2032: 136,300; 2033: 138,300; 2034: 140,300; 2035: 142,300; 2036: 144,300; 2037: 146,300; 2038: 148,300; 2039: 150,300; 2040: 152,300; 2041: 154,300; 2042: 156,300	6.00	Non-Traversable Median	14.00
115	8F	Urban	1388+36.180	1407+00.830	1,864.65	0.3532	2022: 86,100; 2023: 87,580; 2024: 89,060; 2025: 90,540; 2026: 92,020; 2027: 93,500; 2028: 94,980; 2029: 96,460; 2030: 97,940; 2031: 99,420; 2032: 100,900; 2033: 102,380; 2034: 103,860; 2035: 105,340; 2036: 106,820; 2037: 108,300; 2038: 109,780; 2039: 111,260; 2040: 112,740; 2041: 114,220; 2042: 115,700	6.00	Non-Traversable Median	14.00
116	9F	Urban	1407+00.830	1407+99.290	98.46	0.0186	2022: 93,750; 2023: 95,362; 2024: 96,975; 2025: 98,587; 2026: 100,200; 2027: 101,812; 2028: 103,425; 2029: 105,037; 2030: 106,650; 2031: 108,262; 2032: 109,875; 2033: 111,487; 2034: 113,100; 2035: 114,712; 2036: 116,325; 2037: 117,937; 2038: 119,550; 2039: 121,162; 2040: 122,775; 2041: 124,387; 2042: 126,000	6.00	Non-Traversable Median	14.00
117	9F	Urban	1407+99.290	1458+80.350	5,081.06	0.9623	2022: 99,800; 2023: 101,517; 2024: 103,235; 2025: 104,952; 2026: 106,670; 2027: 108,387; 2028: 110,105; 2029: 111,822; 2030: 113,540; 2031: 115,257; 2032: 116,975; 2033: 118,692; 2034: 120,410; 2035: 122,127; 2036: 123,845; 2037: 125,562; 2038: 127,280; 2039: 128,997; 2040: 130,715; 2041: 132,432; 2042: 134,150	6.00	Non-Traversable Median	14.00
119	9F	Urban	1458+80.350	1459+28.940	48.59	0.0092	2022: 108,950; 2023: 110,822; 2024: 112,695; 2025: 114,567; 2026: 116,440; 2027: 118,312; 2028: 120,185; 2029: 122,057; 2030: 123,930; 2031: 125,802; 2032: 127,675; 2033: 129,547; 2034: 131,420; 2035: 133,292; 2036: 135,165; 2037: 137,037; 2038: 138,910; 2039: 140,782; 2040: 142,655; 2041: 144,527; 2042: 146,400	6.00	Non-Traversable Median	14.00
121	9F	Urban	1459+28.940	1485+21.570	2,592.63	0.4910	2022: 115,700; 2023: 117,690; 2024: 119,680; 2025: 121,670; 2026: 123,660; 2027: 125,650; 2028: 127,640; 2029: 129,630; 2030: 131,620; 2031: 133,610; 2032: 135,600; 2033: 137,590; 2034: 139,580; 2035: 141,570; 2036: 143,560; 2037: 145,550; 2038: 147,540; 2039: 149,530; 2040: 151,520; 2041: 153,510; 2042: 155,500	6.00	Non-Traversable Median	14.00

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
124	10F	Urban	1485+21.570	1493+46.760	825.19	0.1563	2022: 119,200; 2023: 121,250; 2024: 123,300; 2025: 125,350; 2026: 127,400; 2027: 129,450; 2028: 131,500; 2029: 133,550; 2030: 135,600; 2031: 137,650; 2032: 139,700; 2033: 141,750; 2034: 143,800; 2035: 145,850; 2036: 147,900; 2037: 149,950; 2038: 152,000; 2039: 154,050; 2040: 156,100; 2041: 158,150; 2042: 160,200	6.00	Non-Traversable Median	14.00
125	10F	Urban	1493+46.760	1516+23.110	2,276.35	0.4311	2022: 122,550; 2023: 124,660; 2024: 126,770; 2025: 128,880; 2026: 130,990; 2027: 133,100; 2028: 135,210; 2029: 137,320; 2030: 139,430; 2031: 141,540; 2032: 143,650; 2033: 145,760; 2034: 147,870; 2035: 149,980; 2036: 152,090; 2037: 154,200; 2038: 156,310; 2039: 158,420; 2040: 160,530; 2041: 162,640; 2042: 164,750	6.00	Non-Traversable Median	14.00
128	10F	Urban	1516+23.110	1524+23.110	800.00	0.1515	2022: 115,000; 2023: 116,980; 2024: 118,960; 2025: 120,940; 2026: 122,920; 2027: 124,900; 2028: 126,880; 2029: 128,860; 2030: 130,840; 2031: 132,820; 2032: 134,800; 2033: 136,780; 2034: 138,760; 2035: 140,740; 2036: 142,720; 2037: 144,700; 2038: 146,680; 2039: 148,660; 2040: 150,640; 2041: 152,620; 2042: 154,600	6.00	Non-Traversable Median	14.00
129	9F	Urban	1524+23.110	1548+51.750	2,428.64	0.4600	2022: 103,100; 2023: 104,875; 2024: 106,650; 2025: 108,425; 2026: 110,200; 2027: 111,975; 2028: 113,750; 2029: 115,525; 2030: 117,300; 2031: 119,075; 2032: 120,850; 2033: 122,625; 2034: 124,400; 2035: 126,175; 2036: 127,950; 2037: 129,725; 2038: 131,500; 2039: 133,275; 2040: 135,050; 2041: 136,825; 2042: 138,600	6.00	Non-Traversable Median	14.00
131	8F	Urban	1548+51.750	1550+07.160	155.41	0.0294	2022: 95,550; 2023: 97,195; 2024: 98,840; 2025: 100,485; 2026: 102,130; 2027: 103,775; 2028: 105,420; 2029: 107,065; 2030: 108,710; 2031: 110,355; 2032: 112,000; 2033: 113,645; 2034: 115,290; 2035: 116,935; 2036: 118,580; 2037: 120,225; 2038: 121,870; 2039: 123,515; 2040: 125,160; 2041: 126,805; 2042: 128,450	6.00	Non-Traversable Median	14.00
133	8F	Urban	1550+07.160	1567+03.620	1,696.46	0.3213	2022: 87,600; 2023: 89,107; 2024: 90,615; 2025: 92,122; 2026: 93,630; 2027: 95,137; 2028: 96,645; 2029: 98,152; 2030: 99,660; 2031: 101,167; 2032: 102,675; 2033: 104,182; 2034: 105,690; 2035: 107,197; 2036: 108,705; 2037: 110,212; 2038: 111,720; 2039: 113,227; 2040: 114,735; 2041: 116,242; 2042: 117,750	6.00	Non-Traversable Median	14.00
134	9F	Urban	1567+03.620	1569+20.770	217.15	0.0411	2022: 97,200; 2023: 98,872; 2024: 100,545; 2025: 102,217; 2026: 103,890; 2027: 105,562; 2028: 107,235; 2029: 108,907; 2030: 110,580; 2031: 112,252; 2032: 113,925; 2033: 115,597; 2034: 117,270; 2035: 118,942; 2036: 120,615; 2037: 122,287; 2038: 123,960; 2039: 125,632; 2040: 127,305; 2041: 128,977; 2042: 130,650	6.00	Non-Traversable Median	14.00
135	9F	Urban	1569+20.770	1597+23.110	2,802.34	0.5308	2022: 108,000; 2023: 109,860; 2024: 111,720; 2025: 113,580; 2026: 115,440; 2027: 117,300; 2028: 119,160; 2029: 121,020; 2030: 122,880; 2031: 124,740; 2032: 126,600; 2033: 128,460; 2034: 130,320; 2035: 132,180; 2036: 134,040; 2037: 135,900; 2038: 137,760; 2039: 139,620; 2040: 141,480; 2041: 143,340; 2042: 145,200	6.00	Non-Traversable Median	14.00
139	9F	Urban	1597+23.110	1600+07.160	284.05	0.0538	2022: 94,700; 2023: 96,330; 2024: 97,960; 2025: 99,590; 2026: 101,220; 2027: 102,850; 2028: 104,480; 2029: 106,110; 2030: 107,740; 2031: 109,370; 2032: 111,000; 2033: 112,630; 2034: 114,260; 2035: 115,890; 2036: 117,520; 2037: 119,150; 2038: 120,780; 2039: 122,410; 2040: 124,040; 2041: 125,670; 2042: 127,300	6.00	Non-Traversable Median	14.00
141	9F	Urban	1600+07.160	1622+13.430	2,206.27	0.4178	2022: 84,550; 2023: 86,002; 2024: 87,455; 2025: 88,907; 2026: 90,360; 2027: 91,812; 2028: 93,265; 2029: 94,717; 2030: 96,170; 2031: 97,622; 2032: 99,075; 2033: 100,527; 2034: 101,980; 2035: 103,432; 2036: 104,885; 2037: 106,337; 2038: 107,790; 2039: 109,242; 2040: 110,695; 2041: 112,147; 2042: 113,600	6.00	Non-Traversable Median	14.00
143	8F	Urban	1622+13.430	1622+60.330	46.90	0.0089	2022: 63,500; 2023: 64,592; 2024: 65,685; 2025: 66,777; 2026: 67,870; 2027: 68,962; 2028: 70,055; 2029: 71,147; 2030: 72,240; 2031: 73,332; 2032: 74,425; 2033: 75,517; 2034: 76,610; 2035: 77,702; 2036: 78,795; 2037: 79,887; 2038: 80,980; 2039: 82,072; 2040: 83,165; 2041: 84,257; 2042: 85,350	6.00	Non-Traversable Median	14.00
144	7F	Urban	1622+60.330	1693+03.680	7,043.35	1.3340	2022: 50,750; 2023: 51,622; 2024: 52,495; 2025: 53,367; 2026: 54,240; 2027: 55,112; 2028: 55,985; 2029: 56,857; 2030: 57,730; 2031: 58,602; 2032: 59,475; 2033: 60,347; 2034: 61,220; 2035: 62,092; 2036: 62,965; 2037: 63,837; 2038: 64,710; 2039: 65,582; 2040: 66,455; 2041: 67,327; 2042: 68,200	6.00	Non-Traversable Median	14.00
145	7F	Urban	1693+03.680	1695+79.250	275.57	0.0522	2022: 57,350; 2023: 58,337; 2024: 59,325; 2025: 60,312; 2026: 61,300; 2027: 62,287; 2028: 63,275; 2029: 64,262; 2030: 65,250; 2031: 66,237; 2032: 67,225; 2033: 68,212; 2034: 69,200; 2035: 70,187; 2036: 71,175; 2037: 72,162; 2038: 73,150; 2039: 74,137; 2040: 75,125; 2041: 76,112; 2042: 77,100	6.00	Non-Traversable Median	14.00
147	8F	Urban	1695+79.250	1758+35.390	6,256.14	1.1849	2022: 70,400; 2023: 71,612; 2024: 72,825; 2025: 74,037; 2026: 75,250; 2027: 76,462; 2028: 77,675; 2029: 78,887; 2030: 80,100; 2031: 81,312; 2032: 82,525; 2033: 83,737; 2034: 84,950; 2035: 86,162; 2036: 87,375; 2037: 88,587; 2038: 89,800; 2039: 91,012; 2040: 92,225; 2041: 93,437; 2042: 94,650	6.00	Non-Traversable Median	14.00
149	7F	Urban	1758+35.390	1765+64.940	729.55	0.1382	2022: 63,350; 2023: 64,440; 2024: 65,530; 2025: 66,620; 2026: 67,710; 2027: 68,800; 2028: 69,890; 2029: 70,980; 2030: 72,070; 2031: 73,160; 2032: 74,250; 2033: 75,340; 2034: 76,430; 2035: 77,520; 2036: 78,610; 2037: 79,700; 2038: 80,790; 2039: 81,880; 2040: 82,970; 2041: 84,060; 2042: 85,150	6.00	Non-Traversable Median	14.00
151	8F	Urban	1765+64.940	1767+60.210	195.27	0.0370	2022: 63,350; 2023: 64,440; 2024: 65,530; 2025: 66,620; 2026: 67,710; 2027: 68,800; 2028: 69,890; 2029: 70,980; 2030: 72,070; 2031: 73,160; 2032: 74,250; 2033: 75,340; 2034: 76,430; 2035: 77,520; 2036: 78,610; 2037: 79,700; 2038: 80,790; 2039: 81,880; 2040: 82,970; 2041: 84,060; 2042: 85,150	6.00	Non-Traversable Median	14.00
153	8F	Urban	1767+60.210	1781+96.430	1,436.22	0.2720	2022: 52,150; 2023: 53,045; 2024: 53,940; 2025: 54,835; 2026: 55,730; 2027: 56,625; 2028: 57,520; 2029: 58,415; 2030: 59,310; 2031: 60,205; 2032: 61,100; 2033: 61,995; 2034: 62,890; 2035: 63,785; 2036: 64,680; 2037: 65,575; 2038: 66,470; 2039: 67,365; 2040: 68,260; 2041: 69,155; 2042: 70,050	6.00	Non-Traversable Median	14.00
154	8F	Urban	1781+96.430	1799+13.770	1,717.34	0.3252	2022: 53,050; 2023: 53,962; 2024: 54,875; 2025: 55,787; 2026: 56,700; 2027: 57,612; 2028: 58,525; 2029: 59,437; 2030: 60,350; 2031: 61,262; 2032: 62,175; 2033: 63,087; 2034: 64,000; 2035: 64,912; 2036: 65,825; 2037: 66,737; 2038: 67,650; 2039: 68,562; 2040: 69,475; 2041: 70,387; 2042: 71,300	6.00	Non-Traversable Median	14.00
156	8F	Urban	1799+13.770	1823+66.040	2,452.27	0.4644	2022: 58,850; 2023: 59,862; 2024: 60,875; 2025: 61,887; 2026: 62,900; 2027: 63,912; 2028: 64,925; 2029: 65,937; 2030: 66,950; 2031: 67,962; 2032: 68,975; 2033: 69,987; 2034: 71,000; 2035: 72,012; 2036: 73,025; 2037: 74,037; 2038: 75,050; 2039: 76,062; 2040: 77,075; 2041: 78,087; 2042: 79,100	6.00	Non-Traversable Median	14.00
159	7F	Urban	1823+66.040	1829+76.930	610.89	0.1157	2022: 50,200; 2023: 51,062; 2024: 51,925; 2025: 52,787; 2026: 53,650; 2027: 54,512; 2028: 55,375; 2029: 56,237; 2030: 57,100; 2031: 57,962; 2032: 58,825; 2033: 59,687; 2034: 60,550; 2035: 61,412; 2036: 62,275; 2037: 63,137; 2038: 64,000; 2039: 64,862; 2040: 65,725; 2041: 66,587; 2042: 67,450	6.00	Non-Traversable Median	14.00

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
161	6F	Urban	1829+76.930	1848+64.940	1,888.01	0.3576	2022: 27,550; 2023: 28,022; 2024: 28,495; 2025: 28,967; 2026: 29,440; 2027: 29,912; 2028: 30,385; 2029: 30,857; 2030: 31,330; 2031: 31,802; 2032: 32,275; 2033: 32,747; 2034: 33,220; 2035: 33,692; 2036: 34,165; 2037: 34,637; 2038: 35,110; 2039: 35,582; 2040: 36,055; 2041: 36,527; 2042: 37,000	6.00	Non-Traversable Median	14.00
162	8F	Urban	1848+64.940	1848+81.480	16.54	0.0031	2022: 34,500; 2023: 35,092; 2024: 35,685; 2025: 36,277; 2026: 36,870; 2027: 37,462; 2028: 38,055; 2029: 38,647; 2030: 39,240; 2031: 39,832; 2032: 40,425; 2033: 41,017; 2034: 41,610; 2035: 42,202; 2036: 42,795; 2037: 43,387; 2038: 43,980; 2039: 44,572; 2040: 45,165; 2041: 45,757; 2042: 46,350	6.00	Non-Traversable Median	14.00
163	10F	Urban	1848+81.480	1868+54.350	1,972.87	0.3736	2022: 46,300; 2023: 47,097; 2024: 47,895; 2025: 48,692; 2026: 49,490; 2027: 50,287; 2028: 51,085; 2029: 51,882; 2030: 52,680; 2031: 53,477; 2032: 54,275; 2033: 55,072; 2034: 55,870; 2035: 56,667; 2036: 57,465; 2037: 58,262; 2038: 59,060; 2039: 59,857; 2040: 60,655; 2041: 61,452; 2042: 62,250	6.00	Non-Traversable Median	14.00
164	10F	Urban	1868+54.350	1873+54.400	500.05	0.0947	2022: 48,150; 2023: 48,977; 2024: 49,805; 2025: 50,632; 2026: 51,460; 2027: 52,287; 2028: 53,115; 2029: 53,942; 2030: 54,770; 2031: 55,597; 2032: 56,425; 2033: 57,252; 2034: 58,080; 2035: 58,907; 2036: 59,735; 2037: 60,562; 2038: 61,390; 2039: 62,217; 2040: 63,045; 2041: 63,872; 2042: 64,700	6.00	Non-Traversable Median	14.00
166	10F	Urban	1873+54.400	1905+16.110	3,161.71	0.5988	2022: 51,700; 2023: 52,587; 2024: 53,475; 2025: 54,362; 2026: 55,250; 2027: 56,137; 2028: 57,025; 2029: 57,912; 2030: 58,800; 2031: 59,687; 2032: 60,575; 2033: 61,462; 2034: 62,350; 2035: 63,237; 2036: 64,125; 2037: 65,012; 2038: 65,900; 2039: 66,787; 2040: 67,675; 2041: 68,562; 2042: 69,450	6.00	Non-Traversable Median	14.00
169	8F	Urban	1905+16.110	1999+18.010	9,401.90	1.7807	2022: 18,850; 2023: 19,175; 2024: 19,500; 2025: 19,825; 2026: 20,150; 2027: 20,475; 2028: 20,800; 2029: 21,125; 2030: 21,450; 2031: 21,775; 2032: 22,100; 2033: 22,425; 2034: 22,750; 2035: 23,075; 2036: 23,400; 2037: 23,725; 2038: 24,050; 2039: 24,375; 2040: 24,700; 2041: 25,025; 2042: 25,350	6.00	Non-Traversable Median	14.00
170	8F	Urban	1999+18.010	2001+13.770	195.76	0.0371	2022: 19,800; 2023: 20,140; 2024: 20,480; 2025: 20,820; 2026: 21,160; 2027: 21,500; 2028: 21,840; 2029: 22,180; 2030: 22,520; 2031: 22,860; 2032: 23,200; 2033: 23,540; 2034: 23,880; 2035: 24,220; 2036: 24,560; 2037: 24,900; 2038: 25,240; 2039: 25,580; 2040: 25,920; 2041: 26,260; 2042: 26,600	6.00	Non-Traversable Median	14.00
172	8F	Urban	2001+13.770	2027+95.160	2,681.39	0.5078	2022: 20,400; 2023: 20,750; 2024: 21,100; 2025: 21,450; 2026: 21,800; 2027: 22,150; 2028: 22,500; 2029: 22,850; 2030: 23,200; 2031: 23,550; 2032: 23,900; 2033: 24,250; 2034: 24,600; 2035: 24,950; 2036: 25,300; 2037: 25,650; 2038: 26,000; 2039: 26,350; 2040: 26,700; 2041: 27,050; 2042: 27,400	6.00	Non-Traversable Median	14.00
175	7F	Urban	2027+95.160	2037+89.330	994.17	0.1883	2022: 18,650; 2023: 18,970; 2024: 19,290; 2025: 19,610; 2026: 19,930; 2027: 20,250; 2028: 20,570; 2029: 20,890; 2030: 21,210; 2031: 21,530; 2032: 21,850; 2033: 22,170; 2034: 22,490; 2035: 22,810; 2036: 23,130; 2037: 23,450; 2038: 23,770; 2039: 24,090; 2040: 24,410; 2041: 24,730; 2042: 25,050	6.00	Non-Traversable Median	14.00
176	6F	Urban	2037+89.330	2126+91.660	8,902.33	1.6861	2022: 16,900; 2023: 17,192; 2024: 17,485; 2025: 17,777; 2026: 18,070; 2027: 18,362; 2028: 18,655; 2029: 18,947; 2030: 19,240; 2031: 19,532; 2032: 19,825; 2033: 20,117; 2034: 20,410; 2035: 20,702; 2036: 20,995; 2037: 21,287; 2038: 21,580; 2039: 21,872; 2040: 22,165; 2041: 22,457; 2042: 22,750	6.00	Non-Traversable Median	14.00
177	7F	Urban	2126+91.660	2127+16.900	25.24	0.0048	2022: 18,300; 2023: 18,617; 2024: 18,935; 2025: 19,252; 2026: 19,570; 2027: 19,887; 2028: 20,205; 2029: 20,522; 2030: 20,840; 2031: 21,157; 2032: 21,475; 2033: 21,792; 2034: 22,110; 2035: 22,427; 2036: 22,745; 2037: 23,062; 2038: 23,380; 2039: 23,697; 2040: 24,015; 2041: 24,332; 2042: 24,650	6.00	Non-Traversable Median	14.00
178	8F	Urban	2127+16.900	2163+05.440	3,588.54	0.6796	2022: 19,500; 2023: 19,837; 2024: 20,175; 2025: 20,512; 2026: 20,850; 2027: 21,187; 2028: 21,525; 2029: 21,862; 2030: 22,200; 2031: 22,537; 2032: 22,875; 2033: 23,212; 2034: 23,550; 2035: 23,887; 2036: 24,225; 2037: 24,562; 2038: 24,900; 2039: 25,237; 2040: 25,575; 2041: 25,912; 2042: 26,250	6.00	Non-Traversable Median	14.00
179	7F	Urban	2163+05.440	2163+09.560	4.12	0.0008	2022: 17,750; 2023: 18,057; 2024: 18,365; 2025: 18,672; 2026: 18,980; 2027: 19,287; 2028: 19,595; 2029: 19,902; 2030: 20,210; 2031: 20,517; 2032: 20,825; 2033: 21,132; 2034: 21,440; 2035: 21,747; 2036: 22,055; 2037: 22,362; 2038: 22,670; 2039: 22,977; 2040: 23,285; 2041: 23,592; 2042: 23,900	6.00	Non-Traversable Median	14.00
180	6F	Urban	2163+09.560	2241+33.280	7,823.72	1.4818	2022: 16,000; 2023: 16,277; 2024: 16,555; 2025: 16,832; 2026: 17,110; 2027: 17,387; 2028: 17,665; 2029: 17,942; 2030: 18,220; 2031: 18,497; 2032: 18,775; 2033: 19,052; 2034: 19,330; 2035: 19,607; 2036: 19,885; 2037: 20,162; 2038: 20,440; 2039: 20,717; 2040: 20,995; 2041: 21,272; 2042: 21,550	6.00	Non-Traversable Median	14.00
181	6F	Urban	2241+33.280	2301+70.080	6,036.80	1.1433	2022: 18,650; 2023: 18,970; 2024: 19,290; 2025: 19,610; 2026: 19,930; 2027: 20,250; 2028: 20,570; 2029: 20,890; 2030: 21,210; 2031: 21,530; 2032: 21,850; 2033: 22,170; 2034: 22,490; 2035: 22,810; 2036: 23,130; 2037: 23,450; 2038: 23,770; 2039: 24,090; 2040: 24,410; 2041: 24,730; 2042: 25,050	6.00	Non-Traversable Median	14.00
184	8F	Urban	2301+70.080	2577+64.980	27,594.90	5.2263	2022: 20,250; 2023: 20,597; 2024: 20,945; 2025: 21,292; 2026: 21,640; 2027: 21,987; 2028: 22,335; 2029: 22,682; 2030: 23,030; 2031: 23,377; 2032: 23,725; 2033: 24,072; 2034: 24,420; 2035: 24,767; 2036: 25,115; 2037: 25,462; 2038: 25,810; 2039: 26,157; 2040: 26,505; 2041: 26,852; 2042: 27,200	6.00	Non-Traversable Median	14.00
185	7F	Urban	2577+64.980	2578+84.390	119.41	0.0226	2022: 17,000; 2023: 17,290; 2024: 17,580; 2025: 17,870; 2026: 18,160; 2027: 18,450; 2028: 18,740; 2029: 19,030; 2030: 19,320; 2031: 19,610; 2032: 19,900; 2033: 20,190; 2034: 20,480; 2035: 20,770; 2036: 21,060; 2037: 21,350; 2038: 21,640; 2039: 21,930; 2040: 22,220; 2041: 22,510; 2042: 22,800	6.00	Non-Traversable Median	14.00
186	6F	Urban	2578+84.390	2652+16.980	7,332.59	1.3887	2022: 14,100; 2023: 14,340; 2024: 14,580; 2025: 14,820; 2026: 15,060; 2027: 15,300; 2028: 15,540; 2029: 15,780; 2030: 16,020; 2031: 16,260; 2032: 16,500; 2033: 16,740; 2034: 16,980; 2035: 17,220; 2036: 17,460; 2037: 17,700; 2038: 17,940; 2039: 18,180; 2040: 18,420; 2041: 18,660; 2042: 18,900	6.00	Non-Traversable Median	14.00
187	7F	Urban	2652+16.980	2653+16.980	100.00	0.0189	2022: 14,850; 2023: 15,105; 2024: 15,360; 2025: 15,615; 2026: 15,870; 2027: 16,125; 2028: 16,380; 2029: 16,635; 2030: 16,890; 2031: 17,145; 2032: 17,400; 2033: 17,655; 2034: 17,910; 2035: 18,165; 2036: 18,420; 2037: 18,675; 2038: 18,930; 2039: 19,185; 2040: 19,440; 2041: 19,695; 2042: 19,950	6.00	Non-Traversable Median	14.00
188	8F	Urban	2653+16.980	2905+85.060	25,268.08	4.7856	2022: 15,500; 2023: 15,767; 2024: 16,035; 2025: 16,302; 2026: 16,570; 2027: 16,837; 2028: 17,105; 2029: 17,372; 2030: 17,640; 2031: 17,907; 2032: 18,175; 2033: 18,442; 2034: 18,710; 2035: 18,977; 2036: 19,245; 2037: 19,512; 2038: 19,780; 2039: 20,047; 2040: 20,315; 2041: 20,582; 2042: 20,850	6.00	Non-Traversable Median	14.00

Seg. No.	Type	Area Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
189	7F	Urban	2905+85.060	2919+19.840	1,334.78	0.2528	2022: 14,900; 2023: 15,157; 2024: 15,415; 2025: 15,672; 2026: 15,930; 2027: 16,187; 2028: 16,445; 2029: 16,702; 2030: 16,960; 2031: 17,217; 2032: 17,475; 2033: 17,732; 2034: 17,990; 2035: 18,247; 2036: 18,505; 2037: 18,762; 2038: 19,020; 2039: 19,277; 2040: 19,535; 2041: 19,792; 2042: 20,050	6.00	Non-Traversable Median	14.00
190	6F	Urban	2919+19.840	2954+65.120	3,545.28	0.6714	2022: 14,450; 2023: 14,700; 2024: 14,950; 2025: 15,200; 2026: 15,450; 2027: 15,700; 2028: 15,950; 2029: 16,200; 2030: 16,450; 2031: 16,700; 2032: 16,950; 2033: 17,200; 2034: 17,450; 2035: 17,700; 2036: 17,950; 2037: 18,200; 2038: 18,450; 2039: 18,700; 2040: 18,950; 2041: 19,200; 2042: 19,450	6.00	Non-Traversable Median	14.00
191	6F	Urban	2954+65.120	2956+02.250	137.13	0.0260	2022: 14,850; 2023: 15,105; 2024: 15,360; 2025: 15,615; 2026: 15,870; 2027: 16,125; 2028: 16,380; 2029: 16,635; 2030: 16,890; 2031: 17,145; 2032: 17,400; 2033: 17,655; 2034: 17,910; 2035: 18,165; 2036: 18,420; 2037: 18,675; 2038: 18,930; 2039: 19,185; 2040: 19,440; 2041: 19,695; 2042: 19,950	6.00	Non-Traversable Median	14.00
193	6F	Urban	2956+02.250	2983+64.940	2,762.69	0.5232	2022: 15,250; 2023: 15,510; 2024: 15,770; 2025: 16,030; 2026: 16,290; 2027: 16,550; 2028: 16,810; 2029: 17,070; 2030: 17,330; 2031: 17,590; 2032: 17,850; 2033: 18,110; 2034: 18,370; 2035: 18,630; 2036: 18,890; 2037: 19,150; 2038: 19,410; 2039: 19,670; 2040: 19,930; 2041: 20,190; 2042: 20,450	6.00	Non-Traversable Median	14.00
196	4F	Urban	2983+64.940	3044+67.123	6,102.18	1.1557	2022: 15,250; 2023: 15,510; 2024: 15,770; 2025: 16,030; 2026: 16,290; 2027: 16,550; 2028: 16,810; 2029: 17,070; 2030: 17,330; 2031: 17,590; 2032: 17,850; 2033: 18,110; 2034: 18,370; 2035: 18,630; 2036: 18,890; 2037: 19,150; 2038: 19,410; 2039: 19,670; 2040: 19,930; 2041: 20,190; 2042: 20,450	6.00	Non-Traversable Median	14.00

Table 2. Evaluation Freeway - Speed Change Lanes (Speed Change)

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
2	6SC	Entrance	10+00.000	10+06.360	6.36	0.0012	2022: 28,450; 2023: 28,937; 2024: 29,425; 2025: 29,912; 2026: 30,400; 2027: 30,887; 2028: 31,375; 2029: 31,862; 2030: 32,350; 2031: 32,837; 2032: 33,325; 2033: 33,812; 2034: 34,300; 2035: 34,787; 2036: 35,275; 2037: 35,762; 2038: 36,250; 2039: 36,737; 2040: 37,225; 2041: 37,712; 2042: 38,200	6.00	Non-Traversable Median	14.00
5	6SC	Entrance	24+08.860	24+17.550	8.69	0.0016	2022: 23,750; 2023: 24,157; 2024: 24,565; 2025: 24,972; 2026: 25,380; 2027: 25,787; 2028: 26,195; 2029: 26,602; 2030: 27,010; 2031: 27,417; 2032: 27,825; 2033: 28,232; 2034: 28,640; 2035: 29,047; 2036: 29,455; 2037: 29,862; 2038: 30,270; 2039: 30,677; 2040: 31,085; 2041: 31,492; 2042: 31,900	6.00	Non-Traversable Median	14.00
7	6SC	Entrance	24+17.550	31+58.860	741.31	0.1404	2022: 23,400; 2023: 23,802; 2024: 24,205; 2025: 24,607; 2026: 25,010; 2027: 25,412; 2028: 25,815; 2029: 26,217; 2030: 26,620; 2031: 27,022; 2032: 27,425; 2033: 27,827; 2034: 28,230; 2035: 28,632; 2036: 29,035; 2037: 29,437; 2038: 29,840; 2039: 30,242; 2040: 30,645; 2041: 31,047; 2042: 31,450	6.00	Non-Traversable Median	14.00
21	6SC	Entrance	320+43.950	327+93.950	750.00	0.1421	2022: 27,800; 2023: 28,280; 2024: 28,760; 2025: 29,240; 2026: 29,720; 2027: 30,200; 2028: 30,680; 2029: 31,160; 2030: 31,640; 2031: 32,120; 2032: 32,600; 2033: 33,080; 2034: 33,560; 2035: 34,040; 2036: 34,520; 2037: 35,000; 2038: 35,480; 2039: 35,960; 2040: 36,440; 2041: 36,920; 2042: 37,400	6.00	Non-Traversable Median	14.00
23	6SC	Exit	333+03.670	340+53.670	750.00	0.1421	2022: 30,050; 2023: 30,567; 2024: 31,085; 2025: 31,602; 2026: 32,120; 2027: 32,637; 2028: 33,155; 2029: 33,672; 2030: 34,190; 2031: 34,707; 2032: 35,225; 2033: 35,742; 2034: 36,260; 2035: 36,777; 2036: 37,295; 2037: 37,812; 2038: 38,330; 2039: 38,847; 2040: 39,365; 2041: 39,882; 2042: 40,400	6.00	Non-Traversable Median	14.00
35	7SC	Entrance	487+68.410	494+75.370	706.96	0.1339	2022: 49,600; 2023: 50,452; 2024: 51,305; 2025: 52,157; 2026: 53,010; 2027: 53,862; 2028: 54,715; 2029: 55,567; 2030: 56,420; 2031: 57,272; 2032: 58,125; 2033: 58,977; 2034: 59,830; 2035: 60,682; 2036: 61,535; 2037: 62,387; 2038: 63,240; 2039: 64,092; 2040: 64,945; 2041: 65,797; 2042: 66,650	6.00	Non-Traversable Median	14.00
37	8SC	Entrance	494+75.370	495+18.410	43.04	0.0081	2022: 54,700; 2023: 55,640; 2024: 56,580; 2025: 57,520; 2026: 58,460; 2027: 59,400; 2028: 60,340; 2029: 61,280; 2030: 62,220; 2031: 63,160; 2032: 64,100; 2033: 65,040; 2034: 65,980; 2035: 66,920; 2036: 67,860; 2037: 68,800; 2038: 69,740; 2039: 70,680; 2040: 71,620; 2041: 72,560; 2042: 73,500	6.00	Non-Traversable Median	14.00
41	6SC	Entrance	585+36.090	590+45.470	509.38	0.0965	2022: 51,550; 2023: 52,435; 2024: 53,320; 2025: 54,205; 2026: 55,090; 2027: 55,975; 2028: 56,860; 2029: 57,745; 2030: 58,630; 2031: 59,515; 2032: 60,400; 2033: 61,285; 2034: 62,170; 2035: 63,055; 2036: 63,940; 2037: 64,825; 2038: 65,710; 2039: 66,595; 2040: 67,480; 2041: 68,365; 2042: 69,250	6.00	Non-Traversable Median	14.00
43	7SC	Entrance	590+45.470	592+86.090	240.62	0.0456	2022: 61,450; 2023: 62,507; 2024: 63,565; 2025: 64,622; 2026: 65,680; 2027: 66,737; 2028: 67,795; 2029: 68,852; 2030: 69,910; 2031: 70,967; 2032: 72,025; 2033: 73,082; 2034: 74,140; 2035: 75,197; 2036: 76,255; 2037: 77,312; 2038: 78,370; 2039: 79,427; 2040: 80,485; 2041: 81,542; 2042: 82,600	6.00	Non-Traversable Median	14.00
45	7SC	Exit	624+72.020	628+07.980	335.96	0.0636	2022: 73,050; 2023: 74,305; 2024: 75,560; 2025: 76,815; 2026: 78,070; 2027: 79,325; 2028: 80,580; 2029: 81,835; 2030: 83,090; 2031: 84,345; 2032: 85,600; 2033: 86,855; 2034: 88,110; 2035: 89,365; 2036: 90,620; 2037: 91,875; 2038: 93,130; 2039: 94,385; 2040: 95,640; 2041: 96,895; 2042: 98,150	6.00	Non-Traversable Median	14.00
47	8SC	Exit	628+07.980	632+22.020	414.04	0.0784	2022: 82,100; 2023: 83,510; 2024: 84,920; 2025: 86,330; 2026: 87,740; 2027: 89,150; 2028: 90,560; 2029: 91,970; 2030: 93,380; 2031: 94,790; 2032: 96,200; 2033: 97,610; 2034: 99,020; 2035: 100,430; 2036: 101,840; 2037: 103,250; 2038: 104,660; 2039: 106,070; 2040: 107,480; 2041: 108,890; 2042: 110,300	6.00	Non-Traversable Median	14.00
48	8SC	Entrance	628+07.980	635+57.980	750.00	0.1421	2022: 82,100; 2023: 83,510; 2024: 84,920; 2025: 86,330; 2026: 87,740; 2027: 89,150; 2028: 90,560; 2029: 91,970; 2030: 93,380; 2031: 94,790; 2032: 96,200; 2033: 97,610; 2034: 99,020; 2035: 100,430; 2036: 101,840; 2037: 103,250; 2038: 104,660; 2039: 106,070; 2040: 107,480; 2041: 108,890; 2042: 110,300	6.00	Non-Traversable Median	14.00
53	7SC	Exit	761+78.560	769+28.560	750.00	0.1421	2022: 73,000; 2023: 74,255; 2024: 75,510; 2025: 76,765; 2026: 78,020; 2027: 79,275; 2028: 80,530; 2029: 81,785; 2030: 83,040; 2031: 84,295; 2032: 85,550; 2033: 86,805; 2034: 88,060; 2035: 89,315; 2036: 90,570; 2037: 91,825; 2038: 93,080; 2039: 94,335; 2040: 95,590; 2041: 96,845; 2042: 98,100	6.00	Non-Traversable Median	14.00
55	9SC	Entrance	799+92.600	806+52.740	660.14	0.1250	2022: 99,850; 2023: 101,567; 2024: 103,285; 2025: 105,002; 2026: 106,720; 2027: 108,437; 2028: 110,155; 2029: 111,872; 2030: 113,590; 2031: 115,307; 2032: 117,025; 2033: 118,742; 2034: 120,460; 2035: 122,177; 2036: 123,895; 2037: 125,612; 2038: 127,330; 2039: 129,047; 2040: 130,765; 2041: 132,482; 2042: 134,200	6.00	Non-Traversable Median	14.00
57	9SC	Entrance	806+52.740	807+42.600	89.86	0.0170	2022: 97,300; 2023: 98,975; 2024: 100,650; 2025: 102,325; 2026: 104,000; 2027: 105,675; 2028: 107,350; 2029: 109,025; 2030: 110,700; 2031: 112,375; 2032: 114,050; 2033: 115,725; 2034: 117,400; 2035: 119,075; 2036: 120,750; 2037: 122,425; 2038: 124,100; 2039: 125,775; 2040: 127,450; 2041: 129,125; 2042: 130,800	6.00	Non-Traversable Median	14.00
63	10SC	Entrance	913+67.280	921+17.280	750.00	0.1421	2022: 116,450; 2023: 118,452; 2024: 120,455; 2025: 122,457; 2026: 124,460; 2027: 126,462; 2028: 128,465; 2029: 130,467; 2030: 132,470; 2031: 134,472; 2032: 136,475; 2033: 138,477; 2034: 140,480; 2035: 142,482; 2036: 144,485; 2037: 146,487; 2038: 148,490; 2039: 150,492; 2040: 152,495; 2041: 154,497; 2042: 156,500	6.00	Non-Traversable Median	14.00
65	9SC	Exit	939+38.890	946+88.890	750.00	0.1421	2022: 105,950; 2023: 107,770; 2024: 109,590; 2025: 111,410; 2026: 113,230; 2027: 115,050; 2028: 116,870; 2029: 118,690; 2030: 120,510; 2031: 122,330; 2032: 124,150; 2033: 125,970; 2034: 127,790; 2035: 129,610; 2036: 131,430; 2037: 133,250; 2038: 135,070; 2039: 136,890; 2040: 138,710; 2041: 140,530; 2042: 142,350	6.00	Non-Traversable Median	14.00
68	9SC	Exit	983+35.310	986+82.810	347.50	0.0658	2022: 111,200; 2023: 113,115; 2024: 115,030; 2025: 116,945; 2026: 118,860; 2027: 120,775; 2028: 122,690; 2029: 124,605; 2030: 126,520; 2031: 128,435; 2032: 130,350; 2033: 132,265; 2034: 134,180; 2035: 136,095; 2036: 138,010; 2037: 139,925; 2038: 141,840; 2039: 143,755; 2040: 145,670; 2041: 147,585; 2042: 149,500	6.00	Non-Traversable Median	14.00
70	8SC	Exit	986+82.810	990+85.310	402.50	0.0762	2022: 100,800; 2023: 102,535; 2024: 104,270; 2025: 106,005; 2026: 107,740; 2027: 109,475; 2028: 111,210; 2029: 112,945; 2030: 114,680; 2031: 116,415; 2032: 118,150; 2033: 119,885; 2034: 121,620; 2035: 123,355; 2036: 125,090; 2037: 126,825; 2038: 128,560; 2039: 130,295; 2040: 132,030; 2041: 133,765; 2042: 135,500	6.00	Non-Traversable Median	14.00

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
72	8SC	Entrance	1021+08.260	1028+58.260	750.00	0.1421	2022: 111,500; 2023: 113,420; 2024: 115,340; 2025: 117,260; 2026: 119,180; 2027: 121,100; 2028: 123,020; 2029: 124,940; 2030: 126,860; 2031: 128,780; 2032: 130,700; 2033: 132,620; 2034: 134,540; 2035: 136,460; 2036: 138,380; 2037: 140,300; 2038: 142,220; 2039: 144,140; 2040: 146,060; 2041: 147,980; 2042: 149,900	6.00	Non-Traversable Median	14.00
73	8SC	Exit	1046+44.350	1053+94.350	750.00	0.1421	2022: 111,500; 2023: 113,420; 2024: 115,340; 2025: 117,260; 2026: 119,180; 2027: 121,100; 2028: 123,020; 2029: 124,940; 2030: 126,860; 2031: 128,780; 2032: 130,700; 2033: 132,620; 2034: 134,540; 2035: 136,460; 2036: 138,380; 2037: 140,300; 2038: 142,220; 2039: 144,140; 2040: 146,060; 2041: 147,980; 2042: 149,900	6.00	Non-Traversable Median	14.00
74	8SC	Entrance	1050+71.360	1053+94.350	322.99	0.0612	2022: 111,500; 2023: 113,420; 2024: 115,340; 2025: 117,260; 2026: 119,180; 2027: 121,100; 2028: 123,020; 2029: 124,940; 2030: 126,860; 2031: 128,780; 2032: 130,700; 2033: 132,620; 2034: 134,540; 2035: 136,460; 2036: 138,380; 2037: 140,300; 2038: 142,220; 2039: 144,140; 2040: 146,060; 2041: 147,980; 2042: 149,900	6.00	Non-Traversable Median	14.00
76	8SC	Entrance	1053+94.350	1058+21.360	427.01	0.0809	2022: 103,500; 2023: 105,280; 2024: 107,060; 2025: 108,840; 2026: 110,620; 2027: 112,400; 2028: 114,180; 2029: 115,960; 2030: 117,740; 2031: 119,520; 2032: 121,300; 2033: 123,080; 2034: 124,860; 2035: 126,640; 2036: 128,420; 2037: 130,200; 2038: 131,980; 2039: 133,760; 2040: 135,540; 2041: 137,320; 2042: 139,100	6.00	Non-Traversable Median	14.00
79	9SC	Entrance	1075+52.580	1079+97.540	444.96	0.0843	2022: 122,700; 2023: 124,810; 2024: 126,920; 2025: 129,030; 2026: 131,140; 2027: 133,250; 2028: 135,360; 2029: 137,470; 2030: 139,580; 2031: 141,690; 2032: 143,800; 2033: 145,910; 2034: 148,020; 2035: 150,130; 2036: 152,240; 2037: 154,350; 2038: 156,460; 2039: 158,570; 2040: 160,680; 2041: 162,790; 2042: 164,900	6.00	Non-Traversable Median	14.00
81	10SC	Entrance	1079+97.540	1083+02.580	305.04	0.0578	2022: 146,650; 2023: 149,172; 2024: 151,695; 2025: 154,217; 2026: 156,740; 2027: 159,262; 2028: 161,785; 2029: 164,307; 2030: 166,830; 2031: 169,352; 2032: 171,875; 2033: 174,397; 2034: 176,920; 2035: 179,442; 2036: 181,965; 2037: 184,487; 2038: 187,010; 2039: 189,532; 2040: 192,055; 2041: 194,577; 2042: 197,100	6.00	Non-Traversable Median	14.00
82	10SC	Entrance	1110+97.190	1116+60.530	563.34	0.1067	2022: 146,650; 2023: 149,172; 2024: 151,695; 2025: 154,217; 2026: 156,740; 2027: 159,262; 2028: 161,785; 2029: 164,307; 2030: 166,830; 2031: 169,352; 2032: 171,875; 2033: 174,397; 2034: 176,920; 2035: 179,442; 2036: 181,965; 2037: 184,487; 2038: 187,010; 2039: 189,532; 2040: 192,055; 2041: 194,577; 2042: 197,100	6.00	Non-Traversable Median	14.00
84	6SC	Entrance	1116+60.530	1118+47.190	186.66	0.0353	2022: 156,550; 2023: 159,242; 2024: 161,935; 2025: 164,627; 2026: 167,320; 2027: 170,012; 2028: 172,705; 2029: 175,397; 2030: 178,090; 2031: 180,782; 2032: 183,475; 2033: 186,167; 2034: 188,860; 2035: 191,552; 2036: 194,245; 2037: 196,937; 2038: 199,630; 2039: 202,322; 2040: 205,015; 2041: 207,707; 2042: 210,400	6.00	Non-Traversable Median	14.00
85	6SC	Entrance	1116+60.530	1118+47.190	186.66	0.0353	2022: 156,550; 2023: 159,242; 2024: 161,935; 2025: 164,627; 2026: 167,320; 2027: 170,012; 2028: 172,705; 2029: 175,397; 2030: 178,090; 2031: 180,782; 2032: 183,475; 2033: 186,167; 2034: 188,860; 2035: 191,552; 2036: 194,245; 2037: 196,937; 2038: 199,630; 2039: 202,322; 2040: 205,015; 2041: 207,707; 2042: 210,400	6.00	Non-Traversable Median	14.00
87	10SC	Entrance	1118+47.190	1124+10.530	563.34	0.1067	2022: 150,000; 2023: 152,580; 2024: 155,160; 2025: 157,740; 2026: 160,320; 2027: 162,900; 2028: 165,480; 2029: 168,060; 2030: 170,640; 2031: 173,220; 2032: 175,800; 2033: 178,380; 2034: 180,960; 2035: 183,540; 2036: 186,120; 2037: 188,700; 2038: 191,280; 2039: 193,860; 2040: 196,440; 2041: 199,020; 2042: 201,600	6.00	Non-Traversable Median	14.00
89	10SC	Exit	1139+16.750	1146+66.750	750.00	0.1421	2022: 159,800; 2023: 162,550; 2024: 165,300; 2025: 168,050; 2026: 170,800; 2027: 173,550; 2028: 176,300; 2029: 179,050; 2030: 181,800; 2031: 184,550; 2032: 187,300; 2033: 190,050; 2034: 192,800; 2035: 195,550; 2036: 198,300; 2037: 201,050; 2038: 203,800; 2039: 206,550; 2040: 209,300; 2041: 212,050; 2042: 214,800	6.00	Non-Traversable Median	14.00
90	10SC	Exit	1141+58.590	1149+08.590	750.00	0.1421	2022: 159,800; 2023: 162,550; 2024: 165,300; 2025: 168,050; 2026: 170,800; 2027: 173,550; 2028: 176,300; 2029: 179,050; 2030: 181,800; 2031: 184,550; 2032: 187,300; 2033: 190,050; 2034: 192,800; 2035: 195,550; 2036: 198,300; 2037: 201,050; 2038: 203,800; 2039: 206,550; 2040: 209,300; 2041: 212,050; 2042: 214,800	6.00	Non-Traversable Median	14.00
96	7SC	Exit	1221+70.230	1229+20.230	750.00	0.1421	2022: 96,100; 2023: 97,755; 2024: 99,410; 2025: 101,065; 2026: 102,720; 2027: 104,375; 2028: 106,030; 2029: 107,685; 2030: 109,340; 2031: 110,995; 2032: 112,650; 2033: 114,305; 2034: 115,960; 2035: 117,615; 2036: 119,270; 2037: 120,925; 2038: 122,580; 2039: 124,235; 2040: 125,890; 2041: 127,545; 2042: 129,200	6.00	Non-Traversable Median	14.00
98	7SC	Entrance	1239+04.550	1246+54.550	750.00	0.1421	2022: 89,150; 2023: 90,685; 2024: 92,220; 2025: 93,755; 2026: 95,290; 2027: 96,825; 2028: 98,360; 2029: 99,895; 2030: 101,430; 2031: 102,965; 2032: 104,500; 2033: 106,035; 2034: 107,570; 2035: 109,105; 2036: 110,640; 2037: 112,175; 2038: 113,710; 2039: 115,245; 2040: 116,780; 2041: 118,315; 2042: 119,850	6.00	Non-Traversable Median	14.00
103	10SC	Entrance	1281+75.860	1289+25.860	750.00	0.1421	2022: 143,350; 2023: 145,817; 2024: 148,285; 2025: 150,752; 2026: 153,220; 2027: 155,687; 2028: 158,155; 2029: 160,622; 2030: 163,090; 2031: 165,557; 2032: 168,025; 2033: 170,492; 2034: 172,960; 2035: 175,427; 2036: 177,895; 2037: 180,362; 2038: 182,830; 2039: 185,297; 2040: 187,765; 2041: 190,232; 2042: 192,700	6.00	Non-Traversable Median	14.00
104	10SC	Exit	1308+43.800	1315+93.800	750.00	0.1421	2022: 143,350; 2023: 145,817; 2024: 148,285; 2025: 150,752; 2026: 153,220; 2027: 155,687; 2028: 158,155; 2029: 160,622; 2030: 163,090; 2031: 165,557; 2032: 168,025; 2033: 170,492; 2034: 172,960; 2035: 175,427; 2036: 177,895; 2037: 180,362; 2038: 182,830; 2039: 185,297; 2040: 187,765; 2041: 190,232; 2042: 192,700	6.00	Non-Traversable Median	14.00
105	10SC	Entrance	1310+99.560	1315+93.800	494.24	0.0936	2022: 143,350; 2023: 145,817; 2024: 148,285; 2025: 150,752; 2026: 153,220; 2027: 155,687; 2028: 158,155; 2029: 160,622; 2030: 163,090; 2031: 165,557; 2032: 168,025; 2033: 170,492; 2034: 172,960; 2035: 175,427; 2036: 177,895; 2037: 180,362; 2038: 182,830; 2039: 185,297; 2040: 187,765; 2041: 190,232; 2042: 192,700	6.00	Non-Traversable Median	14.00
107	10SC	Entrance	1315+93.800	1318+49.560	255.76	0.0484	2022: 134,300; 2023: 136,612; 2024: 138,925; 2025: 141,237; 2026: 143,550; 2027: 145,862; 2028: 148,175; 2029: 150,487; 2030: 152,800; 2031: 155,112; 2032: 157,425; 2033: 159,737; 2034: 162,050; 2035: 164,362; 2036: 166,675; 2037: 168,987; 2038: 171,300; 2039: 173,612; 2040: 175,925; 2041: 178,237; 2042: 180,550	6.00	Non-Traversable Median	14.00
110	10SC	Exit	1352+31.030	1355+24.530	293.50	0.0556	2022: 133,900; 2023: 136,205; 2024: 138,510; 2025: 140,815; 2026: 143,120; 2027: 145,425; 2028: 147,730; 2029: 150,035; 2030: 152,340; 2031: 154,645; 2032: 156,950; 2033: 159,255; 2034: 161,560; 2035: 163,865; 2036: 166,170; 2037: 168,475; 2038: 170,780; 2039: 173,085; 2040: 175,390; 2041: 177,695; 2042: 180,000	6.00	Non-Traversable Median	14.00
112	10SC	Exit	1355+24.530	1359+81.030	456.50	0.0865	2022: 144,300; 2023: 146,782; 2024: 149,265; 2025: 151,747; 2026: 154,230; 2027: 156,712; 2028: 159,195; 2029: 161,677; 2030: 164,160; 2031: 166,642; 2032: 169,125; 2033: 171,607; 2034: 174,090; 2035: 176,572; 2036: 179,055; 2037: 181,537; 2038: 184,020; 2039: 186,502; 2040: 188,985; 2041: 191,467; 2042: 193,950	6.00	Non-Traversable Median	14.00

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
113	10SC	Entrance	1355+24.530	1362+74.530	750.00	0.1421	2022: 144,300; 2023: 146,782; 2024: 149,265; 2025: 151,747; 2026: 154,230; 2027: 156,712; 2028: 159,195; 2029: 161,677; 2030: 164,160; 2031: 166,642; 2032: 169,125; 2033: 171,607; 2034: 174,090; 2035: 176,572; 2036: 179,055; 2037: 181,537; 2038: 184,020; 2039: 186,502; 2040: 188,985; 2041: 191,467; 2042: 193,950	6.00	Non-Traversable Median	14.00
118	9SC	Entrance	1407+99.290	1415+49.290	750.00	0.1421	2022: 99,800; 2023: 101,517; 2024: 103,235; 2025: 104,952; 2026: 106,670; 2027: 108,387; 2028: 110,105; 2029: 111,822; 2030: 113,540; 2031: 115,257; 2032: 116,975; 2033: 118,692; 2034: 120,410; 2035: 122,127; 2036: 123,845; 2037: 125,562; 2038: 127,280; 2039: 128,997; 2040: 130,715; 2041: 132,432; 2042: 134,150	6.00	Non-Traversable Median	14.00
120	9SC	Exit	1458+80.350	1459+28.940	48.59	0.0092	2022: 108,950; 2023: 110,822; 2024: 112,695; 2025: 114,567; 2026: 116,440; 2027: 118,312; 2028: 120,185; 2029: 122,057; 2030: 123,930; 2031: 125,802; 2032: 127,675; 2033: 129,547; 2034: 131,420; 2035: 133,292; 2036: 135,165; 2037: 137,037; 2038: 138,910; 2039: 140,782; 2040: 142,655; 2041: 144,527; 2042: 146,400	6.00	Non-Traversable Median	14.00
122	9SC	Exit	1459+28.940	1466+30.350	701.41	0.1328	2022: 115,700; 2023: 117,690; 2024: 119,680; 2025: 121,670; 2026: 123,660; 2027: 125,650; 2028: 127,640; 2029: 129,630; 2030: 131,620; 2031: 133,610; 2032: 135,600; 2033: 137,590; 2034: 139,580; 2035: 141,570; 2036: 143,560; 2037: 145,550; 2038: 147,540; 2039: 149,530; 2040: 151,520; 2041: 153,510; 2042: 155,500	6.00	Non-Traversable Median	14.00
123	9SC	Entrance	1459+28.940	1466+78.940	750.00	0.1421	2022: 115,700; 2023: 117,690; 2024: 119,680; 2025: 121,670; 2026: 123,660; 2027: 125,650; 2028: 127,640; 2029: 129,630; 2030: 131,620; 2031: 133,610; 2032: 135,600; 2033: 137,590; 2034: 139,580; 2035: 141,570; 2036: 143,560; 2037: 145,550; 2038: 147,540; 2039: 149,530; 2040: 151,520; 2041: 153,510; 2042: 155,500	6.00	Non-Traversable Median	14.00
126	10SC	Exit	1493+46.760	1500+96.760	750.00	0.1421	2022: 122,550; 2023: 124,660; 2024: 126,770; 2025: 128,880; 2026: 130,990; 2027: 133,100; 2028: 135,210; 2029: 137,320; 2030: 139,430; 2031: 141,540; 2032: 143,650; 2033: 145,760; 2034: 147,870; 2035: 149,980; 2036: 152,090; 2037: 154,200; 2038: 156,310; 2039: 158,420; 2040: 160,530; 2041: 162,640; 2042: 164,750	6.00	Non-Traversable Median	14.00
127	10SC	Exit	1508+73.110	1516+23.110	750.00	0.1421	2022: 122,550; 2023: 124,660; 2024: 126,770; 2025: 128,880; 2026: 130,990; 2027: 133,100; 2028: 135,210; 2029: 137,320; 2030: 139,430; 2031: 141,540; 2032: 143,650; 2033: 145,760; 2034: 147,870; 2035: 149,980; 2036: 152,090; 2037: 154,200; 2038: 156,310; 2039: 158,420; 2040: 160,530; 2041: 162,640; 2042: 164,750	6.00	Non-Traversable Median	14.00
130	9SC	Entrance	1542+57.160	1548+51.750	594.59	0.1126	2022: 103,100; 2023: 104,875; 2024: 106,650; 2025: 108,425; 2026: 110,200; 2027: 111,975; 2028: 113,750; 2029: 115,525; 2030: 117,300; 2031: 119,075; 2032: 120,850; 2033: 122,625; 2034: 124,400; 2035: 126,175; 2036: 127,950; 2037: 129,725; 2038: 131,500; 2039: 133,275; 2040: 135,050; 2041: 136,825; 2042: 138,600	6.00	Non-Traversable Median	14.00
132	8SC	Entrance	1548+51.750	1550+07.160	155.41	0.0294	2022: 95,550; 2023: 97,195; 2024: 98,840; 2025: 100,485; 2026: 102,130; 2027: 103,775; 2028: 105,420; 2029: 107,065; 2030: 108,710; 2031: 110,355; 2032: 112,000; 2033: 113,645; 2034: 115,290; 2035: 116,935; 2036: 118,580; 2037: 120,225; 2038: 121,870; 2039: 123,515; 2040: 125,160; 2041: 126,805; 2042: 128,450	6.00	Non-Traversable Median	14.00
136	9SC	Exit	1569+20.770	1576+70.770	750.00	0.1421	2022: 108,000; 2023: 109,860; 2024: 111,720; 2025: 113,580; 2026: 115,440; 2027: 117,300; 2028: 119,160; 2029: 121,020; 2030: 122,880; 2031: 124,740; 2032: 126,600; 2033: 128,460; 2034: 130,320; 2035: 132,180; 2036: 134,040; 2037: 135,900; 2038: 137,760; 2039: 139,620; 2040: 141,480; 2041: 143,340; 2042: 145,200	6.00	Non-Traversable Median	14.00
137	9SC	Exit	1589+73.110	1597+23.110	750.00	0.1421	2022: 108,000; 2023: 109,860; 2024: 111,720; 2025: 113,580; 2026: 115,440; 2027: 117,300; 2028: 119,160; 2029: 121,020; 2030: 122,880; 2031: 124,740; 2032: 126,600; 2033: 128,460; 2034: 130,320; 2035: 132,180; 2036: 134,040; 2037: 135,900; 2038: 137,760; 2039: 139,620; 2040: 141,480; 2041: 143,340; 2042: 145,200	6.00	Non-Traversable Median	14.00
138	9SC	Entrance	1592+57.160	1597+23.110	465.95	0.0882	2022: 108,000; 2023: 109,860; 2024: 111,720; 2025: 113,580; 2026: 115,440; 2027: 117,300; 2028: 119,160; 2029: 121,020; 2030: 122,880; 2031: 124,740; 2032: 126,600; 2033: 128,460; 2034: 130,320; 2035: 132,180; 2036: 134,040; 2037: 135,900; 2038: 137,760; 2039: 139,620; 2040: 141,480; 2041: 143,340; 2042: 145,200	6.00	Non-Traversable Median	14.00
140	9SC	Entrance	1597+23.110	1600+07.160	284.05	0.0538	2022: 94,700; 2023: 96,330; 2024: 97,960; 2025: 99,590; 2026: 101,220; 2027: 102,850; 2028: 104,480; 2029: 106,110; 2030: 107,740; 2031: 109,370; 2032: 111,000; 2033: 112,630; 2034: 114,260; 2035: 115,890; 2036: 117,520; 2037: 119,150; 2038: 120,780; 2039: 122,410; 2040: 124,040; 2041: 125,670; 2042: 127,300	6.00	Non-Traversable Median	14.00
142	9SC	Entrance	1614+63.430	1622+13.430	750.00	0.1421	2022: 84,550; 2023: 86,002; 2024: 87,455; 2025: 88,907; 2026: 90,360; 2027: 91,812; 2028: 93,265; 2029: 94,717; 2030: 96,170; 2031: 97,622; 2032: 99,075; 2033: 100,527; 2034: 101,980; 2035: 103,432; 2036: 104,885; 2037: 106,337; 2038: 107,790; 2039: 109,242; 2040: 110,695; 2041: 112,147; 2042: 113,600	6.00	Non-Traversable Median	14.00
146	7SC	Entrance	1693+03.680	1695+79.250	275.57	0.0522	2022: 57,350; 2023: 58,337; 2024: 59,325; 2025: 60,312; 2026: 61,300; 2027: 62,287; 2028: 63,275; 2029: 64,262; 2030: 65,250; 2031: 66,237; 2032: 67,225; 2033: 68,212; 2034: 69,200; 2035: 70,187; 2036: 71,175; 2037: 72,162; 2038: 73,150; 2039: 74,137; 2040: 75,125; 2041: 76,112; 2042: 77,100	6.00	Non-Traversable Median	14.00
148	8SC	Entrance	1695+79.250	1700+53.680	474.43	0.0898	2022: 70,400; 2023: 71,612; 2024: 72,825; 2025: 74,037; 2026: 75,250; 2027: 76,462; 2028: 77,675; 2029: 78,887; 2030: 80,100; 2031: 81,312; 2032: 82,525; 2033: 83,737; 2034: 84,950; 2035: 86,162; 2036: 87,375; 2037: 88,587; 2038: 89,800; 2039: 91,012; 2040: 92,225; 2041: 93,437; 2042: 94,650	6.00	Non-Traversable Median	14.00
150	7SC	Entrance	1760+10.210	1765+64.940	554.73	0.1051	2022: 63,350; 2023: 64,440; 2024: 65,530; 2025: 66,620; 2026: 67,710; 2027: 68,800; 2028: 69,890; 2029: 70,980; 2030: 72,070; 2031: 73,160; 2032: 74,250; 2033: 75,340; 2034: 76,430; 2035: 77,520; 2036: 78,610; 2037: 79,700; 2038: 80,790; 2039: 81,880; 2040: 82,970; 2041: 84,060; 2042: 85,150	6.00	Non-Traversable Median	14.00
152	8SC	Entrance	1765+64.940	1767+60.210	195.27	0.0370	2022: 63,350; 2023: 64,440; 2024: 65,530; 2025: 66,620; 2026: 67,710; 2027: 68,800; 2028: 69,890; 2029: 70,980; 2030: 72,070; 2031: 73,160; 2032: 74,250; 2033: 75,340; 2034: 76,430; 2035: 77,520; 2036: 78,610; 2037: 79,700; 2038: 80,790; 2039: 81,880; 2040: 82,970; 2041: 84,060; 2042: 85,150	6.00	Non-Traversable Median	14.00
155	8SC	Entrance	1781+96.430	1789+46.430	750.00	0.1421	2022: 53,050; 2023: 53,962; 2024: 54,875; 2025: 55,787; 2026: 56,700; 2027: 57,612; 2028: 58,525; 2029: 59,437; 2030: 60,350; 2031: 61,262; 2032: 62,175; 2033: 63,087; 2034: 64,000; 2035: 64,912; 2036: 65,825; 2037: 66,737; 2038: 67,650; 2039: 68,562; 2040: 69,475; 2041: 70,387; 2042: 71,300	6.00	Non-Traversable Median	14.00
157	8SC	Exit	1799+13.770	1806+63.770	750.00	0.1421	2022: 58,850; 2023: 59,862; 2024: 60,875; 2025: 61,887; 2026: 62,900; 2027: 63,912; 2028: 64,925; 2029: 65,937; 2030: 66,950; 2031: 67,962; 2032: 68,975; 2033: 69,987; 2034: 71,000; 2035: 72,012; 2036: 73,025; 2037: 74,037; 2038: 75,050; 2039: 76,062; 2040: 77,075; 2041: 78,087; 2042: 79,100	6.00	Non-Traversable Median	14.00

Seg. No.	Type	Ramp Type	Start Location (Sta. ft)	End Location (Sta. ft)	Length (ft)	Length(mi)	AADT	Median Width (ft)	Type	Effective Median Width (ft)
158	8SC	Entrance	1822+26.930	1823+66.040	139.11	0.0263	2022: 58,850; 2023: 59,862; 2024: 60,875; 2025: 61,887; 2026: 62,900; 2027: 63,912; 2028: 64,925; 2029: 65,937; 2030: 66,950; 2031: 67,962; 2032: 68,975; 2033: 69,987; 2034: 71,000; 2035: 72,012; 2036: 73,025; 2037: 74,037; 2038: 75,050; 2039: 76,062; 2040: 77,075; 2041: 78,087; 2042: 79,100	6.00	Non-Traversable Median	14.00
160	7SC	Entrance	1823+66.040	1829+76.930	610.89	0.1157	2022: 50,200; 2023: 51,062; 2024: 51,925; 2025: 52,787; 2026: 53,650; 2027: 54,512; 2028: 55,375; 2029: 56,237; 2030: 57,100; 2031: 57,962; 2032: 58,825; 2033: 59,687; 2034: 60,550; 2035: 61,412; 2036: 62,275; 2037: 63,137; 2038: 64,000; 2039: 64,862; 2040: 65,725; 2041: 66,587; 2042: 67,450	6.00	Non-Traversable Median	14.00
165	10SC	Entrance	1868+54.350	1873+54.400	500.05	0.0947	2022: 48,150; 2023: 48,977; 2024: 49,805; 2025: 50,632; 2026: 51,460; 2027: 52,287; 2028: 53,115; 2029: 53,942; 2030: 54,770; 2031: 55,597; 2032: 56,425; 2033: 57,252; 2034: 58,080; 2035: 58,907; 2036: 59,735; 2037: 60,562; 2038: 61,390; 2039: 62,217; 2040: 63,045; 2041: 63,872; 2042: 64,700	6.00	Non-Traversable Median	14.00
167	10SC	Entrance	1873+54.400	1876+04.350	249.95	0.0473	2022: 51,700; 2023: 52,587; 2024: 53,475; 2025: 54,362; 2026: 55,250; 2027: 56,137; 2028: 57,025; 2029: 57,912; 2030: 58,800; 2031: 59,687; 2032: 60,575; 2033: 61,462; 2034: 62,350; 2035: 63,237; 2036: 64,125; 2037: 65,012; 2038: 65,900; 2039: 66,787; 2040: 67,675; 2041: 68,562; 2042: 69,450	6.00	Non-Traversable Median	14.00
168	10SC	Exit	1873+54.400	1881+04.400	750.00	0.1421	2022: 51,700; 2023: 52,587; 2024: 53,475; 2025: 54,362; 2026: 55,250; 2027: 56,137; 2028: 57,025; 2029: 57,912; 2030: 58,800; 2031: 59,687; 2032: 60,575; 2033: 61,462; 2034: 62,350; 2035: 63,237; 2036: 64,125; 2037: 65,012; 2038: 65,900; 2039: 66,787; 2040: 67,675; 2041: 68,562; 2042: 69,450	6.00	Non-Traversable Median	14.00
171	8SC	Exit	1999+18.010	2001+13.770	195.76	0.0371	2022: 19,800; 2023: 20,140; 2024: 20,480; 2025: 20,820; 2026: 21,160; 2027: 21,500; 2028: 21,840; 2029: 22,180; 2030: 22,520; 2031: 22,860; 2032: 23,200; 2033: 23,540; 2034: 23,880; 2035: 24,220; 2036: 24,560; 2037: 24,900; 2038: 25,240; 2039: 25,580; 2040: 25,920; 2041: 26,260; 2042: 26,600	6.00	Non-Traversable Median	14.00
173	8SC	Exit	2001+13.770	2006+68.010	554.24	0.1050	2022: 20,400; 2023: 20,750; 2024: 21,100; 2025: 21,450; 2026: 21,800; 2027: 22,150; 2028: 22,500; 2029: 22,850; 2030: 23,200; 2031: 23,550; 2032: 23,900; 2033: 24,250; 2034: 24,600; 2035: 24,950; 2036: 25,300; 2037: 25,650; 2038: 26,000; 2039: 26,350; 2040: 26,700; 2041: 27,050; 2042: 27,400	6.00	Non-Traversable Median	14.00
174	8SC	Entrance	2001+13.770	2008+63.770	750.00	0.1421	2022: 20,400; 2023: 20,750; 2024: 21,100; 2025: 21,450; 2026: 21,800; 2027: 22,150; 2028: 22,500; 2029: 22,850; 2030: 23,200; 2031: 23,550; 2032: 23,900; 2033: 24,250; 2034: 24,600; 2035: 24,950; 2036: 25,300; 2037: 25,650; 2038: 26,000; 2039: 26,350; 2040: 26,700; 2041: 27,050; 2042: 27,400	6.00	Non-Traversable Median	14.00
182	6SC	Exit	2241+33.280	2248+83.280	750.00	0.1421	2022: 18,650; 2023: 18,970; 2024: 19,290; 2025: 19,610; 2026: 19,930; 2027: 20,250; 2028: 20,570; 2029: 20,890; 2030: 21,210; 2031: 21,530; 2032: 21,850; 2033: 22,170; 2034: 22,490; 2035: 22,810; 2036: 23,130; 2037: 23,450; 2038: 23,770; 2039: 24,090; 2040: 24,410; 2041: 24,730; 2042: 25,050	6.00	Non-Traversable Median	14.00
183	6SC	Entrance	2241+33.280	2248+83.280	750.00	0.1421	2022: 18,650; 2023: 18,970; 2024: 19,290; 2025: 19,610; 2026: 19,930; 2027: 20,250; 2028: 20,570; 2029: 20,890; 2030: 21,210; 2031: 21,530; 2032: 21,850; 2033: 22,170; 2034: 22,490; 2035: 22,810; 2036: 23,130; 2037: 23,450; 2038: 23,770; 2039: 24,090; 2040: 24,410; 2041: 24,730; 2042: 25,050	6.00	Non-Traversable Median	14.00
192	6SC	Exit	2954+65.120	2956+02.250	137.13	0.0260	2022: 14,850; 2023: 15,105; 2024: 15,360; 2025: 15,615; 2026: 15,870; 2027: 16,125; 2028: 16,380; 2029: 16,635; 2030: 16,890; 2031: 17,145; 2032: 17,400; 2033: 17,655; 2034: 17,910; 2035: 18,165; 2036: 18,420; 2037: 18,675; 2038: 18,930; 2039: 19,185; 2040: 19,440; 2041: 19,695; 2042: 19,950	6.00	Non-Traversable Median	14.00
194	6SC	Exit	2956+02.250	2962+15.120	612.87	0.1161	2022: 15,250; 2023: 15,510; 2024: 15,770; 2025: 16,030; 2026: 16,290; 2027: 16,550; 2028: 16,810; 2029: 17,070; 2030: 17,330; 2031: 17,590; 2032: 17,850; 2033: 18,110; 2034: 18,370; 2035: 18,630; 2036: 18,890; 2037: 19,150; 2038: 19,410; 2039: 19,670; 2040: 19,930; 2041: 20,190; 2042: 20,450	6.00	Non-Traversable Median	14.00
195	6SC	Entrance	2956+02.250	2963+52.250	750.00	0.1421	2022: 15,250; 2023: 15,510; 2024: 15,770; 2025: 16,030; 2026: 16,290; 2027: 16,550; 2028: 16,810; 2029: 17,070; 2030: 17,330; 2031: 17,590; 2032: 17,850; 2033: 18,110; 2034: 18,370; 2035: 18,630; 2036: 18,890; 2037: 19,150; 2038: 19,410; 2039: 19,670; 2040: 19,930; 2041: 20,190; 2042: 20,450	6.00	Non-Traversable Median	14.00

Table 3. Predicted Freeway Crash Rates and Frequencies (Section 1)

First Year of Analysis	**2022**
Last Year of Analysis	**2042**
Evaluated Length (mi)	**57.4748**
Average Future Road AADT (vpd)	**61,679**
Predicted Crashes	
Total Crashes	**14,396.52**
Fatal and Injury Crashes	**4,943.46**
Property-Damage-Only Crashes	**9,453.06**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**34**
Percent Property-Damage-Only Crashes (%)	**66**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**11.9278**
FI Crash Rate (crashes/mi/yr)	**4.0958**
PDO Crash Rate (crashes/mi/yr)	**7.8321**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**27,172.53**
Travel Crash Rate (crashes/million veh-mi)	**0.53**
Travel FI Crash Rate (crashes/million veh-mi)	**0.18**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.35**

Table 4. Predicted Freeway Speed Change Lane Crash Rates and Frequencies (Speed Change)

First Year of Analysis	**2022**
Last Year of Analysis	**2042**
Evaluated Length (mi)	**7.1035**
Average Future Road AADT (vpd)	**51,669**
Predicted Crashes	
Total Crashes	**1,500.69**
Fatal and Injury Crashes	**452.81**
Property-Damage-Only Crashes	**1,047.88**
Percent of Total Predicted Crashes	
Percent Fatal and Injury Crashes (%)	**30**
Percent Property-Damage-Only Crashes (%)	**70**
Predicted Crash Rate	
Crash Rate (crashes/mi/yr)	**10.0601**
FI Crash Rate (crashes/mi/yr)	**3.0355**
PDO Crash Rate (crashes/mi/yr)	**7.0246**
Predicted Travel Crash Rate	
Total Travel (million veh-mi)	**2,813.31**
Travel Crash Rate (crashes/million veh-mi)	**0.53**
Travel FI Crash Rate (crashes/million veh-mi)	**0.16**
Travel PDO Crash Rate (crashes/million veh-mi)	**0.37**

Note: *Total Travel and Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 5. Predicted Crash Frequencies and Rates by Freeway Segment/Intersection (Section 1)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
1	10+00.000	10+06.360	0.0006	0.092	0.0044	0.0017	0.0027	7.2582	0.60
3	10+06.360	11+02.460	0.0182	2.266	0.1079	0.0419	0.0660	5.9281	0.54
4	11+02.460	24+17.550	0.2482	27.108	1.2908	0.5063	0.7845	5.1998	0.51
6	24+17.550	31+58.860	0.0702	7.583	0.3611	0.1419	0.2192	5.1439	0.51
8	31+58.860	88+50.570	1.0780	105.189	5.0090	1.9596	3.0493	4.6467	0.48
9	88+50.570	92+73.870	0.0802	8.914	0.4245	0.1766	0.2478	5.2947	0.50

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
10	92+73.870	114+92.280	0.4202	57.152	2.7215	1.1057	1.6159	6.4774	0.51
11	114+92.280	116+12.410	0.0228	3.067	0.1460	0.0600	0.0860	6.4184	0.53
12	116+12.410	159+52.850	0.8221	98.562	4.6934	1.7851	2.9084	5.7094	0.49
13	159+52.850	160+55.670	0.0195	2.703	0.1287	0.0524	0.0764	6.6098	0.52
14	160+55.670	182+04.980	0.4071	57.377	2.7322	1.1041	1.6281	6.7120	0.51
15	182+04.980	190+78.150	0.1654	20.733	0.9873	0.4022	0.5851	5.9701	0.49
16	190+78.150	234+73.270	0.8324	93.198	4.4380	1.7041	2.7339	5.3315	0.48
17	234+73.270	235+38.500	0.0124	1.614	0.0769	0.0316	0.0453	6.2220	0.52
18	235+38.500	256+53.490	0.4006	55.075	2.6226	1.0633	1.5594	6.5473	0.51
19	256+53.490	320+43.950	1.2103	135.018	6.4295	2.4699	3.9595	5.3122	0.48
20	320+43.950	333+03.670	0.1676	21.229	1.0109	0.3856	0.6253	6.0330	0.51
22	333+03.670	376+84.690	0.7587	102.189	4.8661	1.8273	3.0388	6.4136	0.50
24	376+84.690	377+09.150	0.0046	0.757	0.0361	0.0143	0.0217	7.7847	0.53
25	377+09.150	401+43.300	0.4610	79.888	3.8042	1.4886	2.3156	8.2518	0.52
26	401+43.300	410+45.320	0.1708	26.029	1.2395	0.4915	0.7480	7.2553	0.50
27	410+45.320	430+10.320	0.3722	49.389	2.3518	0.8852	1.4666	6.3194	0.51
28	430+10.320	431+12.710	0.0194	3.280	0.1562	0.0621	0.0941	8.0553	0.55
29	431+12.710	444+62.420	0.2556	49.577	2.3608	0.9225	1.4383	9.2353	0.55
30	444+62.420	446+92.250	0.0435	7.360	0.3505	0.1383	0.2122	8.0519	0.52
31	446+92.250	466+93.140	0.3790	52.021	2.4772	0.9246	1.5525	6.5368	0.50
32	466+93.140	473+45.480	0.1235	20.574	0.9797	0.3841	0.5957	7.9299	0.51
33	473+45.480	487+68.410	0.2695	53.043	2.5259	0.9637	1.5622	9.3726	0.51
34	487+68.410	494+75.370	0.0669	16.025	0.7631	0.2840	0.4791	11.3985	0.54
36	494+75.370	518+49.370	0.4455	120.146	5.7212	2.0927	3.6285	12.8409	0.55
38	518+49.370	522+06.730	0.0677	15.836	0.7541	0.2826	0.4715	11.1416	0.54
39	522+06.730	585+36.090	1.1987	231.683	11.0325	3.9161	7.1164	9.2034	0.52
40	585+36.090	590+45.470	0.0482	12.965	0.6174	0.2112	0.4062	12.7993	0.58
42	590+45.470	624+72.020	0.6262	195.077	9.2894	3.2997	5.9896	14.8350	0.56
44	624+72.020	628+07.980	0.0318	13.972	0.6653	0.2274	0.4379	20.9127	0.67
46	628+07.980	651+65.010	0.3362	152.408	7.2575	2.4387	4.8188	21.5884	0.61
49	651+65.010	660+88.730	0.1749	57.208	2.7242	0.9623	1.7619	15.5715	0.56
50	660+88.730	667+93.530	0.1335	31.095	1.4807	0.5455	0.9352	11.0927	0.51
51	667+93.530	761+78.560	1.7775	471.122	22.4344	7.6309	14.8034	12.6215	0.58
52	761+78.560	773+07.600	0.1428	54.305	2.5860	0.8895	1.6964	18.1076	0.58
54	773+07.600	806+52.740	0.5710	342.885	16.3278	5.4646	10.8632	28.5934	0.67
56	806+52.740	807+42.600	0.0085	5.943	0.2830	0.0942	0.1888	33.2588	0.80
58	807+42.600	813+44.180	0.1139	59.779	2.8466	0.9656	1.8811	24.9844	0.62
59	813+44.180	872+94.110	1.1269	600.433	28.5920	9.2362	19.3558	25.3727	0.63
60	872+94.110	873+42.940	0.0092	4.179	0.1990	0.0680	0.1310	21.5192	0.53
61	873+42.940	879+94.370	0.1234	69.641	3.3162	1.1036	2.2126	26.8788	0.59
62	879+94.370	921+17.280	0.7098	449.113	21.3863	6.9458	14.4405	30.1287	0.60
64	921+17.280	946+88.890	0.4160	235.403	11.2097	3.7196	7.4901	26.9447	0.59
66	946+88.890	983+35.310	0.6906	347.294	16.5378	5.5691	10.9687	23.9467	0.56
67	983+35.310	986+82.810	0.0329	24.026	1.1441	0.3735	0.7706	34.7666	0.73
69	986+82.810	1021+08.260	0.6106	470.767	22.4175	6.9666	15.4509	36.7112	0.85
71	1021+08.260	1053+94.350	0.4497	330.567	15.7413	4.8712	10.8700	35.0013	0.73
75	1053+94.350	1058+21.360	0.0404	30.936	1.4732	0.4604	1.0128	36.4315	0.82
77	1058+21.360	1075+52.580	0.3279	193.804	9.2287	2.9319	6.2968	28.1465	0.66
78	1075+52.580	1079+97.540	0.0421	29.079	1.3847	0.4445	0.9402	32.8629	0.63

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
80	1079+97.540	1116+60.530	0.6115	522.068	24.8604	7.6164	17.2440	40.6537	0.65
83	1116+60.530	1118+47.190	0.0000	0.000	0.0000	0.0000	0.0000		
86	1118+47.190	1139+16.750	0.3386	346.802	16.5144	4.9557	11.5587	48.7704	0.76
88	1139+16.750	1149+08.590	0.0458	55.818	2.6580	0.7829	1.8751	58.0312	0.85
91	1149+08.590	1168+08.900	0.3599	336.916	16.0436	4.8389	11.2048	44.5772	0.67
92	1168+08.900	1173+14.860	0.0958	76.448	3.6404	1.1384	2.5020	37.9898	0.65
93	1173+14.860	1184+67.050	0.2182	148.848	7.0880	2.2939	4.7941	32.4814	0.65
94	1184+67.050	1189+27.220	0.0872	52.899	2.5190	0.8392	1.6798	28.9030	0.66
95	1189+27.220	1229+20.230	0.6852	373.252	17.7739	5.7320	12.0419	25.9387	0.63
97	1229+20.230	1246+54.550	0.2574	127.264	6.0602	1.9927	4.0675	23.5395	0.62
99	1246+54.550	1257+20.070	0.2018	78.890	3.7567	1.2756	2.4811	18.6156	0.57
100	1257+20.070	1268+72.230	0.2182	131.871	6.2796	2.1200	4.1596	28.7774	0.71
101	1268+72.230	1281+75.860	0.2469	205.753	9.7977	3.0509	6.7468	39.6831	0.70
102	1281+75.860	1315+93.800	0.4585	462.083	22.0040	6.6735	15.3305	47.9924	0.78
106	1315+93.800	1318+49.560	0.0242	19.823	0.9440	0.2956	0.6483	38.9747	0.68
108	1318+49.560	1352+31.030	0.6404	491.565	23.4079	7.3764	16.0315	36.5502	0.68
109	1352+31.030	1355+24.530	0.0278	22.584	1.0754	0.3371	0.7383	38.6935	0.68
111	1355+24.530	1384+38.980	0.4377	373.904	17.8050	5.4845	12.3204	40.6759	0.66
114	1384+38.980	1388+36.180	0.0752	48.060	2.2886	0.7447	1.5438	30.4218	0.61
115	1388+36.180	1407+00.830	0.3532	161.578	7.6942	2.5449	5.1493	21.7871	0.59
116	1407+00.830	1407+99.290	0.0186	9.410	0.4481	0.1535	0.2946	24.0288	0.60
117	1407+99.290	1458+80.350	0.8913	446.927	21.2823	7.1813	14.1010	23.8778	0.56
119	1458+80.350	1459+28.940	0.0046	2.861	0.1362	0.0450	0.0912	29.6045	0.64
121	1459+28.940	1485+21.570	0.3536	219.685	10.4612	3.4100	7.0512	29.5861	0.60
124	1485+21.570	1493+46.760	0.1563	104.803	4.9906	1.6142	3.3764	31.9325	0.63
125	1493+46.760	1516+23.110	0.2891	199.328	9.4918	3.0532	6.4387	32.8344	0.63
128	1516+23.110	1524+23.110	0.1515	94.684	4.5088	1.4718	3.0370	29.7579	0.60
129	1524+23.110	1548+51.750	0.4037	213.820	10.1819	3.4142	6.7677	25.2238	0.57
131	1548+51.750	1550+07.160	0.0147	8.764	0.4173	0.1352	0.2822	28.3580	0.69
133	1550+07.160	1567+03.620	0.3213	150.512	7.1672	2.3612	4.8061	22.3070	0.59
134	1567+03.620	1569+20.770	0.0411	21.359	1.0171	0.3456	0.6715	24.7309	0.59
135	1569+20.770	1597+23.110	0.3446	198.017	9.4294	3.1308	6.2985	27.3651	0.59
139	1597+23.110	1600+07.160	0.0269	13.380	0.6371	0.2179	0.4192	23.6868	0.58
141	1600+07.160	1622+13.430	0.3468	143.127	6.8156	2.3906	4.4250	19.6510	0.54
143	1622+13.430	1622+60.330	0.0089	2.802	0.1334	0.0496	0.0838	15.0217	0.55
144	1622+60.330	1693+03.680	1.3340	311.072	14.8129	5.4572	9.3557	11.1044	0.51
145	1693+03.680	1695+79.250	0.0261	7.714	0.3673	0.1331	0.2342	14.0771	0.57
147	1695+79.250	1758+35.390	1.1399	408.674	19.4607	6.7409	12.7198	17.0715	0.57
149	1758+35.390	1765+64.940	0.0856	27.103	1.2906	0.4574	0.8332	15.0701	0.56
151	1765+64.940	1767+60.210	0.0185	6.189	0.2947	0.1046	0.1900	15.9366	0.59
153	1767+60.210	1781+96.430	0.2720	65.681	3.1277	1.1465	1.9812	11.4983	0.52
154	1781+96.430	1799+13.770	0.2542	65.523	3.1201	1.1453	1.9748	12.2729	0.54
156	1799+13.770	1823+66.040	0.3802	111.070	5.2891	1.9046	3.3845	13.9095	0.55
159	1823+66.040	1829+76.930	0.0578	13.869	0.6604	0.2449	0.4155	11.4164	0.53
161	1829+76.930	1848+64.940	0.3576	43.163	2.0554	0.7810	1.2744	5.7481	0.49
162	1848+64.940	1848+81.480	0.0031	0.467	0.0222	0.0092	0.0130	7.0984	0.48
163	1848+81.480	1868+54.350	0.3736	73.794	3.5140	1.3877	2.1263	9.4045	0.47
164	1868+54.350	1873+54.400	0.0474	10.219	0.4866	0.1912	0.2954	10.2761	0.50
166	1873+54.400	1905+16.110	0.5041	113.665	5.4126	2.0985	3.3141	10.7368	0.49

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Effective Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
169	1905+16.110	1999+18.010	1.7807	141.160	6.7219	2.8719	3.8500	3.7749	0.47
170	1999+18.010	2001+13.770	0.0185	1.671	0.0796	0.0343	0.0453	4.2923	0.51
172	2001+13.770	2027+95.160	0.3843	34.358	1.6361	0.6988	0.9373	4.2570	0.49
175	2027+95.160	2037+89.330	0.1883	15.171	0.7224	0.3111	0.4113	3.8367	0.48
176	2037+89.330	2126+91.660	1.6860	122.019	5.8105	2.3650	3.4454	3.4462	0.48
177	2126+91.660	2127+16.900	0.0048	0.400	0.0191	0.0083	0.0108	3.9856	0.51
178	2127+16.900	2163+05.440	0.6796	57.958	2.7599	1.1846	1.5753	4.0608	0.49
179	2163+05.440	2163+09.560	0.0008	0.063	0.0030	0.0013	0.0017	3.8485	0.51
180	2163+09.560	2241+33.280	1.4818	101.567	4.8365	1.9825	2.8540	3.2640	0.48
181	2241+33.280	2301+70.080	1.0013	81.131	3.8634	1.5569	2.3065	3.8584	0.48
184	2301+70.080	2577+64.980	5.2263	444.489	21.1661	8.9725	12.1937	4.0499	0.47
185	2577+64.980	2578+84.390	0.0226	1.710	0.0814	0.0357	0.0458	3.6013	0.50
186	2578+84.390	2652+16.980	1.3887	83.846	3.9926	1.6636	2.3291	2.8750	0.48
187	2652+16.980	2653+16.980	0.0189	1.283	0.0611	0.0273	0.0338	3.2268	0.51
188	2653+16.980	2905+85.060	4.7856	314.525	14.9774	6.5608	8.4166	3.1297	0.47
189	2905+85.060	2919+19.840	0.2528	16.654	0.7930	0.3511	0.4419	3.1370	0.49
190	2919+19.840	2954+65.120	0.6715	41.616	1.9817	0.8229	1.1588	2.9514	0.48
191	2954+65.120	2956+02.250	0.0130	0.918	0.0437	0.0184	0.0253	3.3677	0.53
193	2956+02.250	2983+64.940	0.3942	26.572	1.2653	0.5258	0.7396	3.2101	0.49
196	2983+64.940	3044+67.123	1.1557	78.622	3.7439	1.4504	2.2935	3.2395	0.50
Total			53.9231	14,396.521	685.5486	235.4028	450.1458	12.7135	

Note: *Effective Length* is the *segment length* minus the length of the *speed change lanes* if present.

Table 6. Predicted Crash Frequencies and Rates by Freeway Speed Change Lane (Speed Change)

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
2	10+00.000	10+06.360	0.0012	0.077	0.0036	0.0011	0.0025	3.0288	0.50
5	24+08.860	24+17.550	0.0016	0.079	0.0038	0.0010	0.0028	2.2787	0.45
7	24+17.550	31+58.860	0.1404	6.603	0.3144	0.0814	0.2330	2.2394	0.45
21	320+43.950	327+93.950	0.1420	8.702	0.4144	0.1236	0.2908	2.9173	0.49
23	333+03.670	340+53.670	0.1420	11.705	0.5574	0.1634	0.3940	3.9239	0.61
35	487+68.410	494+75.370	0.1339	14.151	0.6739	0.2216	0.4522	5.0329	0.47
37	494+75.370	495+18.410	0.0082	0.969	0.0461	0.0151	0.0310	5.6606	0.48
41	585+36.090	590+45.470	0.0965	13.697	0.6523	0.2344	0.4178	6.7610	0.61
43	590+45.470	592+86.090	0.0456	6.399	0.3047	0.1050	0.1997	6.6861	0.51
45	624+72.020	628+07.980	0.0636	12.687	0.6041	0.1695	0.4346	9.4946	0.61
47	628+07.980	632+22.020	0.0784	16.343	0.7782	0.2235	0.5548	9.9244	0.56
48	628+07.980	635+57.980	0.1420	28.004	1.3335	0.4487	0.8849	9.3882	0.54
53	761+78.560	769+28.560	0.1420	26.564	1.2649	0.3641	0.9008	8.9051	0.57
55	799+92.600	806+52.740	0.1250	27.767	1.3222	0.3431	0.9791	10.5755	0.50
57	806+52.740	807+42.600	0.0170	3.664	0.1745	0.0453	0.1292	10.2527	0.49

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
63	913+67.280	921+17.280	0.1420	35.755	1.7026	0.5491	1.1535	11.9865	0.48
65	939+38.890	946+88.890	0.1420	38.828	1.8489	0.5206	1.3284	13.0164	0.57
68	983+35.310	986+82.810	0.0658	19.338	0.9208	0.2562	0.6646	13.9916	0.59
70	986+82.810	990+85.310	0.0762	24.256	1.1551	0.3020	0.8530	15.1522	0.70
72	1021+08.260	1028+58.260	0.1420	41.114	1.9578	0.6665	1.2913	13.7832	0.58
73	1046+44.350	1053+94.350	0.1420	39.955	1.9026	0.5392	1.3634	13.3945	0.56
74	1050+71.360	1053+94.350	0.0612	16.946	0.8070	0.2310	0.5760	13.1917	0.55
76	1053+94.350	1058+21.360	0.0809	21.877	1.0417	0.2912	0.7506	12.8812	0.58
79	1075+52.580	1079+97.540	0.0843	22.951	1.0929	0.3938	0.6991	12.9686	0.49
81	1079+97.540	1083+02.580	0.0578	19.488	0.9280	0.3328	0.5952	16.0631	0.51
82	1110+97.190	1116+60.530	0.1067	33.195	1.5807	0.4815	1.0993	14.8157	0.47
84	1116+60.530	1118+47.190	0.0354	19.005	0.9050	0.3144	0.5906	25.5996	0.77
85	1116+60.530	1118+47.190	0.0354	18.487	0.8803	0.2897	0.5906	24.9012	0.74
87	1118+47.190	1124+10.530	0.1067	34.994	1.6664	0.5365	1.1298	15.6183	0.49
89	1139+16.750	1146+66.750	0.1420	59.544	2.8354	0.7766	2.0588	19.9613	0.58
90	1141+58.590	1149+08.590	0.1420	55.874	2.6607	0.7475	1.9131	18.7310	0.55
96	1221+70.230	1229+20.230	0.1420	34.321	1.6343	0.4674	1.1669	11.5056	0.56
98	1239+04.550	1246+54.550	0.1420	31.644	1.5068	0.5283	0.9785	10.6082	0.56
103	1281+75.860	1289+25.860	0.1420	49.358	2.3504	0.7287	1.6217	16.5466	0.54
104	1308+43.800	1315+93.800	0.1420	57.041	2.7162	0.7294	1.9868	19.1224	0.62
105	1310+99.560	1315+93.800	0.0936	32.506	1.5479	0.4626	1.0853	16.5366	0.54
107	1315+93.800	1318+49.560	0.0484	13.735	0.6541	0.2055	0.4486	13.5026	0.47
110	1352+31.030	1355+24.530	0.0556	18.208	0.8671	0.2465	0.6206	15.5982	0.55
112	1355+24.530	1359+81.030	0.0865	30.344	1.4450	0.4101	1.0348	16.7127	0.54
113	1355+24.530	1362+74.530	0.1420	44.609	2.1243	0.6892	1.4351	14.9548	0.48
118	1407+99.290	1415+49.290	0.1420	27.696	1.3189	0.4019	0.9169	9.2848	0.43
120	1458+80.350	1459+28.940	0.0092	2.491	0.1186	0.0339	0.0848	12.8901	0.55
122	1459+28.940	1466+30.350	0.1328	38.017	1.8103	0.5162	1.2941	13.6275	0.55
123	1459+28.940	1466+78.940	0.1420	33.301	1.5857	0.4885	1.0972	11.1636	0.45
126	1493+46.760	1500+96.760	0.1420	42.874	2.0416	0.5814	1.4602	14.3731	0.55
127	1508+73.110	1516+23.110	0.1420	42.874	2.0416	0.5814	1.4602	14.3731	0.55
130	1542+57.160	1548+51.750	0.1126	23.220	1.1057	0.3494	0.7563	9.8188	0.45
132	1548+51.750	1550+07.160	0.0294	6.907	0.3289	0.1083	0.2206	11.1746	0.55
136	1569+20.770	1576+70.770	0.1420	38.151	1.8167	0.5187	1.2980	12.7898	0.55
137	1589+73.110	1597+23.110	0.1420	38.151	1.8167	0.5187	1.2980	12.7898	0.55
138	1592+57.160	1597+23.110	0.0882	19.547	0.9308	0.3037	0.6271	10.5479	0.46
140	1597+23.110	1600+07.160	0.0538	10.175	0.4845	0.1587	0.3258	9.0066	0.45
142	1614+63.430	1622+13.430	0.1420	25.311	1.2053	0.4304	0.7749	8.4851	0.47
146	1693+03.680	1695+79.250	0.0522	6.554	0.3121	0.1018	0.2104	5.9803	0.49
148	1695+79.250	1700+53.680	0.0899	14.437	0.6875	0.2228	0.4646	7.6508	0.51
150	1760+10.210	1765+64.940	0.1051	15.403	0.7335	0.2557	0.4778	6.9814	0.52
152	1765+64.940	1767+60.210	0.0370	5.422	0.2582	0.0900	0.1682	6.9814	0.52
155	1781+96.430	1789+46.430	0.1420	14.540	0.6924	0.1717	0.5207	4.8743	0.43
157	1799+13.770	1806+63.770	0.1420	21.772	1.0368	0.2998	0.7370	7.2988	0.58
158	1822+26.930	1823+66.040	0.0263	3.719	0.1771	0.0676	0.1096	6.7225	0.53
160	1823+66.040	1829+76.930	0.1157	13.496	0.6427	0.2461	0.3965	5.5546	0.52
165	1868+54.350	1873+54.400	0.0947	7.179	0.3418	0.0897	0.2521	3.6096	0.35
167	1873+54.400	1876+04.350	0.0473	3.908	0.1861	0.0487	0.1374	3.9315	0.36
168	1873+54.400	1881+04.400	0.1420	19.311	0.9196	0.2666	0.6530	6.4739	0.59

Segment Number/Intersection Name/Cross Road	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
171	1999+18.010	2001+13.770	0.0371	2.078	0.0989	0.0293	0.0697	2.6683	0.63
173	2001+13.770	2006+68.010	0.1050	6.046	0.2879	0.0851	0.2028	2.7426	0.63
174	2001+13.770	2008+63.770	0.1420	4.496	0.2141	0.0511	0.1630	1.5073	0.35
182	2241+33.280	2248+83.280	0.1420	7.531	0.3586	0.1062	0.2524	2.5246	0.63
183	2241+33.280	2248+83.280	0.1420	5.242	0.2496	0.0708	0.1789	1.7573	0.44
192	2954+65.120	2956+02.250	0.0260	1.116	0.0531	0.0158	0.0373	2.0458	0.64
194	2956+02.250	2962+15.120	0.1161	5.106	0.2431	0.0723	0.1709	2.0947	0.64
195	2956+02.250	2963+52.250	0.1420	3.834	0.1826	0.0427	0.1399	1.2852	0.40
Total			7.1035	1,500.689	71.4614	21.5623	49.8991	10.0601	

Note: *Travel Crash Rates/Million Vehicle Miles* for *Speed Change Lanes* reflect AADTs that are **half of the Freeway Segment AADTs** based on the assumption of 50/50 directional distribution.

Table 7. Predicted Crash Frequencies and Rates by Horizontal Design Element (Section 1)

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Tangent	10+00.000	419+23.502	7.7507	954.981	45.4753	17.5799	27.8954	5.8673	0.52
Simple Curve 1	419+23.502	431+10.395	0.2248	30.522	1.4534	0.5503	0.9032	6.4658	0.51
Tangent	431+10.395	571+19.905	2.6533	529.621	25.2200	9.2705	15.9495	9.5051	0.55
Simple Curve 2	571+19.905	576+61.681	0.1026	19.831	0.9444	0.3352	0.6091	9.2034	0.52
Tangent	576+61.681	612+83.668	0.6860	192.492	9.1663	3.2470	5.9192	13.3622	0.68
Simple Curve 3	612+83.668	628+07.981	0.2887	94.313	4.4911	1.5413	2.9498	15.5564	0.72
Tangent	628+07.981	729+40.788	1.9191	593.646	28.2689	9.6169	18.6519	14.7303	0.65
Simple Curve 4	729+40.788	747+48.636	0.3424	90.753	4.3216	1.4700	2.8516	12.6215	0.58
Tangent	747+48.636	782+70.380	0.6670	251.337	11.9684	3.9891	7.9793	17.9438	0.73
Simple Curve 5	782+70.380	786+88.158	0.0791	42.823	2.0392	0.6825	1.3567	25.7720	0.67
Simple Curve 6	786+88.158	809+26.404	0.4239	257.013	12.2387	3.9870	8.2517	28.8710	0.84
Simple Curve 7	809+26.404	813+44.182	0.0791	41.514	1.9769	0.6705	1.3063	24.9844	0.62
Tangent	813+44.182	822+87.343	0.1786	95.178	4.5323	1.4641	3.0682	25.3727	0.63
Simple Curve 8	822+87.343	840+64.062	0.3365	179.296	8.5379	2.7580	5.7799	25.3727	0.63
Tangent	840+64.062	852+95.652	0.2333	124.285	5.9183	1.9118	4.0065	25.3727	0.63
Simple Curve 9	852+95.652	860+99.479	0.1522	81.118	3.8627	1.2478	2.6149	25.3727	0.63
Tangent	860+99.479	904+25.932	0.8194	459.248	21.8689	7.1225	14.7464	26.6888	0.61
Simple Curve 10	904+25.932	919+75.962	0.2936	197.864	9.4221	3.0570	6.3652	32.0953	0.79
Tangent	919+75.962	924+05.671	0.0814	48.530	2.3110	0.7587	1.5523	28.3956	0.76
Simple Curve 11	924+05.671	935+45.854	0.2159	104.371	4.9701	1.6492	3.3209	23.0155	0.59
Tangent	935+45.854	940+92.923	0.1036	58.053	2.7644	0.8982	1.8662	26.6804	0.76
Simple Curve 12	940+92.923	952+73.568	0.2236	141.094	6.7187	2.1686	4.5501	30.0471	0.87
Tangent	952+73.568	966+09.112	0.2529	127.200	6.0572	2.0398	4.0174	23.9467	0.56
Simple Curve 13	966+09.112	971+01.815	0.0933	46.926	2.2346	0.7525	1.4821	23.9467	0.56
Tangent	971+01.815	985+97.065	0.2832	150.144	7.1497	2.3582	4.7915	25.2470	0.69
Simple Curve 14	985+97.065	999+25.032	0.2515	205.677	9.7942	2.9838	6.8103	38.9416	1.09
Simple Curve 15	999+25.032	1003+65.738	0.0835	60.567	2.8841	0.8963	1.9878	34.5543	0.85
Simple Curve 16	1003+65.738	1018+37.441	0.2787	202.259	9.6314	2.9931	6.6383	34.5543	0.85

Title	Start Location (Sta. ft)	End Location (Sta. ft)	Length (mi)	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Crash Rate (crashes/mi/yr)	Predicted Travel Crash Rate (crashes/million veh-mi)
Simple Curve 17	1018+37.441	1019+88.432	0.0286	20.751	0.9881	0.3071	0.6811	34.5543	0.85
Simple Curve 18	1019+88.432	1031+03.076	0.2111	157.657	7.5075	2.3849	5.1226	35.5624	1.14
Tangent	1031+03.076	1035+88.916	0.0920	48.873	2.3273	0.7202	1.6071	25.2926	0.73
Simple Curve 19	1035+88.916	1046+55.066	0.2019	107.821	5.1343	1.5881	3.5462	25.4273	0.74
Tangent	1046+55.066	1052+86.140	0.1195	108.372	5.1606	1.5428	3.6178	43.1768	1.48
Simple Curve 20	1052+86.140	1063+52.291	0.2019	134.576	6.4084	1.9663	4.4421	31.7369	1.08
Tangent	1063+52.291	1127+89.533	1.2192	991.546	47.2165	14.6989	32.5176	38.7282	
Simple Curve 21	1127+89.533	1129+89.522	0.0379	33.513	1.5959	0.4789	1.1170	42.1326	0.76
Simple Curve 22	1129+89.522	1132+54.659	0.0502	44.430	2.1157	0.6349	1.4808	42.1326	0.76
Simple Curve 23	1132+54.659	1140+66.913	0.1538	131.321	6.2534	1.8594	4.3939	40.6497	0.88
Simple Curve 24	1140+66.913	1142+20.312	0.0291	25.410	1.2100	0.3414	0.8685	41.6477	1.65
Simple Curve 25	1142+20.312	1144+84.149	0.0500	55.450	2.6405	0.7444	1.8960	52.8421	1.98
Tangent	1144+84.149	1173+14.785	0.5361	483.357	23.0170	6.9243	16.0927	42.9337	0.81
Simple Curve 26	1173+14.785	1180+16.823	0.1330	90.696	4.3189	1.3977	2.9212	32.4820	0.65
Tangent	1180+16.823	1184+07.646	0.0740	50.489	2.4043	0.7781	1.6262	32.4814	0.65
Simple Curve 27	1184+07.646	1191+12.075	0.1334	77.853	3.7073	1.2228	2.4845	27.7876	0.65
Tangent	1191+12.075	1209+46.021	0.3473	171.431	8.1634	2.6326	5.5307	23.5026	0.63
Simple Curve 28	1209+46.021	1217+15.661	0.1458	71.943	3.4259	1.1048	2.3210	23.5026	0.63
Simple Curve 29	1217+15.661	1224+85.302	0.1458	86.361	4.1124	1.3012	2.8113	28.2128	0.86
Tangent	1224+85.302	1260+56.704	0.6764	336.886	16.0422	5.3114	10.7307	23.7169	0.80
Simple Curve 30	1260+56.704	1272+63.702	0.2286	155.128	7.3870	2.4167	4.9703	32.3145	0.71
Tangent	1272+63.702	1285+09.421	0.2359	211.013	10.0483	3.1101	6.9381	42.5897	0.86
Simple Curve 31	1285+09.421	1286+01.093	0.0174	18.426	0.8774	0.2681	0.6094	50.5381	1.32
Simple Curve 32	1286+01.093	1298+68.000	0.2399	192.651	9.1738	2.7892	6.3847	38.2332	0.92
Simple Curve 33	1298+68.000	1301+26.584	0.0490	34.959	1.6647	0.5049	1.1598	33.9915	0.78
Tangent	1301+26.584	1308+20.451	0.1314	93.806	4.4670	1.3548	3.1122	33.9915	0.78
Simple Curve 34	1308+20.451	1314+64.093	0.1219	158.168	7.5318	2.2012	5.3306	61.7858	1.69
Tangent	1314+64.093	1328+00.970	0.2532	207.796	9.8951	3.0773	6.8177	39.0806	0.89
Simple Curve 35	1328+00.970	1340+17.080	0.2303	176.786	8.4184	2.6529	5.7655	36.5502	0.68
Simple Curve 36	1340+17.080	1341+21.959	0.0199	15.246	0.7260	0.2288	0.4972	36.5502	0.68
Tangent	1341+21.959	1436+51.660	1.8049	1,148.512	54.6911	17.4632	37.2279	30.3020	0.73
Simple Curve 37	1436+51.660	1444+05.265	0.1427	66.287	3.1565	1.0651	2.0914	22.1155	0.56
Tangent	1444+05.265	1613+06.823	3.2011	1,736.983	82.7135	26.8512	55.8623	25.8395	0.78
Simple Curve 38	1613+06.823	1625+55.126	0.2364	99.947	4.7594	1.6908	3.0686	20.1309	0.82
Tangent	1625+55.126	1772+21.799	2.7778	810.657	38.6027	13.7036	24.8992	13.8970	0.59
Simple Curve 39	1772+21.799	1776+88.886	0.0885	21.361	1.0172	0.3729	0.6443	11.4983	0.52
Tangent	1776+88.886	1974+76.528	3.7477	643.410	30.6386	11.4841	19.1545	8.1754	0.59
Simple Curve 40	1974+76.528	1985+13.994	0.1965	15.576	0.7417	0.3169	0.4248	3.7749	0.47
Tangent	1985+13.994	2665+03.415	12.8768	1,006.907	47.9480	19.9211	28.0269	3.7236	0.50
Simple Curve 41	2665+03.415	2677+15.139	0.2295	15.083	0.7182	0.3146	0.4036	3.1297	0.47
Simple Curve 42	2677+15.139	2692+75.308	0.2955	19.420	0.9248	0.4051	0.5197	3.1297	0.47
Simple Curve 43	2692+75.308	2705+01.733	0.2323	15.266	0.7270	0.3184	0.4085	3.1297	0.47
Tangent	2705+01.733	2893+06.656	3.5615	234.075	11.1464	4.8826	6.2638	3.1297	0.47
Simple Curve 44	2893+06.656	2912+95.834	0.3767	24.781	1.1801	0.5189	0.6612	3.1323	0.48
Tangent	2912+95.834	3044+67.123	2.4946	165.570	7.8843	3.1124	4.7718	3.1606	0.55

Table 8. Predicted Crash Frequencies by Year (Section 1)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2022	630.55	219.14	0.347	411.41	0.652
2023	644.02	223.08	0.346	420.94	0.654
2024	657.61	227.04	0.345	430.56	0.655
2025	671.28	231.02	0.344	440.26	0.656
2026	685.06	235.00	0.343	450.06	0.657
2027	698.94	239.00	0.342	459.93	0.658
2028	712.92	243.02	0.341	469.90	0.659
2029	727.00	247.05	0.340	479.95	0.660
2030	741.18	251.09	0.339	490.09	0.661
2031	755.46	255.15	0.338	500.31	0.662
2032	769.84	259.22	0.337	510.63	0.663
2033	784.32	263.30	0.336	521.02	0.664
2034	798.90	267.39	0.335	531.51	0.665
2035	813.58	271.50	0.334	542.08	0.666
2036	828.36	275.63	0.333	552.74	0.667
2037	843.24	279.76	0.332	563.48	0.668
2038	858.22	283.91	0.331	574.31	0.669
2039	873.30	288.07	0.330	585.23	0.670
2040	888.48	292.25	0.329	596.23	0.671
2041	903.75	296.44	0.328	607.32	0.672
2042	919.14	300.64	0.327	618.50	0.673
Total	16,205.15	5,448.70	0.336	10,756.44	0.664
Average	771.67	259.46	0.336	512.21	0.664

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 9. Predicted Crash Severity by Freeway Segment (Section 1)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0006	0.0017	0.0117	0.0214	0.0564
3	0.0161	0.0414	0.2899	0.5329	1.3855
4	0.1949	0.4998	3.5021	6.4364	16.4745

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
6	0.0546	0.1401	0.9817	1.8042	4.6024
8	0.7545	1.9343	13.5538	24.9100	64.0359
9	0.0680	0.1744	1.2217	2.2454	5.2045
10	0.4257	1.0914	7.6472	14.0545	33.9332
11	0.0231	0.0592	0.4149	0.7626	1.8068
12	0.6873	1.7620	12.3464	22.6909	61.0757
13	0.0202	0.0517	0.3622	0.6656	1.6034
14	0.4251	1.0899	7.6366	14.0350	34.1905
15	0.1549	0.3970	2.7818	5.1126	12.2871
16	0.6561	1.6821	11.7862	21.6614	57.4126
17	0.0122	0.0312	0.2183	0.4012	0.9515
18	0.4094	1.0495	7.3541	13.5158	32.7467
19	0.9509	2.4380	17.0831	31.3964	83.1500
20	0.1485	0.3806	2.6671	4.9017	13.1309
22	0.7035	1.8037	12.6385	23.2278	63.8152
24	0.0055	0.0141	0.0991	0.1822	0.4564
25	0.5731	1.4694	10.2958	18.9222	48.6277
26	0.1892	0.4851	3.3993	6.2474	15.7079
27	0.3699	0.9669	6.3678	10.8852	30.7988
28	0.0276	0.0732	0.4596	0.7431	1.9770
29	0.3552	0.9106	6.3803	11.7261	30.2045
30	0.0532	0.1365	0.9564	1.7578	4.4563
31	0.3560	0.9127	6.3953	11.7536	32.6032
32	0.1479	0.3791	2.6564	4.8821	12.5089
33	0.3710	0.9512	6.6653	12.2498	32.8059
34	0.1093	0.2803	1.9640	3.6095	10.0620
36	0.8057	2.0657	14.4739	26.6010	76.1994
38	0.1088	0.2790	1.9548	3.5927	9.9005
39	1.5271	3.9270	27.2539	49.5302	149.4450
40	0.0813	0.2085	1.4611	2.6852	8.5292
42	1.3401	3.4793	23.4172	41.0580	125.7823
44	0.1014	0.2692	1.6862	2.7185	9.1965
46	0.9389	2.4072	16.8671	30.9994	101.1951
49	0.3705	0.9499	6.6558	12.2324	36.9993
50	0.2100	0.5384	3.7728	6.9338	19.6399
51	3.0235	7.8043	53.5168	95.9052	310.8721
52	0.3425	0.8781	6.1525	11.3074	35.6245
54	2.3263	6.1080	39.6568	66.6660	228.1275
56	0.0420	0.1115	0.6987	1.1265	3.9645
58	0.4305	1.1429	7.1599	11.5432	39.5023
59	3.7923	9.8716	65.8897	114.4074	406.4719
60	0.0262	0.0671	0.4704	0.8646	2.7509
61	0.4249	1.0894	7.6332	14.0287	46.4644
62	2.8096	7.2876	49.1981	86.5666	303.2506
64	1.5774	4.1380	26.9448	45.4504	157.2920
66	2.2405	5.8039	39.3440	69.5633	230.3421
67	0.1492	0.3858	2.6294	4.6788	16.1823
69	3.1058	8.2465	51.6600	83.2862	324.4680
71	2.0819	5.4714	35.4162	59.3265	228.2706
75	0.2053	0.5450	3.4141	5.5043	21.2678
77	1.1815	3.0618	20.7294	36.5974	132.2335

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
78	0.1711	0.4388	3.0745	5.6504	19.7444
80	2.9324	7.5181	52.6786	96.8157	362.1230
83					0.0000
86	2.0943	5.4891	35.8398	60.6468	242.7325
88	0.3246	0.8469	5.6110	9.6584	39.3771
91	1.8630	4.7764	33.4679	61.5093	235.2998
92	0.4383	1.1238	7.8740	14.4710	52.5414
93	0.9737	2.5548	16.6241	28.0192	100.6766
94	0.3741	0.9934	6.2229	10.0325	35.2761
95	2.3533	6.1255	40.8890	71.0042	252.8804
97	0.7672	1.9670	13.7825	25.3303	85.4168
99	0.4911	1.2591	8.8225	16.2145	52.1031
100	0.9060	2.3812	15.4133	25.8189	87.3517
101	1.2283	3.1824	21.5612	38.0977	141.6830
102	2.8260	7.4106	48.3094	81.5976	321.9399
106	0.1138	0.2918	2.0446	3.7577	13.6151
108	3.0096	7.8222	52.4633	91.6097	336.6605
109	0.1298	0.3328	2.3316	4.2851	15.5048
111	2.1116	5.4137	37.9335	69.7163	258.7293
114	0.2867	0.7351	5.1509	9.4666	32.4202
115	0.9798	2.5120	17.6017	32.3495	108.1347
116	0.0591	0.1515	1.0617	1.9513	6.1862
117	2.8317	7.3007	50.2462	90.4283	296.1206
119	0.0173	0.0444	0.3112	0.5719	1.9158
121	1.3129	3.3659	23.5850	43.3458	148.0750
124	0.6215	1.5933	11.1643	20.5184	70.9053
125	1.1755	3.0137	21.1170	38.8101	135.2120
128	0.5666	1.4528	10.1795	18.7084	63.7768
129	1.3145	3.3701	23.6142	43.3996	142.1219
131	0.0520	0.1334	0.9350	1.7184	5.9252
133	0.9091	2.3307	16.3309	30.0138	100.9272
134	0.1331	0.3412	2.3906	4.3936	14.1007
135	1.2054	3.0904	21.6543	39.7976	132.2695
139	0.0839	0.2151	1.5072	2.7700	8.8039
141	0.9610	2.4890	16.8826	29.8700	92.9246
143	0.0221	0.0588	0.3681	0.5934	1.7597
144	2.1143	5.4285	37.8594	69.1996	196.4698
145	0.0512	0.1314	0.9206	1.6920	4.9191
147	2.5953	6.6538	46.6229	85.6863	267.1158
149	0.1761	0.4515	3.1634	5.8139	17.4982
151	0.0403	0.1033	0.7238	1.3302	3.9910
153	0.4633	1.2013	8.1166	14.2950	41.6049
154	0.4410	1.1305	7.9217	14.5589	41.4710
156	0.7333	1.8800	13.1730	24.2101	71.0741
159	0.0943	0.2417	1.6939	3.1131	8.7259
161	0.3007	0.7709	5.4016	9.9273	26.7627
162	0.0036	0.0091	0.0639	0.1174	0.2731
163	0.5343	1.3698	9.5983	17.6403	44.6514
164	0.0736	0.1888	1.3227	2.4309	6.2028
166	0.8080	2.0715	14.5145	26.6756	69.5953
169	1.1241	2.8931	20.0227	36.2708	80.8493

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
170	0.0132	0.0338	0.2369	0.4354	0.9517
172	0.2690	0.6897	4.8330	8.8824	19.6841
175	0.1198	0.3071	2.1519	3.9549	8.6370
176	0.9105	2.3345	16.3575	30.0628	72.3542
177	0.0032	0.0082	0.0573	0.1053	0.2261
178	0.4561	1.1694	8.1936	15.0586	33.0806
179	0.0005	0.0013	0.0091	0.0167	0.0355
180	0.7633	1.9569	13.7120	25.2007	59.9341
181	0.5994	1.5368	10.7679	19.7899	48.4367
184	3.4544	8.8566	62.0576	114.0529	256.0672
185	0.0137	0.0352	0.2466	0.4532	0.9617
186	0.6405	1.6421	11.5061	21.1465	48.9104
187	0.0105	0.0269	0.1887	0.3469	0.7103
188	2.6058	6.7297	46.0647	82.3757	176.7493
189	0.1463	0.3820	2.5220	4.3228	9.2806
190	0.3168	0.8123	5.6917	10.4606	24.3347
191	0.0071	0.0182	0.1275	0.2343	0.5313
193	0.2024	0.5190	3.6365	6.6834	15.5310
196	0.5584	1.4317	10.0318	18.4370	48.1630
Total					9,453.0623

Table 10. Predicted Crash Severity by Speed Change Lane (Speed Change)

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
2	0.0004	0.0011	0.0077	0.0142	0.0532
5	0.0004	0.0010	0.0067	0.0123	0.0584
7	0.0313	0.0804	0.5631	1.0349	4.8929
21	0.0476	0.1220	0.8546	1.5707	6.1072
23	0.0629	0.1613	1.1302	2.0771	8.2734
35	0.0853	0.2188	1.5329	2.8173	9.4970
37	0.0058	0.0149	0.1047	0.1924	0.6512
41	0.0903	0.2314	1.6214	2.9799	8.7745
43	0.0404	0.1036	0.7260	1.3343	4.1944
45	0.0756	0.2007	1.2570	2.0265	9.1270
47	0.0860	0.2206	1.5457	2.8408	11.6499
48	0.1727	0.4429	3.1031	5.7030	18.5828
53	0.1402	0.3594	2.5185	4.6286	18.9169
55	0.1530	0.4062	2.5445	4.1022	20.5608
57	0.0202	0.0536	0.3361	0.5418	2.7126
63	0.2382	0.6284	4.0206	6.6440	24.2241
65	0.2253	0.5939	3.8072	6.3053	27.8957
68	0.1023	0.2646	1.8037	3.2095	13.9576
70	0.1347	0.3575	2.2398	3.6110	17.9134
72	0.2971	0.7889	4.9423	7.9679	27.1182
73	0.2126	0.5480	3.7723	6.7905	28.6318
74	0.0935	0.2425	1.6363	2.8781	12.0959

Seg. No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
76	0.1298	0.3447	2.1593	3.4812	15.7616
79	0.1516	0.3887	2.7236	5.0056	14.6813
81	0.1281	0.3285	2.3016	4.2301	12.4999
82	0.1854	0.4753	3.3301	6.1203	23.0844
84	0.1210	0.3103	2.1745	3.9965	12.4027
85	0.1115	0.2860	2.0038	3.6826	12.4027
87	0.2066	0.5296	3.7109	6.8202	23.7265
89	0.3343	0.8800	5.6653	9.4296	43.2346
90	0.3069	0.7990	5.3328	9.2591	40.1761
96	0.1915	0.4983	3.3312	5.7944	24.5052
98	0.2034	0.5215	3.6543	6.7160	20.5485
103	0.3046	0.7962	5.2427	8.9594	34.0548
104	0.3172	0.8371	5.3463	8.8168	41.7238
105	0.1986	0.5224	3.3704	5.6238	22.7911
107	0.0791	0.2028	1.4213	2.6121	9.4198
110	0.0949	0.2433	1.7048	3.1331	13.0322
112	0.1579	0.4048	2.8366	5.2132	21.7315
113	0.2653	0.6803	4.7666	8.7604	30.1369
118	0.1547	0.3967	2.7799	5.1090	19.2557
120	0.0130	0.0334	0.2342	0.4305	1.7799
122	0.1987	0.5095	3.5701	6.5614	27.1768
123	0.1881	0.4822	3.3787	6.2095	23.0421
126	0.2239	0.5739	4.0215	7.3910	30.6641
127	0.2239	0.5739	4.0215	7.3910	30.6641
130	0.1345	0.3449	2.4167	4.4416	15.8823
132	0.0417	0.1069	0.7493	1.3771	4.6320
136	0.1997	0.5120	3.5879	6.5940	27.2577
137	0.1997	0.5120	3.5879	6.5940	27.2577
138	0.1169	0.2998	2.1007	3.8607	13.1693
140	0.0611	0.1566	1.0975	2.0171	6.8427
142	0.1919	0.5095	3.1917	5.1456	16.2720
146	0.0392	0.1004	0.7038	1.2935	4.4175
148	0.0858	0.2200	1.5412	2.8326	9.7570
150	0.0984	0.2524	1.7684	3.2500	10.0339
152	0.0347	0.0888	0.6225	1.1440	3.5320
155	0.0661	0.1695	1.1874	2.1823	10.9344
157	0.1154	0.2959	2.0734	3.8106	15.4768
158	0.0260	0.0667	0.4673	0.8588	2.3007
160	0.0948	0.2430	1.7025	3.1289	8.3267
165	0.0345	0.0886	0.6206	1.1407	5.2944
167	0.0188	0.0481	0.3372	0.6197	2.8847
168	0.1026	0.2632	1.8440	3.3889	13.7125
171	0.0113	0.0289	0.2023	0.3718	1.4633
173	0.0328	0.0840	0.5884	1.0814	4.2592
174	0.0197	0.0505	0.3538	0.6501	3.4222
182	0.0409	0.1048	0.7343	1.3495	5.3014
183	0.0272	0.0698	0.4894	0.8995	3.7559
192	0.0061	0.0156	0.1093	0.2009	0.7839
194	0.0278	0.0713	0.4999	0.9187	3.5880
195	0.0164	0.0421	0.2951	0.5424	2.9378
Total	8.6501	22.4056	152.0287	269.7236	1,047.8812

Table 11. Predicted Freeway Segment Crash Type Distribution (Section 1)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	9.94	0.1	102.92	0.7	112.86	0.8
Highway Segment	Collision with Fixed Object	1,793.65	12.2	3,349.55	22.8	5,143.19	35.1
Highway Segment	Collision with Other Object	126.70	0.9	650.26	4.4	776.96	5.3
Highway Segment	Other Single-vehicle Collision	516.73	3.5	500.56	3.4	1,017.29	6.9
Highway Segment	Collision with Parked Vehicle	37.26	0.3	74.85	0.5	112.11	0.8
Highway Segment	Total Single Vehicle Crashes	2,484.28	16.9	4,678.14	31.9	7,162.41	48.8
Highway Segment	Right-Angle Collision	77.44	0.5	90.17	0.6	167.60	1.1
Highway Segment	Head-on Collision	19.98	0.1	10.02	0.1	30.00	0.2
Highway Segment	Other Multi-vehicle Collision	77.44	0.5	120.22	0.8	197.66	1.3
Highway Segment	Rear-end Collision	1,873.49	12.8	3,456.36	23.6	5,329.85	36.3
Highway Segment	Sideswipe, Same Direction Collision	449.64	3.1	1,332.45	9.1	1,782.09	12.1
Highway Segment	Total Multiple Vehicle Crashes	2,497.98	17.0	5,009.22	34.1	7,507.21	51.2
Highway Segment	Total Highway Segment Crashes	4,982.26	34.0	9,687.36	66.0	14,669.62	100.0
	Total Crashes	4,982.26	34.0	9,687.36	66.0	14,669.62	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 12. Predicted Exit Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	3.57	0.5	3.57	0.5
Highway Segment	Collision with Fixed Object	39.27	5.5	105.60	14.9	144.88	20.4
Highway Segment	Collision with Other Object	3.21	0.5	15.30	2.2	18.51	2.6
Highway Segment	Other Single-vehicle Collision	9.82	1.4	11.73	1.7	21.55	3.0
Highway Segment	Collision with Parked Vehicle	0.00	0.0	0.00	0.0	0.00	0.0
Highway Segment	Total Single Vehicle Crashes	52.30	7.4	136.21	19.2	188.51	26.5
Highway Segment	Right-Angle Collision	2.20	0.3	6.12	0.9	8.33	1.2
Highway Segment	Head-on Collision	1.00	0.1	1.02	0.1	2.02	0.3
Highway Segment	Other Multi-vehicle Collision	3.21	0.5	8.16	1.1	11.37	1.6
Highway Segment	Rear-end Collision	110.00	15.5	288.24	40.6	398.24	56.0
Highway Segment	Sideswipe, Same Direction Collision	31.66	4.5	70.40	9.9	102.06	14.4
Highway Segment	Total Multiple Vehicle Crashes	148.07	20.8	373.94	52.6	522.02	73.5
Highway Segment	Total Highway Segment Crashes	200.37	28.2	510.15	71.8	710.52	100.0
	Total Crashes	200.37	28.2	510.15	71.8	710.52	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 13. Predicted Entrance Speed Change Lane Crash Type Distribution (Speed Change)

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Highway Segment	Collision with Animal	0.00	0.0	1.12	0.1	1.12	0.1
Highway Segment	Collision with Fixed Object	51.62	6.3	72.10	8.7	123.72	15.0
Highway Segment	Collision with Other Object	5.05	0.6	20.12	2.4	25.18	3.1
Highway Segment	Other Single-vehicle Collision	17.83	2.2	8.94	1.1	26.77	3.2
Highway Segment	Collision with Parked Vehicle	1.06	0.1	1.68	0.2	2.74	0.3
Highway Segment	Total Single Vehicle Crashes	75.56	9.2	103.96	12.6	179.53	21.8
Highway Segment	Right-Angle Collision	5.05	0.6	8.94	1.1	14.00	1.7
Highway Segment	Head-on Collision	1.06	0.1	0.56	0.1	1.62	0.2
Highway Segment	Other Multi-vehicle Collision	4.52	0.5	8.38	1.0	12.91	1.6
Highway Segment	Rear-end Collision	144.48	17.5	296.23	35.9	440.71	53.4
Highway Segment	Sideswipe, Same Direction Collision	35.39	4.3	140.85	17.1	176.24	21.4
Highway Segment	Total Multiple Vehicle Crashes	190.51	23.1	454.97	55.1	645.48	78.2
Highway Segment	Total Highway Segment Crashes	266.07	32.3	558.93	67.7	825.00	100.0
	Total Crashes	266.07	32.3	558.93	67.7	825.00	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 14. Evaluation Message

Start Location (Sta. ft)	End Location (Sta. ft)	Message
88+50.570	92+73.870	for segment #9 (88+50.570 to 92+73.870), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
114+92.280	116+12.410	for segment #11 (114+92.280 to 116+12.410), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
159+52.850	160+55.670	for segment #13 (159+52.850 to 160+55.670), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
182+04.980	190+78.150	for segment #15 (182+04.980 to 190+78.150), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
234+73.270	235+38.500	for segment #17 (234+73.270 to 235+38.500), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
376+84.690	377+09.150	for segment #24 (376+84.690 to 377+09.150), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
401+43.300	410+45.320	for segment #26 (401+43.300 to 410+45.320), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
430+10.320	431+12.710	for segment #28 (430+10.320 to 431+12.710), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
444+62.420	446+92.250	for segment #30 (444+62.420 to 446+92.250), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
466+93.140	473+45.480	for segment #32 (466+93.140 to 473+45.480), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
473+45.480	487+68.410	for segment #33 (473+45.480 to 487+68.410), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
487+68.410	494+75.370	for segment #34 (487+68.410 to 494+75.370), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
518+49.370	522+06.730	for segment #38 (518+49.370 to 522+06.730), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
590+45.470	624+72.020	for segment #42 (590+45.470 to 624+72.020), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
624+72.020	628+07.980	for segment #44 (624+72.020 to 628+07.980), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
651+65.010	660+88.730	for segment #49 (651+65.010 to 660+88.730), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
660+88.730	667+93.530	for segment #50 (660+88.730 to 667+93.530), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
761+78.560	773+07.600	for segment #52 (761+78.560 to 773+07.600), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
773+07.600	806+52.740	for segment #54 (773+07.600 to 806+52.740), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
806+52.740	807+42.600	for segment #56 (806+52.740 to 807+42.600), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
807+42.600	813+44.180	for segment #58 (807+42.600 to 813+44.180), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
872+94.110	873+42.940	for segment #60 (872+94.110 to 873+42.940), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway

Start Location (Sta. ft)	End Location (Sta. ft)	Message
921+17.280	946+88.890	for segment #64 (921+17.280 to 946+88.890), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
946+88.890	983+35.310	for segment #66 (946+88.890 to 983+35.310), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
983+35.310	986+82.810	for segment #67 (983+35.310 to 986+82.810), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1075+52.580	1079+97.540	for segment #78 (1075+52.580 to 1079+97.540), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1116+60.530	1118+47.190	for segment #83 (1116+60.530 to 1118+47.190), traffic volume (180,782 vpd) for 2031 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
1116+60.530	1118+47.190	for segment #83 (1116+60.530 to 1118+47.190), traffic volume (183,475 vpd) for 2032 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
1116+60.530	1118+47.190	for segment #83 (1116+60.530 to 1118+47.190), traffic volume (186,167 vpd) for 2033 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
1116+60.530	1118+47.190	for segment #83 (1116+60.530 to 1118+47.190), traffic volume (188,860 vpd) for 2034 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
1116+60.530	1118+47.190	for segment #83 (1116+60.530 to 1118+47.190), traffic volume (191,552 vpd) for 2035 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
1116+60.530	1118+47.190	for segment #83 (1116+60.530 to 1118+47.190), traffic volume (194,245 vpd) for 2036 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
1116+60.530	1118+47.190	for segment #83 (1116+60.530 to 1118+47.190), traffic volume (196,937 vpd) for 2037 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
1116+60.530	1118+47.190	for segment #83 (1116+60.530 to 1118+47.190), traffic volume (199,630 vpd) for 2038 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
1116+60.530	1118+47.190	for segment #83 (1116+60.530 to 1118+47.190), traffic volume (202,322 vpd) for 2039 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
1116+60.530	1118+47.190	for segment #83 (1116+60.530 to 1118+47.190), traffic volume (205,015 vpd) for 2040 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
1116+60.530	1118+47.190	for segment #83 (1116+60.530 to 1118+47.190), traffic volume (207,707 vpd) for 2041 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
1116+60.530	1118+47.190	for segment #83 (1116+60.530 to 1118+47.190), traffic volume (210,400 vpd) for 2042 exceeds model limit (180,000 vpd) for reliable results for segment type 6F
1173+14.860	1184+67.050	for segment #93 (1173+14.860 to 1184+67.050), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1184+67.050	1189+27.220	for segment #94 (1184+67.050 to 1189+27.220), Freeway Segment of type Eight-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Ten-lane Freeway
1189+27.220	1229+20.230	for segment #95 (1189+27.220 to 1229+20.230), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1229+20.230	1246+54.550	for segment #97 (1229+20.230 to 1246+54.550), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1246+54.550	1257+20.070	for segment #99 (1246+54.550 to 1257+20.070), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1257+20.070	1268+72.230	for segment #100 (1257+20.070 to 1268+72.230), Freeway Segment of type Eight-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Ten-lane Freeway
1384+38.980	1388+36.180	for segment #114 (1384+38.980 to 1388+36.180), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1407+00.830	1407+99.290	for segment #116 (1407+00.830 to 1407+99.290), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1407+99.290	1458+80.350	for segment #117 (1407+99.290 to 1458+80.350), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1458+80.350	1459+28.940	for segment #119 (1458+80.350 to 1459+28.940), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1459+28.940	1485+21.570	for segment #121 (1459+28.940 to 1485+21.570), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1524+23.110	1548+51.750	for segment #129 (1524+23.110 to 1548+51.750), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1567+03.620	1569+20.770	for segment #134 (1567+03.620 to 1569+20.770), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1569+20.770	1597+23.110	for segment #135 (1569+20.770 to 1597+23.110), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1597+23.110	1600+07.160	for segment #139 (1597+23.110 to 1600+07.160), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1600+07.160	1622+13.430	for segment #141 (1600+07.160 to 1622+13.430), Freeway Segment of type Nine-lane Freeway is using unbalanced lane processing with types Eight-lane Freeway and Ten-lane Freeway
1622+13.430	1622+60.330	for segment #143 (1622+13.430 to 1622+60.330), Freeway Segment of type Eight-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Ten-lane Freeway
1622+60.330	1693+03.680	for segment #144 (1622+60.330 to 1693+03.680), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1693+03.680	1695+79.250	for segment #145 (1693+03.680 to 1695+79.250), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1758+35.390	1765+64.940	for segment #149 (1758+35.390 to 1765+64.940), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1823+66.040	1829+76.930	for segment #159 (1823+66.040 to 1829+76.930), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
1848+64.940	1848+81.480	for segment #162 (1848+64.940 to 1848+81.480), Freeway Segment of type Eight-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Ten-lane Freeway
2027+95.160	2037+89.330	for segment #175 (2027+95.160 to 2037+89.330), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
2126+91.660	2127+16.900	for segment #177 (2126+91.660 to 2127+16.900), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
2163+05.440	2163+09.560	for segment #179 (2163+05.440 to 2163+09.560), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
2577+64.980	2578+84.390	for segment #185 (2577+64.980 to 2578+84.390), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
2652+16.980	2653+16.980	for segment #187 (2652+16.980 to 2653+16.980), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
2905+85.060	2919+19.840	for segment #189 (2905+85.060 to 2919+19.840), Freeway Segment of type Seven-lane Freeway is using unbalanced lane processing with types Six-lane Freeway and Eight-lane Freeway
487+68.410	494+75.370	for segment #35 (487+68.410 to 494+75.370), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
590+45.470	592+86.090	for segment #43 (590+45.470 to 592+86.090), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
624+72.020	628+07.980	for segment #45 (624+72.020 to 628+07.980), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
761+78.560	769+28.560	for segment #53 (761+78.560 to 769+28.560), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
799+92.600	806+52.740	for segment #55 (799+92.600 to 806+52.740), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
806+52.740	807+42.600	for segment #57 (806+52.740 to 807+42.600), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
939+38.890	946+88.890	for segment #65 (939+38.890 to 946+88.890), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change

Start Location (Sta. ft)	End Location (Sta. ft)	Message
983+35.310	986+82.810	for segment #68 (983+35.310 to 986+82.810), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
1075+52.580	1079+97.540	for segment #79 (1075+52.580 to 1079+97.540), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
1116+60.530	1118+47.190	for segment #84 (1116+60.530 to 1118+47.190), traffic volume (180,782 vpd) for 2031 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #84 (1116+60.530 to 1118+47.190), traffic volume (183,475 vpd) for 2032 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #84 (1116+60.530 to 1118+47.190), traffic volume (186,167 vpd) for 2033 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #84 (1116+60.530 to 1118+47.190), traffic volume (188,860 vpd) for 2034 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #84 (1116+60.530 to 1118+47.190), traffic volume (191,552 vpd) for 2035 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #84 (1116+60.530 to 1118+47.190), traffic volume (194,245 vpd) for 2036 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #84 (1116+60.530 to 1118+47.190), traffic volume (196,937 vpd) for 2037 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #84 (1116+60.530 to 1118+47.190), traffic volume (199,630 vpd) for 2038 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #84 (1116+60.530 to 1118+47.190), traffic volume (202,322 vpd) for 2039 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #84 (1116+60.530 to 1118+47.190), traffic volume (205,015 vpd) for 2040 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #84 (1116+60.530 to 1118+47.190), traffic volume (207,707 vpd) for 2041 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #84 (1116+60.530 to 1118+47.190), traffic volume (210,400 vpd) for 2042 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #85 (1116+60.530 to 1118+47.190), traffic volume (180,782 vpd) for 2031 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #85 (1116+60.530 to 1118+47.190), traffic volume (183,475 vpd) for 2032 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #85 (1116+60.530 to 1118+47.190), traffic volume (186,167 vpd) for 2033 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #85 (1116+60.530 to 1118+47.190), traffic volume (188,860 vpd) for 2034 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #85 (1116+60.530 to 1118+47.190), traffic volume (191,552 vpd) for 2035 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #85 (1116+60.530 to 1118+47.190), traffic volume (194,245 vpd) for 2036 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #85 (1116+60.530 to 1118+47.190), traffic volume (196,937 vpd) for 2037 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #85 (1116+60.530 to 1118+47.190), traffic volume (199,630 vpd) for 2038 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #85 (1116+60.530 to 1118+47.190), traffic volume (202,322 vpd) for 2039 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #85 (1116+60.530 to 1118+47.190), traffic volume (205,015 vpd) for 2040 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #85 (1116+60.530 to 1118+47.190), traffic volume (207,707 vpd) for 2041 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1116+60.530	1118+47.190	for segment #85 (1116+60.530 to 1118+47.190), traffic volume (210,400 vpd) for 2042 exceeds model limit (180,000 vpd) for reliable results for segment type 6SC
1221+70.230	1229+20.230	for segment #96 (1221+70.230 to 1229+20.230), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
1239+04.550	1246+54.550	for segment #98 (1239+04.550 to 1246+54.550), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
1407+99.290	1415+49.290	for segment #118 (1407+99.290 to 1415+49.290), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
1458+80.350	1459+28.940	for segment #120 (1458+80.350 to 1459+28.940), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
1459+28.940	1466+30.350	for segment #122 (1459+28.940 to 1466+30.350), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
1459+28.940	1466+78.940	for segment #123 (1459+28.940 to 1466+78.940), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change

Start Location (Sta. ft)	End Location (Sta. ft)	Message
1542+57.160	1548+51.750	for segment #130 (1542+57.160 to 1548+51.750), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
1569+20.770	1576+70.770	for segment #136 (1569+20.770 to 1576+70.770), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
1589+73.110	1597+23.110	for segment #137 (1589+73.110 to 1597+23.110), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
1592+57.160	1597+23.110	for segment #138 (1592+57.160 to 1597+23.110), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
1597+23.110	1600+07.160	for segment #140 (1597+23.110 to 1600+07.160), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
1614+63.430	1622+13.430	for segment #142 (1614+63.430 to 1622+13.430), Speed Change Segment of type Nine-lane Freeway Speed Change is using unbalanced lane processing with types Eight-lane Freeway Speed Change and Ten-lane Freeway Speed Change
1693+03.680	1695+79.250	for segment #146 (1693+03.680 to 1695+79.250), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
1760+10.210	1765+64.940	for segment #150 (1760+10.210 to 1765+64.940), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change
1823+66.040	1829+76.930	for segment #160 (1823+66.040 to 1829+76.930), Speed Change Segment of type Seven-lane Freeway Speed Change is using unbalanced lane processing with types Six-lane Freeway Speed Change and Eight-lane Freeway Speed Change

Appendix G

Technology Report

Reimagine I-10 Corridor Study

Technology Report

CSJ: 2121-01-095

September 2019

Table of Contents

List of Figures

List of Tables

1. Introduction

1.1 Defining the Study Area

Texas Department of Transportation (TxDOT) in coordination with, El Paso Metropolitan Planning Organization (MPO), and City of El Paso is conducting a study of the Interstate Highway 10 (I-10) Corridor from the New Mexico Stateline to FM 3380 (Aguilera International Highway) (Figure 1). The study's purpose is to analyze current and future transportation needs for the El Paso I-10 Corridor.

Figure 1. I-10 Study Limits

1.2 Study Objectives

The overall objective of this study is to conduct a corridor feasibility and planning analysis of current and future transportation needs for the approximate 55 miles of the I-10 Corridor in El Paso from the New Mexico State Line to FM 3380 (M.F. Aguilera Rd).

The objective of this technical memorandum is to provide an assessment and recommendations for transportation technology options within this corridor as part of the overall feasibility and planning analysis.

2. Corridor Characteristics

This corridor is highly traveled by both passenger and commercial vehicles. When considering transportation technology options for the corridor, it is important to have an understanding and a sense of the current traffic conditions along the corridor. One important component is to understand the utilization of the corridor by passenger vehicles versus commercial vehicle or truck traffic as there could potentially be different technology options that are more suitable for one versus the other. Much of the traffic conditions and future traffic projections for the corridor have been documented as part of the overall project with only a brief summary included below.

2.1 Corridor Configuration Overview

To better evaluate the elements of the corridor, the corridor was broken into four segments (Figure 2), or context areas, to identify unique characteristics and needs specific to that segment which may not be applicable to the entire project area. The four segments are as follows:

- Segment 1: Northern Gateway (New Mexico State Line to Executive Center Boulevard)
- Segment 2: Downtown (Executive Center Boulevard to US 54)
- Segment 3: Airport (US 54 to Loop 375)
- Segment 4: Southern Gateway (Loop 375 to FM 3380).

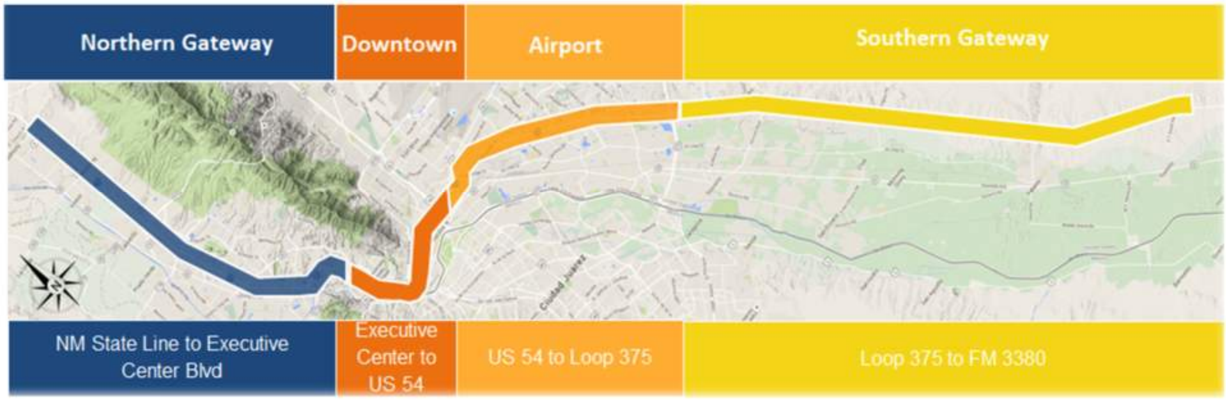

Figure 2. I-10 Segments

HDR was given a travel demand model for the state of Texas created by Alliance Transportation Group, Inc. for TxDOT. The Texas Statewide Analysis Model Version 3 (SAM-V3) model includes scenarios for the year 2010, 2020, 2030, and 2040. The SAM model is based on the four-step model and is a multimodal travel demand model that focuses on forecasting traffic volumes for passenger and freight transportation, rail ridership, freight rail tonnage, and train and rail projections. The interface includes the model steps of Network Update, Trip Generation, Freight Trip Generation, Trip Distribution, Freight Trip Distribution, Mode Choice, Freight Mode Choice, Assignment, Optional Assignment, and Reports.

2.2 Existing Traffic Conditions

I-10 Segment	Length (mi)	Speed Limit (mph)	Average Travel Speed (mph)	Speed Limit - Average Speed (mph)	Ramp Density (per mile)	Crashed (per mile - 5 yr avg)
Segment 1	16.3	75	61	14	1	12
Segment 2	7	60	35	25	2.1	27
Segment 3	12.3	60	49	11	1.9	25
Segment 4	22.5	75	71	4	0.5	4

gives an overview of the current characteristics of each of the four segments of I-10, including the segment length, speed limit, average speed, ramp density, and crashes per mile. Segment 2 is the shortest, has the largest difference between speed limit and average speed, and the highest ramp density and crashes per mile. On the contrary, Segment 4 is the longest and has the lowest ramp density, crashes per mile, and difference between speed limit and average speed.

Table 1. Overview of I-10 Segment Characteristics

I-10 Segment	Length (mi)	Speed Limit (mph)	Average Travel Speed (mph)	Speed Limit - Average Speed (mph)	Ramp Density (per mile)	Crashed (per mile - 5 yr avg)
Segment 1	16.3	75	61	14	1	12
Segment 2	7	60	35	25	2.1	27
Segment 3	12.3	60	49	11	1.9	25
Segment 4	22.5	75	71	4	0.5	4

(a) Traffic Volume (AADT)

Traffic data for the four segments of the I-10 mainline was collected for four time periods. The time periods reflect those used in the MPO's travel demand model: 6:30-8:30AM, 8:30AM-2:30PM, 2:30PM-6:30PM, and 6:30PM-6:30AM. Volumes were captured by vehicle class and summarized into car and truck traffic. Tables 2 and 3 show the traffic volume and percentage of truck traffic by time of day for the westbound and eastbound segments of I-10. The values are shaded to reflect the magnitude of the value with dark shading representing the highest values. The morning and midday volumes are the highest across all segments of the corridor while Segment 4 experiences the lowest volume and the highest percentage of truck traffic.

Table 2. I-10 Westbound Travel Volumes

Time of Day	Segment 1 EB		Segment 2 EB		Segment 3 EB		Segment 4 EB	
	Volume (veh/hr)	% Trucks	Volume (veh/hr)	% Trucks	Volume (veh/hr)	% Trucks	Volume (veh/hr)	% Trucks
6:30 AM to 8:30 AM	2642	11%	6935	3%	6160	6%	1120	14%
8:30 AM to 2:30 PM	2240	18%	5324	5%	4539	11%	895	29%
2:20 PM to 6:30 PM	1292	14%	2395	5%	2354	10%	478	26%
6:30 PM to 6:30 AM	1454	13%	2203	5%	2432	9%	522	29%

Table 3. I-10 Eastbound Traffic Volumes

Time of Day	Segment 1 EB		Segment 2 EB		Segment 3 EB		Segment 4 EB	
	Volume (veh/hr)	% Trucks	Volume (veh/hr)	% Trucks	Volume (veh/hr)	% Trucks	Volume (veh/hr)	% Trucks
6:30 AM to 8:30 AM	2415	7%	5560	4%	4145	6%	700	21%
8:30 AM to 2:30 PM	2319	14%	6172	8%	4952	10%	699	36%
2:20 PM to 6:30 PM	1285	13%	3795	6%	2920	9%	436	32%
6:30 PM to 6:30 AM	1377	14%	3742	7%	3146	8%	541	31%

(b) Travel Patterns

The travel patterns for each segment of the corridor were studied by tracking destinations of vehicles traveling on I-10. Most heavily used eastbound exits include Old Hueco Tanks Road for cars and Horizon Boulevard for both cars and trucks. On the Westbound segment, the Sunland Park Drive and Horizon Boulevard exits experience the heaviest traffic of passenger cars and trucks. Figures 3 through 6 show the breakdown of the exits used by local car and truck traffic as well as the percentages of through traffic for each segment.

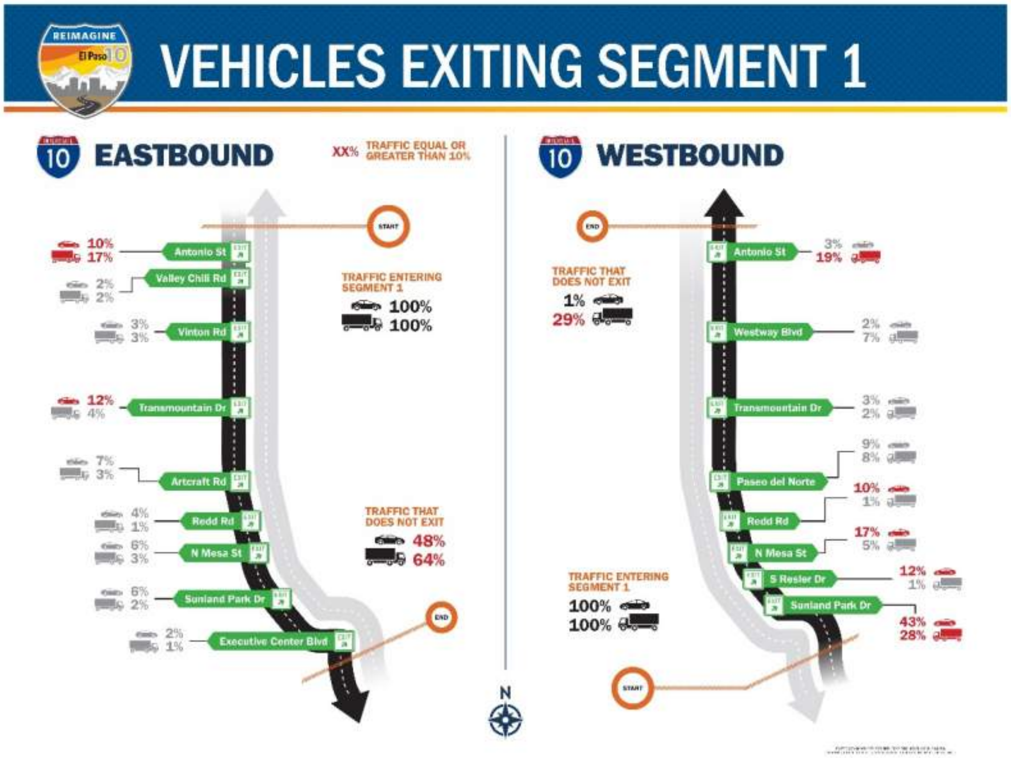

Figure 3. I-10 Segment 1 Local Traffic Patterns

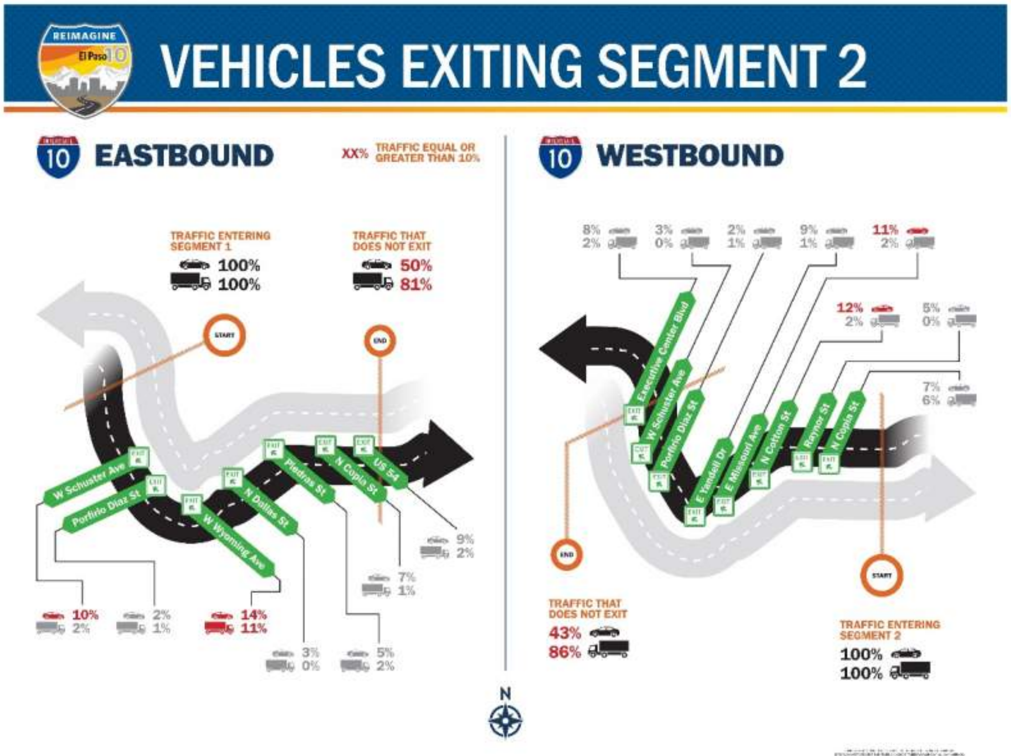

Figure 4. I-10 Segment 2 Local Traffic Patterns

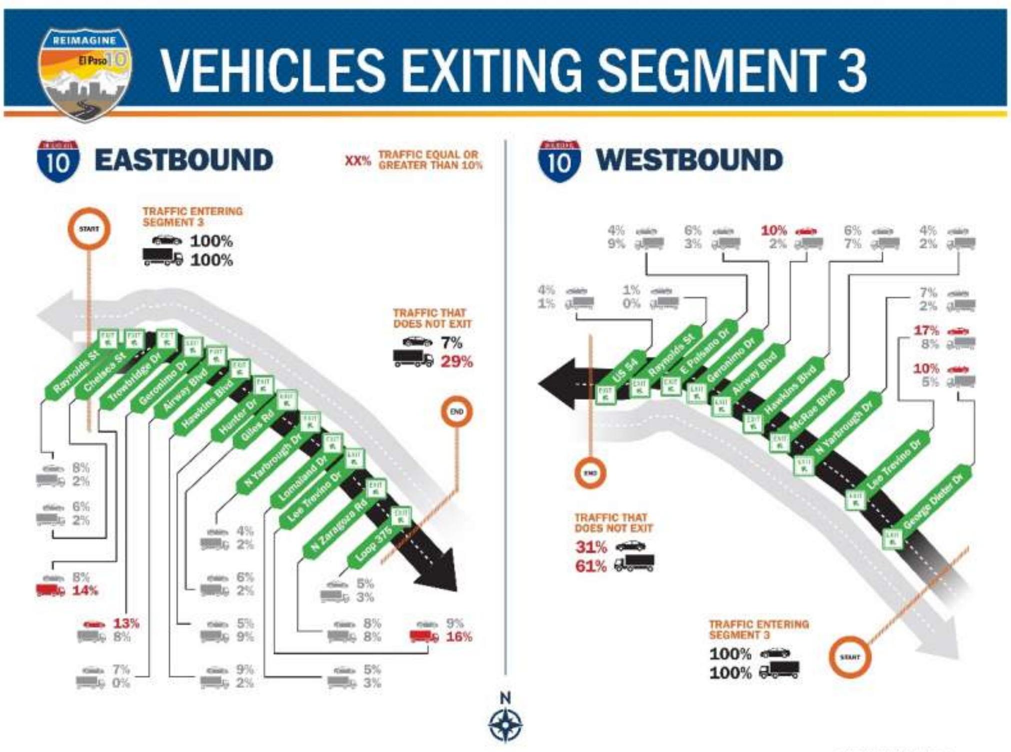

Figure 5. I-10 Segment 3 Local Traffic Patterns

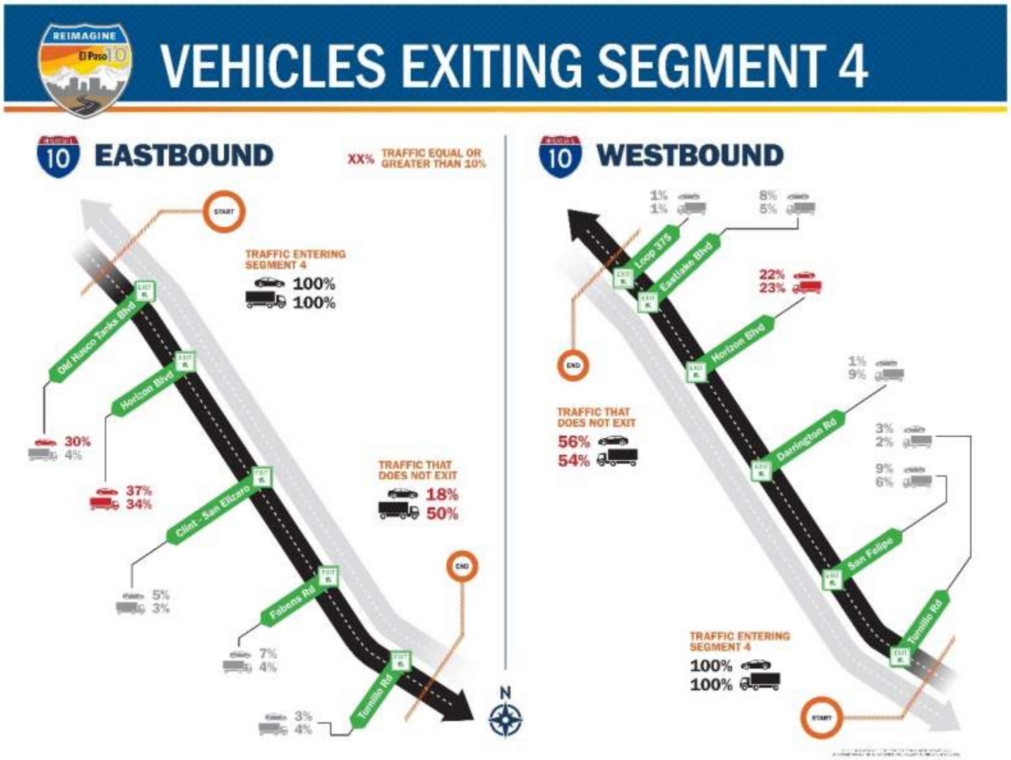

Figure 6. I-10 Segment 4 Local Traffic Patterns

(c) Mix of Traffic (Commuter, Local, Long-Distance, Trucks)

Traffic along the I-10 corridor is made up of local and long-distance passenger car and truck traffic. **Figure 7** shows the distribution of local and through traffic for both vehicle categories on I-10 Eastbound and Westbound. As expected, more through traffic was observed for trucks than cars in both directions.

Figure 7. I-10 Local and Through Traffic Distribution

2.3 Summary of Current Corridor Technologies

TxDOT El Paso district has been implementing numerous ITS technologies and solutions on the I-10 corridor. The current deployment includes fiber optic communication, video surveillance, speed monitoring and data sharing with other agencies. The current breakdown of ITS technology deployed throughout the I-10 corridor is as follows:

- CCTV Cameras: 38 cameras currently monitor 37 miles of the corridor starting at the New Mexico state line and end at Horizon Blvd.
- Dynamic Message Signs (DMS): 25 signs provide information to the traveling public beginning at Westway Blvd and ending at Horizon Blvd.
- Vehicle Detectors: 141 detectors are stationed on 37 miles of the corridor starting at the New Mexico state line and end at Horizon Blvd.
- Lane Control Signals: 34 LCS stations from Country Club Rd. to Horizon Blvd.
- Highway Advisory Radio: 9 controllers and 8 beacons provide information to tune in to a preset station on the travelers radio.

The data received from these devices is transmitted to the TxDOT TransVista TMC and shared with the City of El Paso's TMC and 911 emergency center which includes Police, Fire and EMS.

The utilization of traditional ITS technologies can facilitate a smoother transition into AV/CV. The existing ITS infrastructure can support the AV/CV hardware by mounting to the camera/detector poles and utilizing the same sources for power and communications backhaul as the existing ITS systems. This coordination is key to providing seamless implementation of future advancements in connected vehicles.

With expanding technology and ITS infrastructures, being able to provide a system that is can adjust with additional networked devices is critical. To facilitate new technologies, TxDOT should ensure that legacy ITS technology is upgraded to include Ethernet based IP networking, has dedicated power, and has expansion capabilities so that new technologies that require Power-over-Ethernet (POE) and a communications backhaul such as Dedicated Short Range Communications (DSRC) or 5G microcells can be readily added.

(a) Closed Circuit Television (CCTV) Cameras

CCTV cameras provide visual traffic monitoring and incident verification that can be shared with various agencies and the traveling public. There are two variations of CCTV camera technology, analog and digital, which is typically implemented through an Internet Protocol (IP) communications bridge. As technology has progressed, analog video feeds are no longer the preferred technology as digital, IP based technology has the following advantages:

- **Resolution:** High definition digital IP cameras provide higher zoom-in capabilities and details for traffic incident management.

- **Resource Sharing:** Video feeds are already digitized at the camera, providing that video to other agencies and the traveling public will be easier and not require extra hardware that an analog camera system would typically use.

- **Less Hardware:** Analog systems require two fiber optic strands per camera, however with digital, IP based systems multiple cameras can utilize the same fiber optic strands. This enables the use of the fiber optic strands for other purposes in addition to reducing the amount of equipment required at the local cabinet, satellite cabinets and TMC.

- **Expandability:** Because the images and video are digital, they can be readily analyzed by computer software for image recognition to enable vehicle detection, incident detection, vehicle classifications, and vehicle counts (see **Section 3.3.a**).

Currently, the existing CCTV cameras along the corridor are analog-based (see **Figure 8**). As funding and resources permit, these systems should be replaced with digital-IP based systems. Future camera deployments should be digital-IP based.

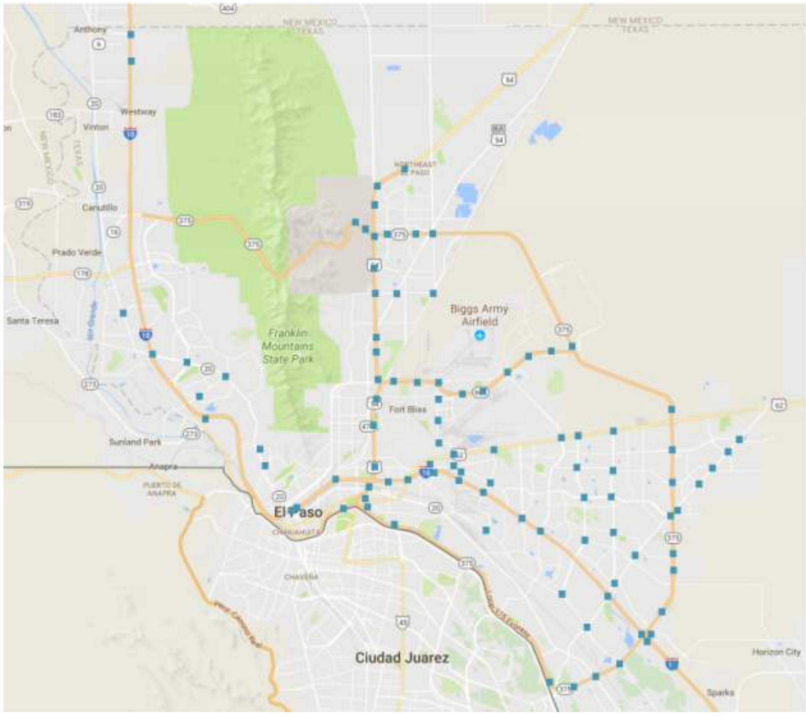

Figure 8. Map of Existing CCTV Locations

(b) Dynamic Message Signs

DMS technology has progressed in the past years and more agencies are switching to a high-resolution full color LED. A potential benefit of this technology is the customization of the message to include MUTCD compliant graphics. These graphics are thought to do a better job of getting the attention of the traveling public over traditional monochrome three-line text. This in turn, could lead to a faster response time to avoid incidents and decrease travel delays. The current signs on the corridor are character and line matrix amber LED (see Figure 9 for locations). DMS are a key part of Active Traffic Management applications as the signs can provide lane specific information (i.e. dynamic lane assignments), assist with lane closures due to planned roadwork, and incident management. The Lane Use DMS would allow more detailed information over each lane during an incident vs. the existing lane control signals which only provide open/closed status. Connected and autonomous vehicles would also be able to receive the information from these signs and display them internally to provide instant updates to the passengers.

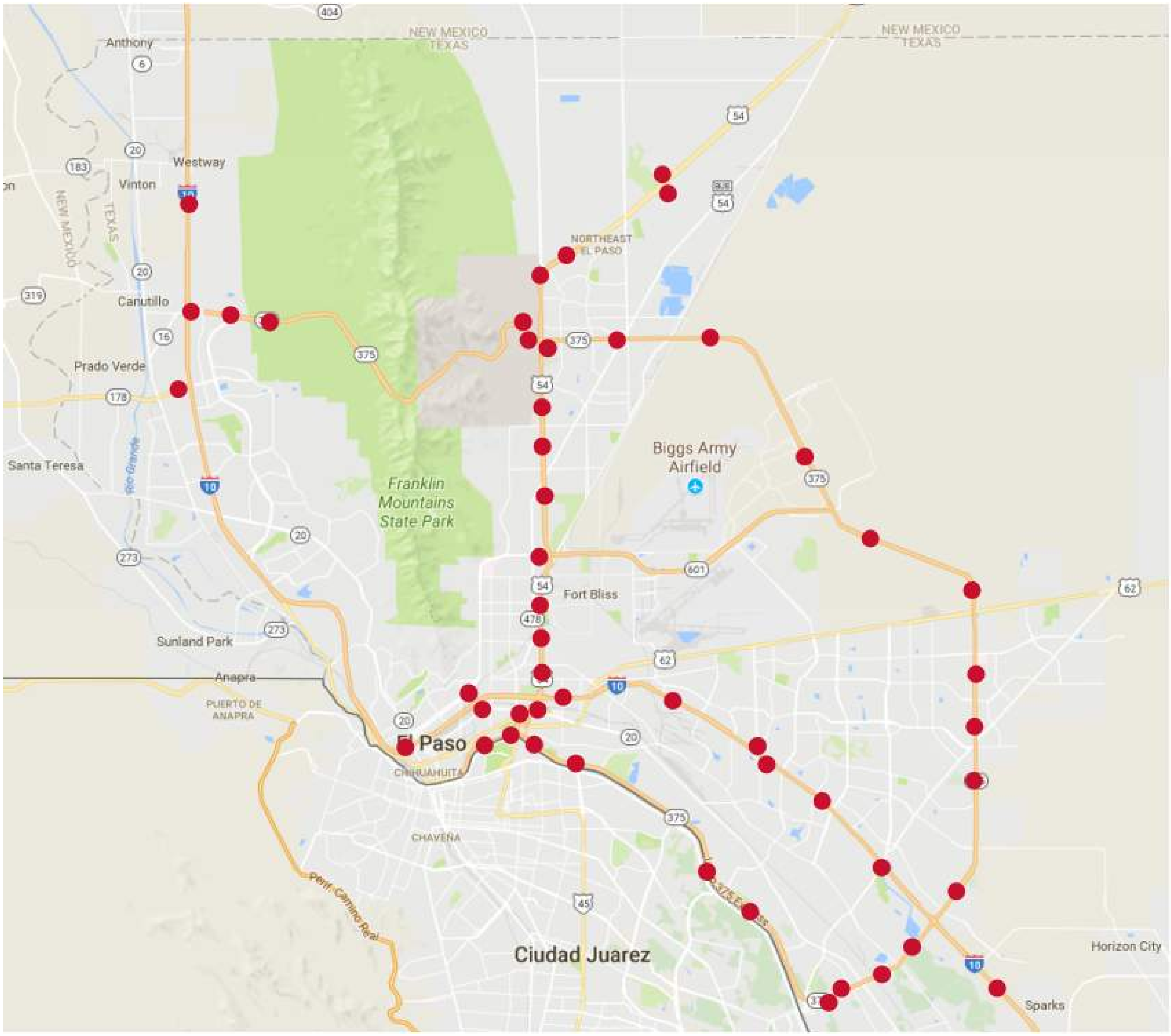

Figure 9. Map of Existing DMS Locations

(c) Vehicle Detection Sensors

Microwave vehicle detection provides accurate speed data to the TMC and also the data can be shared with both public and private partners such as Google and Waze. These sensors are commonly used in conjunction with the CCTV cameras to identify incidents. In addition, these types of sensors can be placed to monitor queues within on-ramps or on arterials for incident detection and traffic queues. Currently, a number of radar detection devices offer built in cameras for detection lane verification and to offer additional video coverage. El Paso is moving to these types of detectors, which will provide more ways to improve traffic management.

El Paso also utilizes Bluetooth technology for vehicle detection. The Bluetooth sensors are installed in the same locations as the microwave sensors and also provide vehicle detection and speeds. However, because the Bluetooth sensors at multiple locations can be linked (see Section 3.3.b below) these sensors can be used to estimate travel times and to provide origin/destination information.

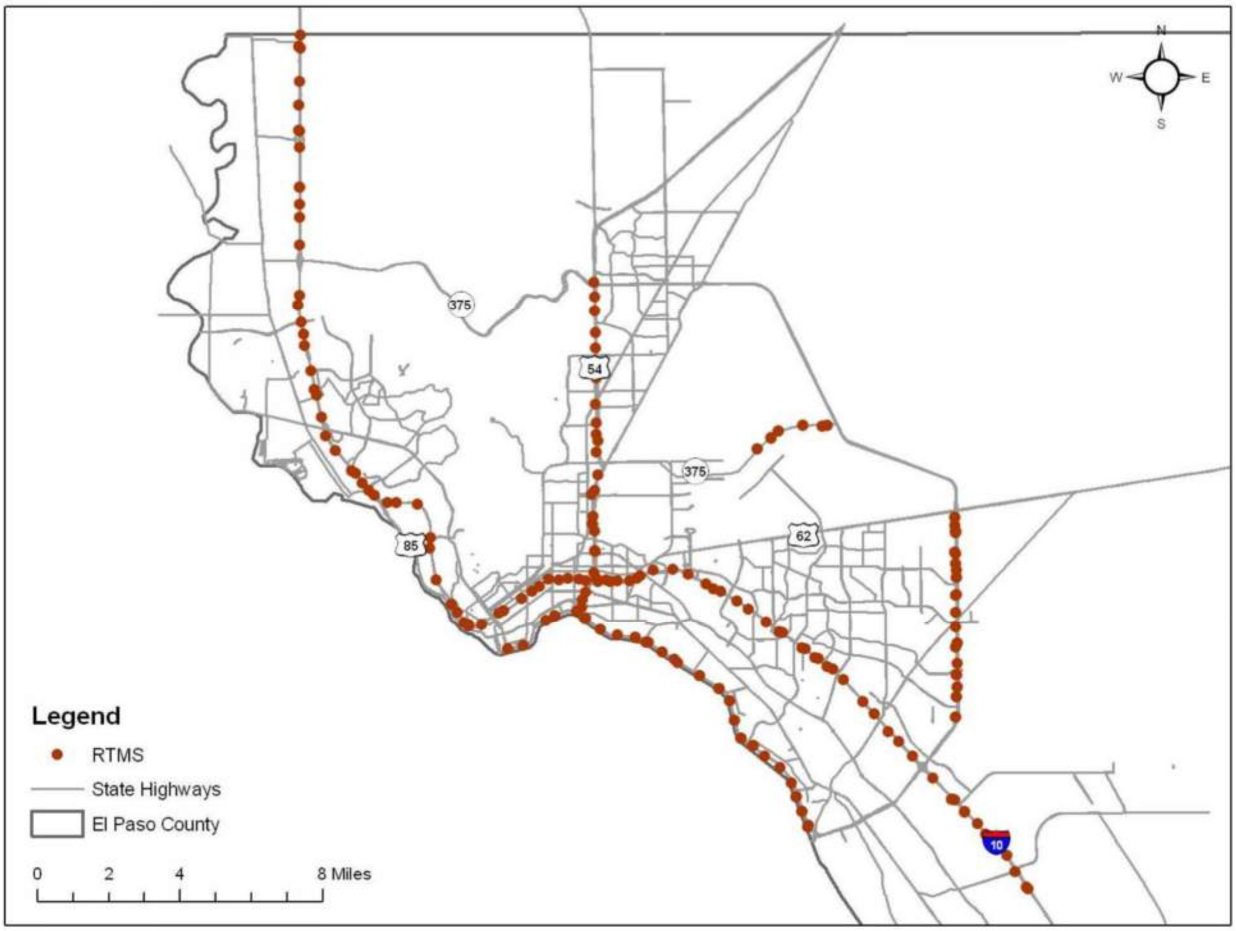

Figure 10. Locations of Existing Microwave Vehicle Detectors[1]

(d) Traveler Information Systems

TxDOT's Travel Information Division supports a number of information systems that provide real-time information on the conditions of roadways throughout Texas, including the I-10 Corridor. One such

[1] Final Technical Memorandum May 26, 2010, prepared for TxDOT by Texas Transportation Institute

tool is the DriveTexas™ portal that is available as a web or mobile application that provides historical and current traffic conditions throughout Texas. Information such as road closures, traffic, and construction are displayed as information layers on an interactive map (Figure 11).

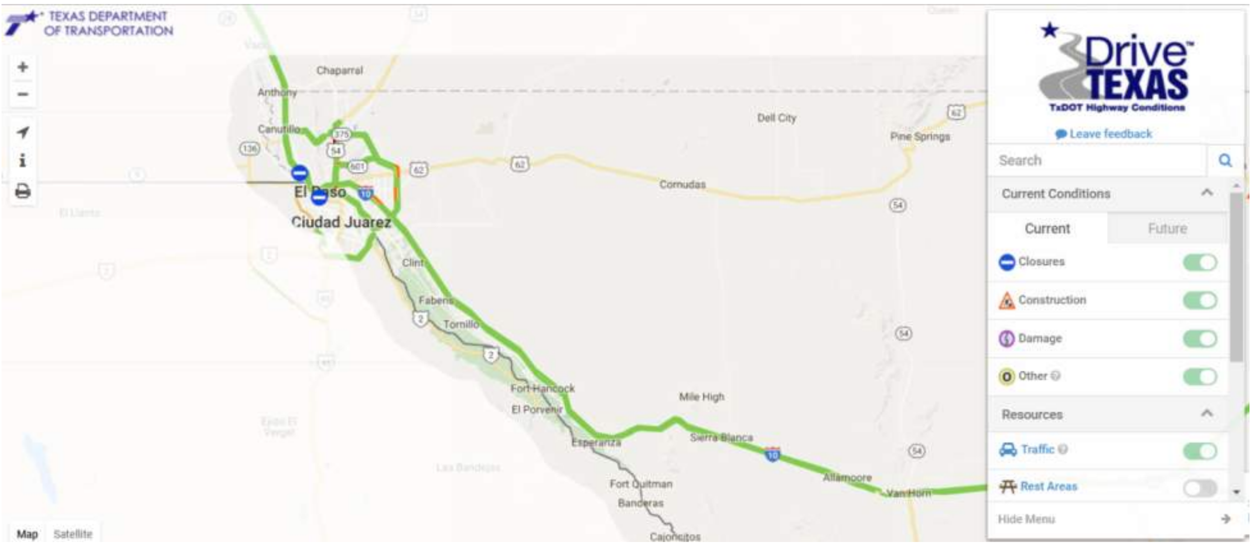

Figure 11. Screenshot of TxDOT's DriveTexas™ Traveler Information Portal

(i) Trip Planning Application (Mobile Devices)

Within El Paso, there are a number of different trip planning applications and tools. One in particular is SunMetro's Trip Planner tool. This tool enables trip planning for the area's mass transit system, which is an alternative mode for travel on I-10 within the city. However, this trip planning application does not integrate with traffic conditions or other systems such as carpooling or ridesharing/ridesourcing.

(ii) 511

There is not currently a 511 system in the El Paso area. The only 511 system currently available in the state of Texas is in the Dallas-Fort Worth metro area.

(e) Existing Communications Coverage

Figure 12 below shows the existing cellular coverage of all providers in the El Paso region. The I-10 Corridor is well covered by existing cellular communications providers.

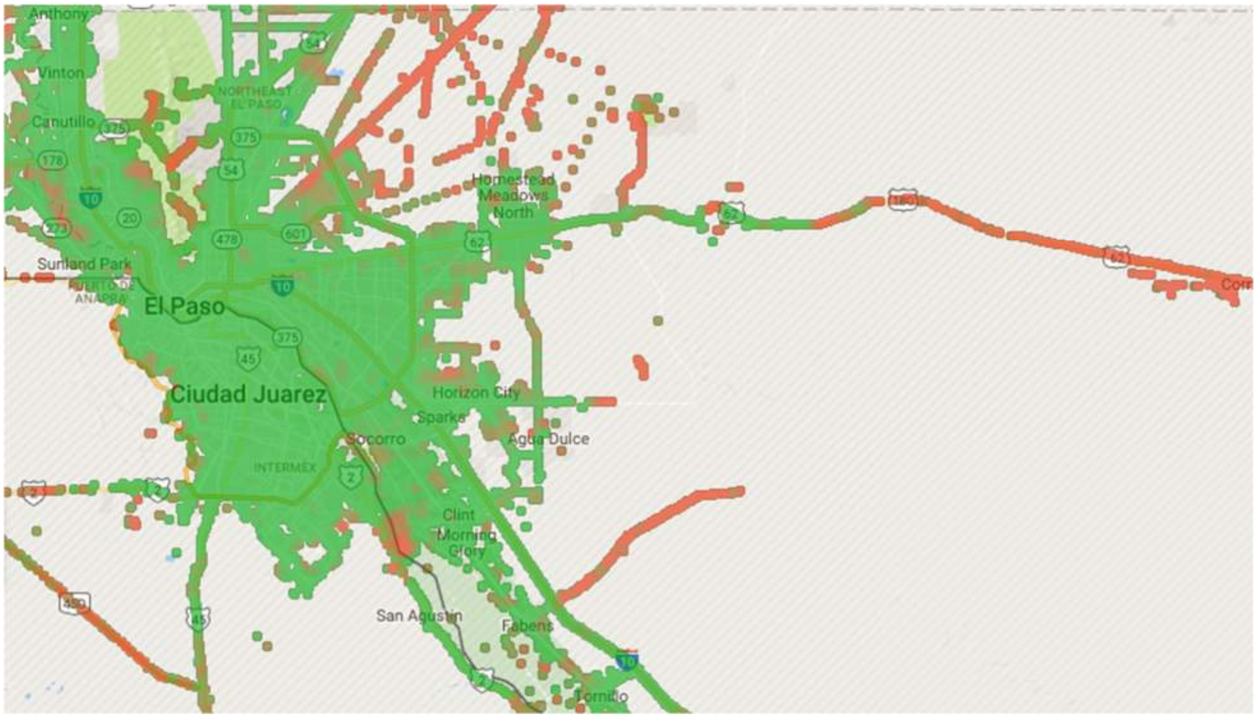

Figure 12. Existing communication coverage in the El Paso region

3. Emerging Transportation Technologies

There are a number of technologies that have been developed and deployed during the past several years. The rapid pace of technological advancement in transportation promises to bring about a sea change for transportation owners and the traveling public. Key technological improvements include not just the evolution and adaptation of autonomous and connected vehicles, but other transportation technologies as well. These technologies include adaptive traffic signals, smart streetlights, smart parking, integrated multi-modal trip planning applications, integrated payment systems, ridesourcing, and dynamic transit service. This section summarizes these technologies, followed by a discussion of potential adoption rates.

There are five broad categories of technologies that are emerging within the transportation market. These technology categories include:

1. Enabling Technologies: These technologies are fundamental elements for other technological components. These include technologies such as advancements in fiber optic technologies, wireless communications backhaul technologies, Power-Over-Ethernet (POE), etc.

2. Safety: These technologies are focused directly upon improving the safety of a component(s) of the transportation system. While several technologies may indirectly improve safety by reducing congestion, these technologies will have a direct and measureable improvement on safety.

3. Monitoring and Detection: These technologies involve various methods and approaches for detecting vehicles and/or incidents as well as monitoring roadway conditions.

4. Operational Optimization: These technologies include the set of technologies that are designed and deployed with the express purpose of improving the management of the transportation system through optimizing vehicle travel throughout a corridor.

5. Mode/Travel Demand Change: These technologies facilitate the use of modes other than personally-owned vehicles (POVs) for travel. They also include those technologies that are used to shift transportation demand from peak congestion periods.

3.1 Enabling Technologies

In many respects, enabling technologies are not necessarily new. For example, TxDOT has long supported ITS deployments requiring power and communications backhaul (e.g., DMS). However, as technologies continue to advance, they are increasingly dependent upon power and backhaul communications. So much so that assessing and providing dedicated power to new technologies should be viewed as an important and critical component of design/construction. Moreover, with the dependence on power, TxDOT and other State Agencies should include provisions for alternative power sources and power management capabilities.

Fiber optic technologies continue to advance as does improvements in other backhaul communications devices such as millimeter wave and even cellular communications. Fiber optic communication is a method of sending data by transmitting pulses of light through an optical fiber. The transmitted light forms an electromagnetic carrier wave that is then modulated to carry information. Fiber is preferred over electrical cabling when high bandwidth, long distance, or immunity to electromagnetic interference are required and is becoming common within the transportation environment for these reasons. Currently, fiber optic systems used in transportation provide 1 Gbps transmission rates and include 72, 96, or 144 strands for backhaul communications with 144 strands commonly used. Currently, transmission rates of 10 Gbps are possible with expected improvements to 40+ Gbps in the near future.

Two technologies that particularly require significant fiber optic backhauls are connected vehicle communications including either Dedicated Short Range Communications (DSRC) and/or 5G communications. The extent that these communication technologies are adopted by the Texas public and used by TxDOT to capture information from vehicle-to-infrastructure communications will drive both the number and bandwidth of the stands and associated equipment. Currently, some DOTs are installing one pair of 1 Gbps for each connected vehicle radio while others are linking 10-20 radios with a single pair. A standard has yet to emerge, but a conservative approach would be to consider connected vehicle communications as equivalent to digital video feeds suggesting that 6-8 radios can be linked to a given pair.

3.2 Safety Technologies

These technologies are focused directly upon improving the safety of a component(s) of the transportation system. They include technologies associated with autonomous and connected vehicles as well as other infrastructure-based technologies.

(a) Autonomous Vehicles

Autonomous and connected vehicles include a variety of technologies that enable vehicle operation without the need or with a reduced need for a driver. Autonomous vehicles use several sensors simultaneously to safely operate the vehicle. Light Detection and Ranging (LiDAR) and optical camera technology are the vehicle’s eyes, "seeing" the edge of the road and lane markings by bouncing pulses of light of the vehicle’s surroundings. When parking, ultrasonic sensors detect curbs and other vehicles. More powerful and quicker-transmitting radios or cellular technology will be used to share basic safety messages with other nearby vehicles 10 times a second — faster than you can blink your eyes. This technology helps keep all vehicles alert to the presence of potential conflicts. At the very core of all this technology is a central computer, or brain, that is constantly analyzing the data received to control steering, acceleration and braking through the use of vehicle actuators, which act as the vehicle’s hands and feet.

Autonomous vehicles utilize technology to monitor the driving environment and perform driving functions independent of human interaction. There are several technologies that support these functions:

- Radar sensors monitor the position of nearby vehicles.
- LIDAR sensors detect lane markings and road edges.
- Video cameras interpret traffic signals and road signs and detect pedestrians, nearby vehicles, and other objects.
- A global positioning system (GPS) places the vehicle accurately within a map.
- An on-board computer analyzes the above inputs and controls steering, acceleration, and braking.

Today, AV technology exists on a spectrum, with many currently available vehicles having autonomous capabilities such as radar cruise control and lane keeping assistance. The Society of Automotive Engineers (SAE) has defined the following levels of autonomy (Figure 13):

- Level 0 vehicles lack any autonomous capabilities.
- Level 1 vehicles have a specific driver assistance function such as adaptive cruise control, with all other driving functions performed by the driver.
- Level 2 vehicles utilize multiple forms of assistance such as control over steering and acceleration, allowing the driver to have his or her hands off the steering wheel and foot off the pedals at the same time.
- Level 3 vehicles are capable of monitoring the driving environment and making safety-critical decisions but require a driver in the vehicle to intervene.
- Level 4 vehicles are capable of completing fully autonomous trips, but only under certain driving scenarios.
- Level 5 vehicles are fully autonomous and capable of driving in any scenario.

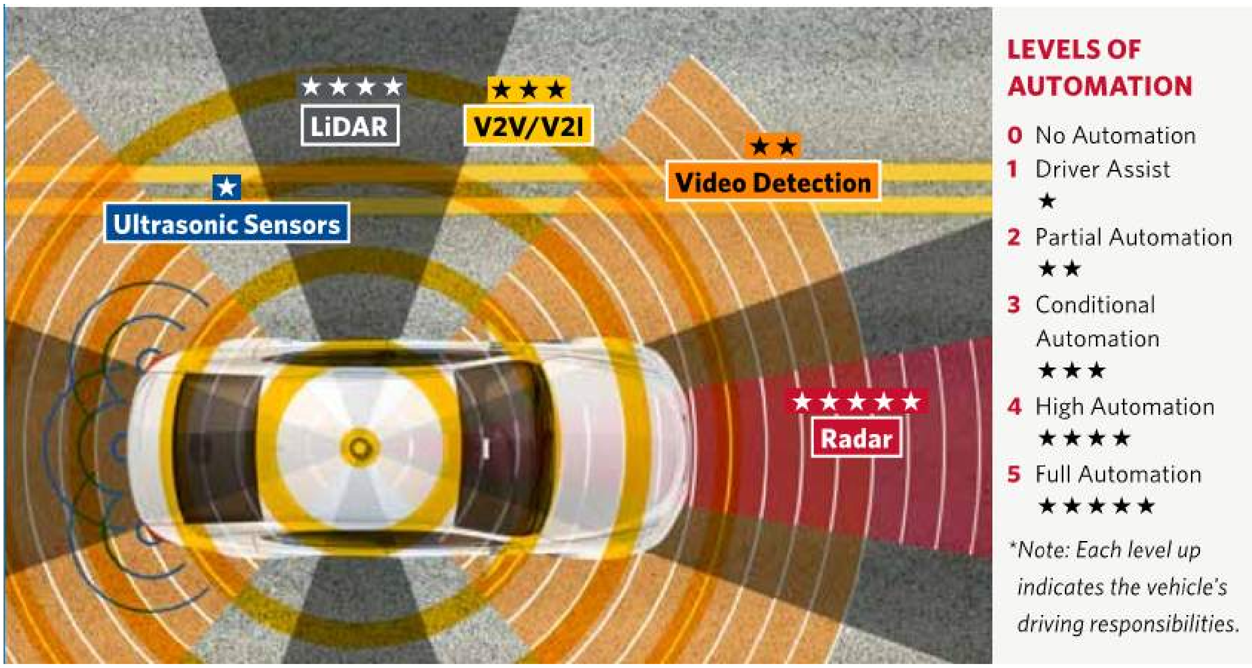

Figure 13. Sensors and Levels of Automation for Autonomous Vehicles

The potential impacts of autonomous vehicles depend on the speed of technological advancement, the rate of public acceptance, and the presence of a variety of societal trends. As the technology continues to advance, the anticipation of these impacts must guide the adoption of policy and investments in infrastructure. Autonomous vehicles will cause changes in driver behavior, incident frequency, and infrastructure needs. In recent years, experts have closely examined the potential impacts of autonomous driving systems as research and development have advanced towards a future in which these vehicles are expected to be widely available.

In the 2060s and 2070s, as autonomous vehicles become a major share of total vehicle travel, there will be a significant reduction in traffic and an increase in roadway capacity. This will be a result of vehicles traveling closer together, maintaining a free flow speed, and a reduction of crashes which are a result of human error. It is likely that there will be a significant reduction in personal vehicles as the costs of owning a personal vehicle exceed the benefits. While this could result in fewer cars on the road, an increase in Vehicle Miles Traveled (VMT) is likely as vehicles are constantly picking up and dropping off passengers. It is also important to note that the impacts will vary between rural and urban areas. Urban areas tend to have more affluent persons (early adopters) and more congestion while rural areas are slower to adopt new technologies and rarely experience congestion.

Research indicates that 80%-90% of vehicle crashes are due to human error. The elimination of human drivers takes away the risks associated with distracted or fatigued driving, speed limit violations, and driving under the influence. Autonomous vehicles introduce an easy transportation for groups that are currently unable to drive such as the elderly, people with disabilities, and children. Autonomous vehicles will greatly increase the efficiency of existing transportation systems. Aside from the decreases in congestion and increases in capacity, the technology will allow travel time to be spent however each passenger chooses, whether it be sleeping, working, reading, or exercising. This increased freedom while utilizing a safe, reliable, and comfortable mode of transportation on a less congested network has the potential to drastically change societies.

Autonomous vehicles are being driven by private industry and are quickly moving into the market. According to the National Council on State Legislatures, “twenty-nine states - Alabama, Arkansas, California, Colorado, Connecticut, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Maine, Michigan, Mississippi, Nebraska, New York, Nevada, North Carolina, North Dakota, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Virginia, Vermont, Washington and Wisconsin —and Washington D.C have passes legislation related to autonomous vehicles.[2]” Further, “Governors in Arizona, Delaware, Hawaii, Idaho, Illinois, Maine, Massachusetts, Minnesota, Ohio, Washington and Wisconsin have issued executive orders related to autonomous vehicles.[3]”The pace of legislation has slowed since 2017, but states such as Michigan, Arizona and California have either passed legislation or through executive order to allow for the testing of autonomous vehicles under certain conditions and criteria. In Texas, the Governor signed a bill in June of 2017 that allows an automated motor vehicle to operate in the state regardless of whether a human operator is present in the vehicle, as long as certain requirements are met.[4,5]

On a Federal level, the National Highway Traffic Safety Administration (NHTSA) issued their third guide to highly automated vehicles In September of 2018, titled “Preparing for the Future of Transportation: Automated Vehicles 3.0’.[6] This guidance document is an update to the Automated Driving Systems (ADS): A Vision for Safety 2.0 document that was released by NHTSA in September of 2017. AV 3.0, as it is commonly referred to, outlines the role of the Federal Government for regulating and administering autonomous vehicles. AV 3.0 outlines all of the operating administrations, eight in total, within the Department of Transportation, that are involved with regulating autonomous vehicles.

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[2] http://www.ncsl.org/research/transportation/autonomous-vehicles-self-driving-vehicles-enacted-legislation.aspx

[3] Ibid

[4] https://www.texastribune.org/2017/06/15/lawmakers-clear-way-driverless-cars-texas-roads-and-highways/

[5] http://www.ncsl.org/research/transportation/autonomous-vehicles-self-driving-vehicles-enacted-legislation.aspx

[6] https://www.nhtsa.gov/press-releases/us-department-transportation-releases-preparing-future-transportation-automated

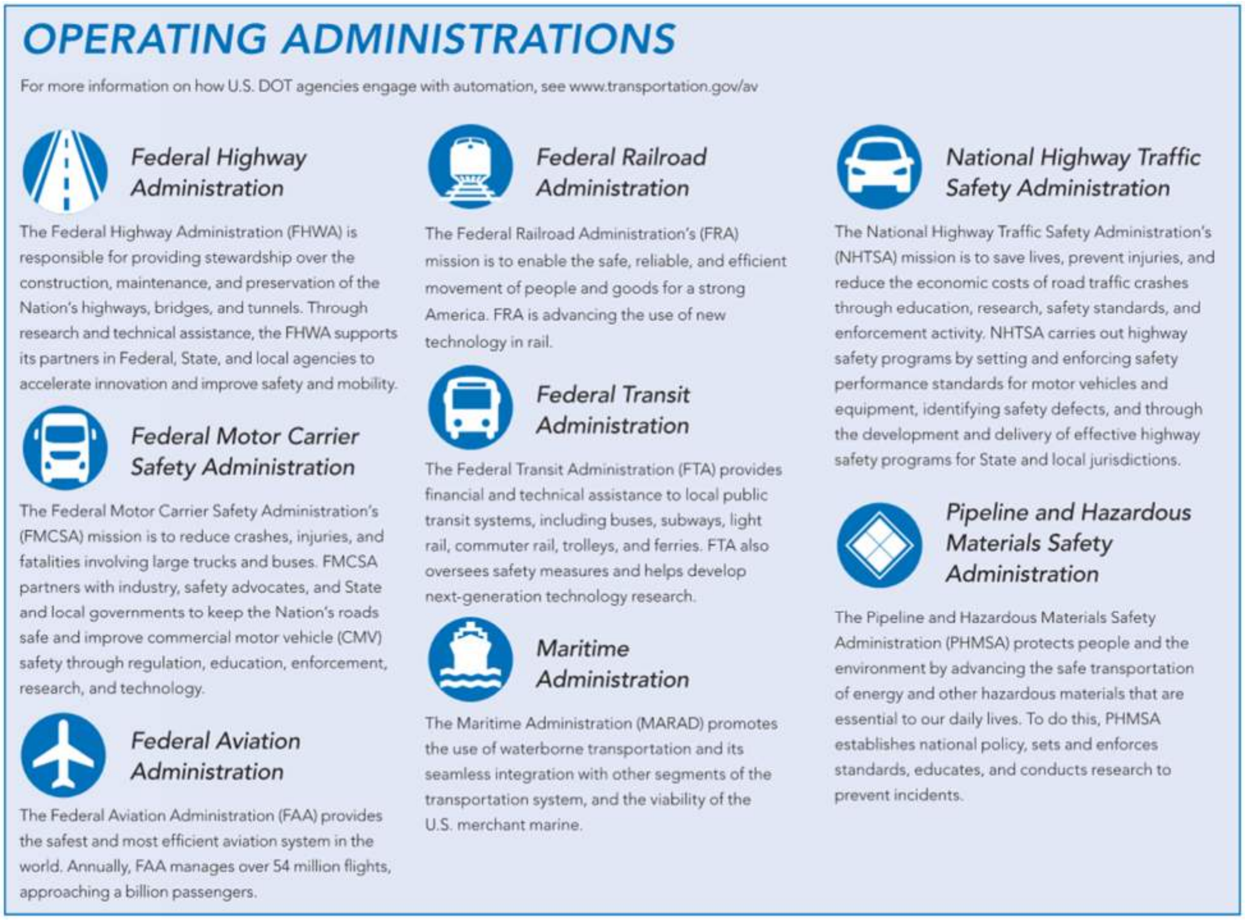


Figure 14. Operating Administrations under AV 3.0[7]

Key operating administrations include NHTSA, Federal Motor Carrier Safety Administration (FMCSA), Federal Highway Administration (FHWA) and Federal Transit Administration (FTA). NHTSA governs the safety authority over Automated Driving System (ADS) -Equipped Vehicles & Equipment. In addition, NHTSA is the owner of the Federal Motor Vehicle Safety Standards (FMVSS) regulations and waivers. AV 3.0 directs FMCSA to avoid barriers to the development of ADS in commercial vehicles and to work closely with industry, state and local agencies. FHWA administers the Manual on Uniform Traffic Control Devices (MUTCD) and will be pursuing an update to the 2009 MUTCD to incorporate ADS technology. The FTA will work with transit agencies on tailored technical assistance on safety management systems (SMS). The US DOT will also play a leading role in cross-cutting policy issues as they relate to ADS such as Cybersecurity, Connectivity, Piloting and Privacy.

In addition to updating the guidance on ADS on a Federal level, AV 3.0 also highlighted roles and responsibilities for state, local and tribal governments for ADS. AV 3.0 showcases ways that states, local and tribal governments can prepare for AV's including focusing on:

[7] https://www.transportation.gov/sites/dot.gov/files/docs/policy-initiatives/automated-vehicles/320711/preparing-future-transportation-automated-vehicle-30.pdf

- Laws & Regulations;
- Licensing & Registrations;
- Assessing Infrastructure Elements; and
- Providing Guidance, Information & Training.

AV 3.0 highlights best practices for state legislatures and highway safety officials along with consideration given to owners & operators of infrastructure. In addition, AV 3.0, lays out criteria that state agencies should consider with ADS-equipped vehicles to ensure compatibility between intrastate and interstate commercial vehicle regulations and continued application of roadside inspection procedures. The DOT, through AV 3.0, offers the Public Sector Transit Industry and Stakeholders areas of consideration with the adoption of ADS including:

- Needs-Based Implementation;
- Realistic Expectations;
- Workforce & Labor;
- Complete Streets;
- Accessibility; and
- Engagement & Education.

AV 3.0 points to the fact that local governments should consider facilitating safe testing and operation of ADS vehicles on local streets and understand near term opportunities & affects for land use, curb space & congestion on ADS deployments. The US DOT, through AV 3.0 encourages States, local, Tribal, and Territorial governments to fully utilize the resources provided by United States Computer Emergency Readiness Team (US-CERT) for ADS cybersecurity.

AV 3.0 also highlights the role of private industry in the adoption and deployment of ADS equipped vehicles. AV 3.0 highlights the role of Voluntary Safety Self-Assessments (VSSA) that were first outlined in AV 2.0 and encourages private entities to make public their VSSA to promote transparency and strengthen public acceptance of ADS technology. Through AV 3.0, the US DOT encourages vehicles owners and operators to explore the adoption and impact of ADS technology on:

- System Knowledge;
- System Functionality;
- System Training;
- Equipment Maintenance;
- Information Exchange; and
- Safety Inspection.

Finally AV 3.0 highlights the role of private industry in helping to promote safety, volunteer consensus based standards, and adopt best practices for cyber security.

At the Congressional level, bills such as the SEF DRIVE ACT, are stalled in Congress and any movement towards its passage will most likely occur after the 2020 Presidential election.

(i) Passenger Vehicles

Most vehicles now offer technology in line with Level 1 automation as an option, with some luxury brands offering Level 2 capabilities. Advanced driver assist systems such as Tesla's Autopilot and General Motors' Super Cruise offer capabilities in line with Level 3. Numerous major automakers have committed to offering advanced autonomy in the coming years:

- Daimler, in partnership with Uber and Bosch, intends to offer nearly fully autonomous vehicles by the early 2020s
- Ford has partnered with Argo AI to offer full autonomy in 2021
- Honda has partnered with Waymo to offer full autonomy on highways by 2020
- Hyundai will offer highway self-driving by 2020 and urban autonomy by 2030
- Renault-Nissan, in partnership with Microsoft, intends to offer autonomous cars in urban conditions in 2020, and truly driverless cars in 2025
- Toyota intends to offer full autonomy on highways by 2020
- Volvo, in partnership with Uber, intends to offer self-driving on highways by 2021.

There are varying projections on the timeline of connected and autonomous vehicle adoption. Automakers such as Tesla have demonstrated Level 3 autonomy capabilities (autonomous driving capabilities with driver fallback under some conditions), while many manufacturers have committed to making Level 3 vehicles available to the public by 2021. Level 4 (capable of fully autonomous trips on certain roadways) are currently in the testing stage. As with other forms of new technology, it is anticipated that early autonomous technology will be made available as an option on higher end vehicle models, with technology trickling down across the entire fleet over the next decade.

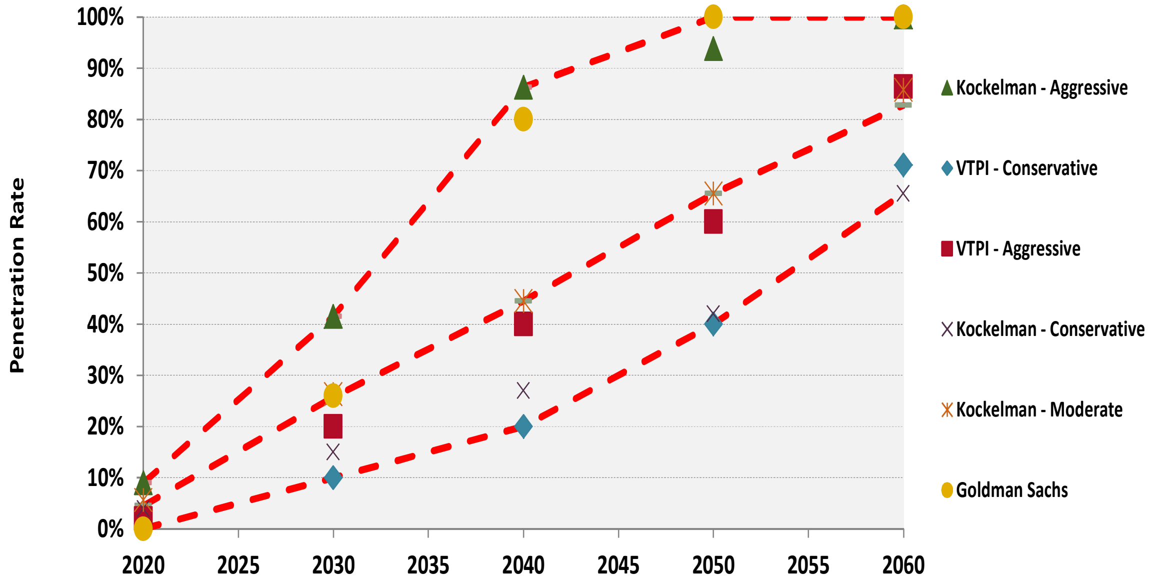


Figure 15. Autonomous Vehicle Sales and Fleet Projections in Published Literature

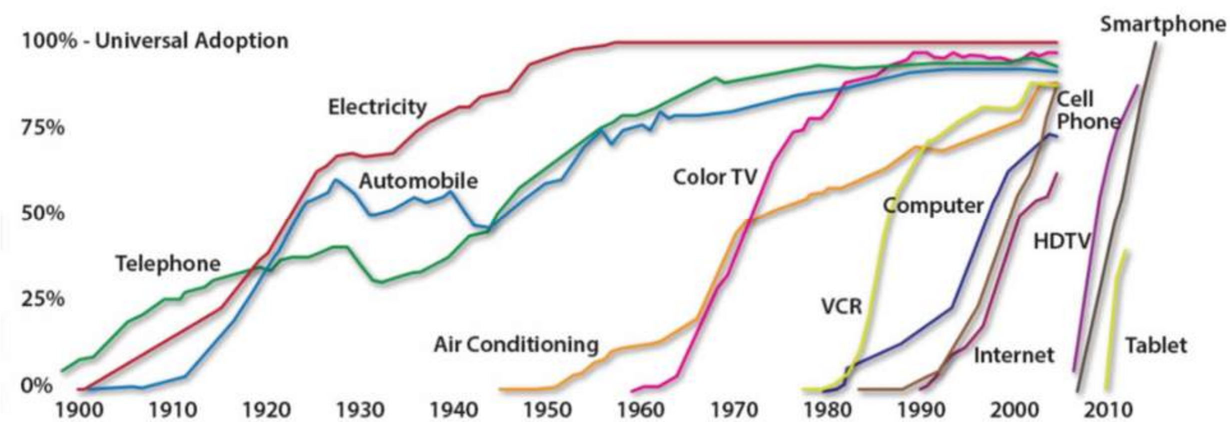


Figure *15* shows estimated adoption rates for autonomous vehicles based upon a literature review. As observed in the figure, there is significant variability in the estimated adoption rates of autonomous passenger vehicles Level 3 or higher. For example, by 2040, estimates in the literature suggest an adoption rate ranging from 20% to nearly 90%. With such variability within the literature it is challenging to provide a concrete estimate of adoption rates for autonomous passenger vehicles. However, recent trends in adoption of other technologies, such as smartphones, tablets, etc. suggests a rapid adoption rate (Figure 16) or one that is closer to the upper end of the range presented in Figure 17.

Figure 16. Technology Adoption Rates of the Past Century[8]

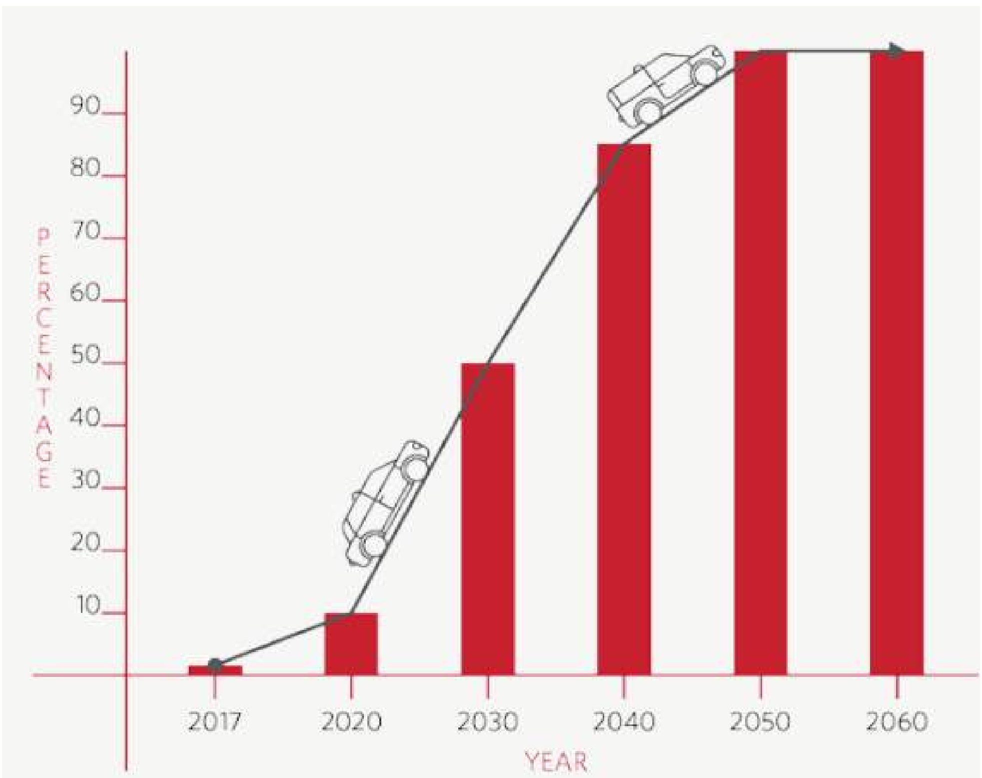


Figure 17. Estimated Adoption Rate for Level 3 and Above Autonomous Passenger Vehicles

(ii) Transit Vehicles

Autonomous Vehicle technology offers a number of potential applications for transit vehicles, from microshuttle vehicles to full-size buses. A number of manufacturers are marketing low-speed 8-16 passenger autonomous shuttle vehicles. At present these vehicles operate primarily in dedicated

[8] Florida Department of Transportation

lanes, though some pilots are making the push towards mixed-traffic scenarios. Examples of microshuttle manufacturers include:

- EasyMile, a French-based company, offers a 12-passenger all-electric shuttle vehicle with a top speed of 23 miles per hour.
- Navya, another French-based company, builds a 15-passenger all-electric shuttle vehicle with a top speed of 28 miles per hour.
- Local motors, based in the United States, offers a 12-passenger all-electric shuttle with a top speed of 30 miles per hour.
- Coast Autonomous, also based in the United States, builds an 8-passenger all-electric shuttle with a top speed of 12.5 miles per hour.

As currently configured and available, these microtransit vehicles are not suitable for deployment on highways and Interstates such as I-10. However, these vehicles are suitable for providing first-mile/last-mile connectivity to a fixed route transit system or to bridge connectivity for travelers utilizing ridesharing or carsharing within arterials and surface streets within the I-10 Corridor.

Other manufacturers are developing full-size transit vehicles at varying levels of automation. For example, Daimler is developing the fully autonomous Mercedes-Benz Future Bus prototype as part of the City Pilot demonstration. On the other end of the spectrum, vendors such as Mobileye are developing aftermarket solutions to add low level autonomous features such as pedestrian detection and collision avoidance that can be added to existing transit vehicles.

(A) Heavy Duty Vehicles (Platooning)

Platooning technology merges the benefits of connected and autonomous vehicles while utilizing human drivers. Platoons allow multiple vehicles to couple electronically such that many vehicles can accelerate and brake simultaneously based on the steering, acceleration, and braking inputs of the lead vehicle. The connection between vehicles be done via DSRC technology, with the vehicle controls for platooning vehicles being automated.

Truck platooning in particular has quickly emerged as a means of improving capacity through reduced headways; increasing fuel economy due to lower air resistance; and decreasing collisions due to increased connectivity and automating among vehicles. Truck platooning technology is currently nearing maturity for market penetration and is likely to be one of the early dominant forms of automation.

(b) Connected Vehicles

Dedicated Short Range Communications (DSRC) and 5G cellular are two rapidly emerging technologies that enable vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications with very low latencies. In this section, we describe these two similar, competing technologies and why 5G may become the industry standard for enabling V2V and V2I communications.

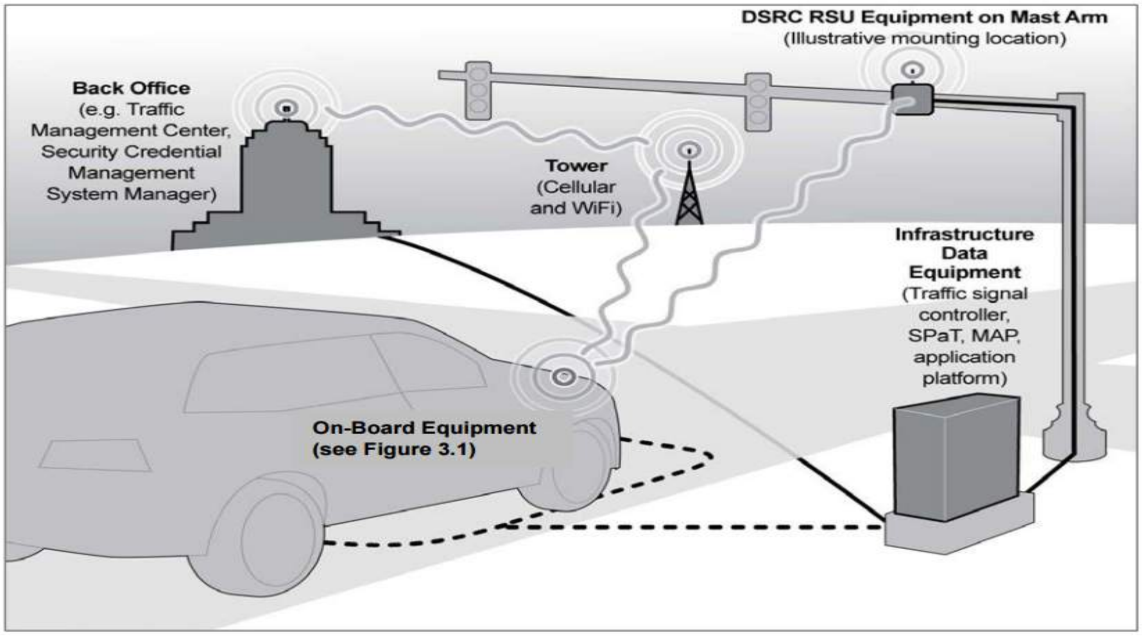
(i) Dedicated Short Range Communications

DSRC technology utilizes low latency wireless connections using an 802.11 phased modulation wireless router across a spectrum of 5.9GHz band that was dedicated to Intelligent Transportation Systems (ITS) by the U.S. Federal Communications Commission (FCC). Connected vehicle technology consists of point-to-point wireless communication between and among vehicles and infrastructure. Beyond infrastructure- and vehicle-based radios, connected vehicle technology relies upon a communications link to a back office for system management. This is typically done using fiber optic or cellular connectivity. Additional interfaces with infrastructure, such as signal control cabinets or road weather information stations, may also be necessary depending upon the desired application.

Connected vehicle technology consists of point-to-point wireless communication between and among vehicles and infrastructure, including the following:

- Vehicle-to-vehicle (V2V) communication that allows vehicles to communicate with each other;
- Vehicle-to-infrastructure (V2I) communication that allows vehicles to communicate with surrounding infrastructure; and,
- Vehicle-to-all (V2X) communication that enables the interaction of vehicles and any capable communication device in the immediate vicinity.

There are three components to a Connected Vehicle system as illustrated in Figure 18. First, there is the DSRC radio that is on-board the vehicle (On-Board Unit or OBU). This component receives information from the vehicle's sensors and broadcasts DSRC messages from the vehicle to other



vehicles and the roadside infrastructure. Connected Vehicle applications that are associated with V2V communications are typically installed on this device. Second, the Connected Vehicle infrastructure component is a pole-mounted DSRC radio frequently referred to as the Roadside Equipment (RSE) or Roadside Unit (RSU). This radio serves the same functionality as the on-board unit, but is also tied back to a central data repository and processing system, which is the third major component of a Connected Vehicle system.

Figure 18. Components of a DSRC System[9]

DSRC technologies have been under development for more than a decade, mostly through sponsorship by the U.S. DOT. There are existing standards governing the hardware, software and transmission protocols that have been developed and adopted by the Institute of Electrical and Electronics Engineers (IEEE) and the Society of Automotive Engineers (SAE). Currently, The National Highway Traffic Safety Administration (NHTSA) is considering mandating DSRC technology on new vehicles, a move that is supported by the automotive industry, but one that has met with political resistance from the White House. If the proposed rulemaking comes to fruition it is expected that the draft mandate will be released around 2019, followed by comment and phase-in periods. Full implementation of this rule was expected in the 2021 – 2023 range, but this timing has now been questioned. Based on anticipated availability and typical fleet turnover rates, the potential adoption rates for connected vehicle technologies would be significant with more than 50% of the U.S. fleet being equipped by 2030. One factor that will likely accelerate adoption rates is the availability of aftermarket safety devices for vehicles that contain a DSRC radio. As production increases and the price of radios decreases over time, drivers of older model vehicles will likely seek ways to capitalize on the safety and mobility benefits that connected vehicle technology can offer.

The key benefits of DSRC technologies primarily stem from the low-latency communications capabilities of the radios with additional benefits just due to the establishment of a communications link between vehicles and with infrastructure components. Safety benefits are primarily realized from low-latency communications employed by radio applications such as Emergency Electronic Brake Lights, Queue Warning, etc. The potential applications allowed by this environment are considerable in number and include safety, environmental mobility, agency data, road weather, and smart roadside families of applications. The following is a brief summary of a small selection of applications that may be relevant for improving safety and congestion on I-10.

(A) V2I Safety Applications

The V2I Safety family of applications integrate roadside DSRC infrastructure and vehicle data to enhance safety while also providing potential mobility benefits to drivers. Potential V2I safety applications that could serve highway travelers include:

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[9] USDOT

- **Curve Speed Warning:** An application that provides an alert to a driver approaching a curve at a speed beyond what is recommended for that curve.
- **Spot Weather Impact Warning:** An application that warns drivers of local weather impacts by relaying information from roadside weather stations and centralized operations.
- **Reduced Speed/Work Zone Warning:** An application that broadcasts alerts to drivers to reduce speed, change lanes, or come to a stop utilized within work zones.

(B) V2V Safety Applications

The V2V Safety family of applications utilize communication between vehicles (V2V) to prevent crashes. Emergency Electronic Brake Lights, Forward Collision Warning, and Blind Spot/Lane Change Warning applications all have relevance on a highway corridor. However, it is assumed that these will fall under the purview of automakers, which will deploy in-vehicle DSRC radios as part of the proposed NHTSA rulemaking if passed.

(C) Mobility Applications

There are many different potential mobility applications and applications in general that DSRC would enable. While these applications are generally designed to improve mobility of travelers, several of these applications will also enhance safety of the traveling public. These applications include:

- **Dynamic Speed Harmonization:** An application that recommends target speeds in response to congestion, incidents, and road conditions to optimize throughput and reduce incidents.
- **Queue Warning:** An application that warns drivers of existing and developing queues downstream.
- **Cooperative Adaptive Cruise Control:** An application that dynamically adjusts and coordinates cruise control speeds among platooning vehicles to improve traffic flow and throughput.
- **Incident Scene Pre-Arrival Staging:** An application that provides incident information, including positioning of the disabled vehicle to first responders while en-route to the incident to improve incident staging and reduce impact to the roadway facility.
- **Incident Scene and Work Zone Alerts:** Provides real-time alerts to workers and first responders in incident and work zones for incursion of an on-coming vehicle into the zone.
- **Dynamic Ridesharing:** This application leverages V2V and V2I communications to promote the arranging and execution of dynamic ridesharing to reduce congestion and subsequently improve safety.

Although the final rule from NHTSA on DSRC has not yet been issued, there have been significant deployments of DSRC technologies in the U.S. Most notably, there are three on-going Connected

Vehicle Regional Pilots in New York City, Tampa, and Wyoming where thousands of vehicles and infrastructure components are being equipped with DSRC equipment. Additionally, through the Advanced Transportation Congestion Mitigation and Technology Deployment (ATCMTD) program and other grants, U.S. DOT has continued to promote and encourage the deployment of DSRC. Additionally, the American Association of State Highway and Transportation Officials (AASHTO) has issued a “Signal Phase and Timing or SPaT Challenge” to States also encouraging the deployment of DSRC.

(ii) 5th Generation Mobile Networks

5th Generation Mobile Networks (5G) is an alternative wireless protocol that is a widely touted alternative to DSRC for supporting V2V, V2I, and V2X communications. Although universal standards for 5G have not yet been adopted or promulgated and are not expected until 2019, existing standards for 4G provide a likely perspective for future 5G standards. Unlike DSRC, 5G is being driven by private industry, primarily the telecommunications firms, which would provide significant opportunities for public/private partnerships for states, cities, and local agencies.

There are many different visions and use cases associated with 5G, but a consistent theme is that 5G will enable a higher density of mobile broadband users (i.e., more simultaneously connected devices) and will more reliably support low latency device-to-device communications than 4G. The key technological advances for 5G is that it will dynamically operate across several spectrums or frequencies with each frequency serving a specific use case and need.

The exact implementation of 5G remains to be seen, however, the emergence of a host of small cells including femtocells, picocells, and microcells across the U.S. might suggest that one possible deployment of 5G technology would involve localized transmitters. This is a particularly likely scenario for low-latency applications such as those involving autonomous and connected vehicles.

5G is an enabling technology that allows communication between devices, but C-V2X is the critical application that allows for the connectivity between vehicles and everything else. C-V2X, which was standardized in 2017, is designed to connect vehicles to each other, to roadside infrastructure, to other road-users and to cloud-based services.[10] C-V2X employs two complementary transmission modes:

1. Direct communications between vehicles, between vehicles and infrastructure, and vehicles and other road users, such as cyclists and pedestrians. In this mode, C-V2X works independently of the cellular networks.

[10] https://www.gsma.com/iot/wp-content/uploads/2017/12/C-2VX-Enabling-Intelligent-Transport_2.pdf

2. Network communications, in which C-V2X employs the conventional mobile network to enable a vehicle to receive information about road conditions and traffic in the area.[11]

The application of C-V2X will have a wide-ranging effect on existing traffic management, traffic management safety, traffic tolling in dense urban area, and the speed of adoption of autonomous vehicles. Examples of applications include:[12]

Platooning: The formation of a convoy in which the vehicles are much closer together than can be safely achieved with human drivers, making better use of road space, saving fuel and making the transport of goods more efficient.

Co-operative driving: Vehicles can use C-V2X to work together to minimize the disruption caused by lane changes and sudden braking.

Queue warning: Roadside infrastructure can use C-V2X to warn vehicles of queues or road work ahead of them, so they can slow down smoothly and avoid hard braking.

Avoiding collisions: Each vehicle on the road could use C-V2X to broadcast its identity, position, speed and direction. An on-board computer could combine that data with that from other vehicles to build its own real-time map of the immediate surroundings and alert the driver to any potential collisions.

Hazards ahead warning: C-V2X can be used to extend a vehicle's electronic horizon, so it can detect hazards around a blind corner, obscured by fog or other obstructions, such as high vehicles or undulations in the landscape.

Increasingly autonomous driving: Along with other sensors and communications systems, C-V2X will play an important role in enabling vehicles to become increasingly autonomous.

Collecting road tolls: designed to reduce congestion and the impact of motor transport on the environment

C-V2X allows for critical applications to be deployed which will allow for an increase in driving speeds and corresponding decrease in congestion, a reduction in roadside accidents and fatalities and the ability to create real-time demand-based tolling systems to change driving behavior in highly dense urban areas. C-V2X applications are now being tested by an assortment of leading automotive companies such as Audi, Toyota and the PSA Group along with technology infrastructure companies such as Qualcomm, AT&T, Verizon and Nokia. Ford announced at CES 2019, that all of their global fleet will adopt C-V2X technology by 2022.[13]

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[11] Ibid

[12] https://www.gsma.com/iot/wp-content/uploads/2017/12/C-2VX-Enabling-Intelligent-Transport_2.pdf; page 2

[13] https://www.zdnet.com/article/what-is-c-v2x-and-how-it-changes-the-driving-smart-cities/

(c) 3.2.3 5G versus DSRC

With the rollout of 5G C-V2X applications and the lack of a governmental mandate on the use of DSRC technology, there is an industry wide debate as to which technology will become the industry standard. Having been tested and deployed over the past decade, DSRC would seem to have an early advantage over 5G and C-V2X. With that said, China and some in the automotive industry are placing their bets on 5G C-V2X. Companies such as Qualcomm have indicated that 5G and C-V2X are compatible with prior cellular standards, such as 4G, which should allow for a faster rollout. 5G may have a further advantage: Many pedestrians and bicyclists carry smartphones in their pockets, their precise locations may be more seamlessly transmitted to vehicles[14]. Finally, potential advantages of 5G over DSRC, including greater interoperability, wider bandwidth, increased cybersecurity and a decentralized network that runs on private cell towers instead of dedicated roadside units that the government has to pay for and maintain[15]. While the two different technologies will continue to be used over the next few years, 5G and C-V2X, may become the long-term predominant technology for connected vehicles.

3.3 Monitoring and Detection

The use of roadside equipment to gather information on traffic, vehicles, and travel has been used for decades. Many early uses of roadside sensors were in-pavement loop detectors that were used both to count and classify vehicles as well as to identify when a vehicle was present. Today's roadside sensors are much more sophisticated than pneumatic loop detectors and are capable of collecting a wide variety of data to benefit traffic operations and maintenance. This section discusses those roadside sensors that are widely used today by agencies for congestion management and traffic analysis.

All of the technologies discussed in this section represent existing technologies and have been deployed throughout the United States. These technologies can be purchased today from a variety of different vendors and suppliers. As Connected and Autonomous Vehicles begin to emerge, these technologies will become less effective and cost prohibitive. For example, a connected vehicle will include a cellular, Wi-Fi, and/or DSRC radio, all of which can be used for origin/destination studies rendering the technologies included herein obsolete. Similarly, a connected vehicle will continuously broadcast and provide its location to roadside infrastructure and other vehicles through cellular or DSRC so these two technologies will eventually replace magnometers, loop detectors, and cameras for the detection of vehicles. Nevertheless, these technologies are still viable and provide useful information to system managers to operate and manage congestion, perform weather-related maintenance, and to obtain information on travel patterns of the traveling public. The rise of these technologies has had a tremendous impact on the transportation system, and a system operator's ability to better manger the transportation network. For example, prior to the use of RFID, Bluetooth,

[14] https://www.autonews.com/mobility-report/new-connected-car-battle-cellular-vs-dsrc

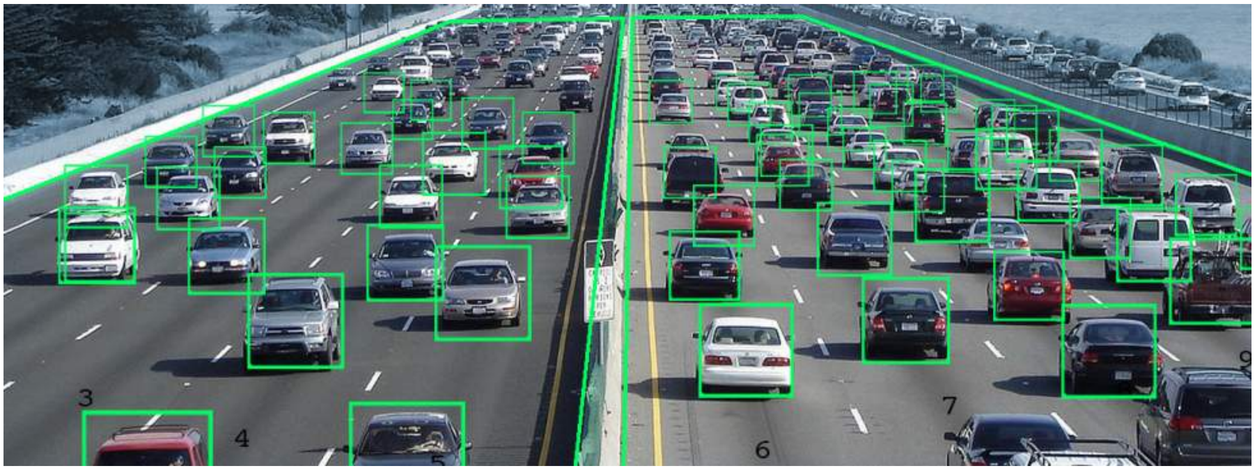
[15] https://www.wardsauto.com/industry-voices/dsrc-vs-5glte-which-will-it-be-connected-vehicles

and Wi-Fi sniffers on the roadside to conduct Origin/Destination studies, a DOT would have had to deploy an extensive license plate reader study using HD video, process the video images to capture the license plates and match them to origins and destinations. These technologies will continue to provide valuable information to system operators and managers for the next several years if not a decade.

Generally, these existing technologies have passed the policy and regulatory tests and have been widely deployed. During the past decade, there has been some pushback by the public regarding the use of video or still cameras for enforcement (e.g., red-light enforcement in Ohio), but other States have successfully deployed cameras for these purposes. Within Texas, video cameras and RFID sensors are widely used for open-road tolling applications and have been accepted within the policy and regulatory environment. Over the course of the next decade, all of these technologies will continue to see evolutionary improvements, particularly with respect to connectivity and ability to communicate to a central location.

(a) Camera Technology Improvements (infrared, auto traffic classification and counting)

Still frame traffic cameras are still in use throughout the U.S., though are increasingly being switched to pan-tilt-zoom video cameras by agencies. Typical applications of video-based systems include presence detection at signalized intersections and incident detection along freeways. However, the video cameras can be configured to emulate inductive loop detection as well as to perform vehicle classification and vehicle counting at highway speeds. Usually, the digital video feed from a traffic camera is streamed to a processing center where statistical algorithms scan the images and



determine the number and classification of the vehicles. These counts and classifications are then reported to a TMC in summary format.

Figure 19. Video Cameras are Commonly Used for Vehicle Counting and Classification[16]

As processing capabilities continue to improve, extracting events and images from digital video feeds is becoming increasingly automated. The latencies with image processing have dramatically improved during the past decade to the point where digital video processing is now being used by some agencies for real-time incident detection and notification. This includes identifying stopped vehicles, vehicles traveling in the wrong direction, etc. With the standardization and conversion to digital images, an agency may be able to conduct emerging video processing techniques and methods using their existing video hardware (i.e., video software processing is no longer strictly tied to the video hardware).

(b) Bluetooth and WiFi

Both Bluetooth and Wi-Fi are standardized communications standards that operate in the 2.4 Ghz band. These communication protocols and chipsets are common in mobile devices such as cellular phones, tablets, in-vehicle infotainment units, etc. In both cases, the transceivers regularly and continuously broadcast “discovery” messages as the devices seek other networks or devices to connect with. These discovery messages contain a media access control address (MAC address). The MAC address of a device is a unique identifier assigned to network interfaces for communications at the data link layer of a network segment. Bluetooth and Wi-Fi equipment mounted at the roadside can “listen” for these discovery messages and capture the unique MAC address without having to connect to the actual Bluetooth or Wi-Fi enabled device. Additional roadside sensors at other points of the transportation network capture the same MAC

Figure 20. RWIS Platform[18]

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[16] Trafficvision

addresses, which are then matched to derive information on travel origins/destinations, travel time, speeds, etc.

(c) RWIS

A Road Weather Information System (RWIS) is an automatic weather station or Environmental Sensor Station deployed along a roadside. This system includes a number of sensors that can measure atmospheric parameters, pavement conditions, water level conditions, wind speed, barometric pressure, temperature, and other metrics such as visibility and humidity.

(d) Radar

Figure 22. Typical Radar Device[19]

Radar, is "a nonintrusive technology that uses microwaves to detect the presence of vehicles. Microwaves emanating from the device will reflect off of the metallic surface of the vehicle and can provide the position of the vehicle relative to the device (e.g., which lane it is in). When two radar beams are used in series, characteristics, such as vehicle speed and length, can be obtained. Dual-beam radar antennas can be housed in the same unit; meaning only one device is needed to obtain these parameters.[20]" Radar units can be installed in a "front-fire" orientation as illustrated in Figure 22, or in a "side-fire" orientation where the microwaves are beamed across the roadway travel lanes. In either case, radar units can provide a number of different data elements including speed, heading, volume, position (lane), and acceleration/deceleration.

(e) Laser and LIDAR Systems

Laser and LIDAR (Light Detection and Ranging) systems use invisible beams of light to detect vehicles in much the same fashion as radar. Fixed Laser and LIDAR systems are not common and are typically used in situations where vehicle detection is critical such as at toll gantries, ramp meters, etc. Mounted overhead in each travel lane, a Laser and LIDAR system performs well in identifying the presence of a vehicle, speed, heading, and vehicle classification. However, the performance of these

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17 Trafficcast

18 Enterprise Flasher Company

19 Wavetronix

20 USDOT, "ITS E-Primer, Module 9," Available at: https://www.pcb.its.dot.gov/eprimer/module9.aspx

systems can be adversely impacted by weather. Because these systems are typically mounted over each travel lane, they are more expensive to deploy than other sensing technologies.

(f) Magnetometers

Magentometers is a class of vehicle detection equipment that uses changes in the earth's magnetic field to detect a vehicle. Found in both wired (microloops) and wireless form, these devices are designed to be mounted directly in the travel lane or buried immediately under the roadway surface. These devices are able to capture information similar to the traditional loop detector such as volume, lane occupancy, speed, and vehicle length. New processing algorithms are being developed and tested that would also enable vehicle classification to be performed with these devices by FHWA and others.[21]

Figure 23. In-Ground Wireless Magnetometer for Vehicle Detection

(g) Radio Frequency Identification (RFID)

Radio Frequency Identification (RFID) is a technology that has been heavily utilized within the transportation industry during the past two decades for tolling operations. RFID technology consists of a "tag," and a "reader." Tags can be either "passive," activated by the energy of the reader, or "active," continuously broadcasting a short message that is then received by the reader. The use of RFID technology for vehicle detection as well as origin/destination studies has increased due to the inclusion of RFID tags inside of an automobile's tires. Although the primary purpose of these tags is to monitor tire pressure, each tag has a unique signature, much like the MAC address of a Bluetooth or Wi-Fi transceiver. Roadside RDIF readers can pick up these signatures and use them to determine Origin/Destination along a given route.

3.4 Operational Optimization

These technologies include the set of technologies that are designed and deployed with the express purpose of improving the management of the transportation system through optimizing vehicle travel throughout a corridor. These technologies can be used to establish and manage an Integrated Corridor Management system to improve the overall operational efficiency within the I-10 corridor. What separates these technologies from others is that these technologies are specifically designed to manage and control the flow of traffic or are otherwise directly interacting with the transportation network – these are part of the "levers" that a system manager can activate to manage the transportation network.

[21] Sensys Networks

There are several subcategories of technologies within this category including those that are used to manage freeways, arterials, and transit systems.

(a) Active Freeway Management

Strategies involving infrastructure modifications and ITS Equipment seek to relieve congestion by adding or modifying a physical component of the highway. For example, these strategies may involve installation of additional lanes, pull-over shoulders, technology, etc. that are designed to separate traffic flow from stopped vehicles or to harmonize/optimize the traffic flow.

(i) Queue Warning Systems

Queue warning's basic principle is to inform travelers of the presence of downstream stop-and-go traffic (based on real-time traffic detection) using warning signs and flashing lights. Drivers can anticipate an upcoming situation of emergency braking and slow down, avoid erratic behavior, and reduce queuing related collisions. Dynamic message signs show a symbol or word when stop-and-go traffic is near. Speed harmonization and lane control signals that provide incident management capabilities can be combined with queue warning. The system can be automated or controlled by a traffic management center operator. Work zones also benefit from queue warning with portable dynamic message signs units placed upstream of expected queue points. Increasingly, queue warning systems are turning to mobile devices and alerts to in-dash infotainment systems to notify drivers of impending queues. Text messages and dedicated travel applications with voice and/or screen notification are typical of deployments. Recently, the Emergency Broadcast System inherent within mobile devices has been used to disseminate both Amber alerts as well as traffic related information based upon the device's current location.

(ii) Ramp metering

Ramp meters are a traffic signal that is timed or actuated to regulate the flow of traffic entering freeways. The traffic signal consists of a red and green only (no yellow). Connected to a traffic signal controller, the ramp meter is used either in a pre-timed or dynamic setting to segregate incoming traffic to the interstate.

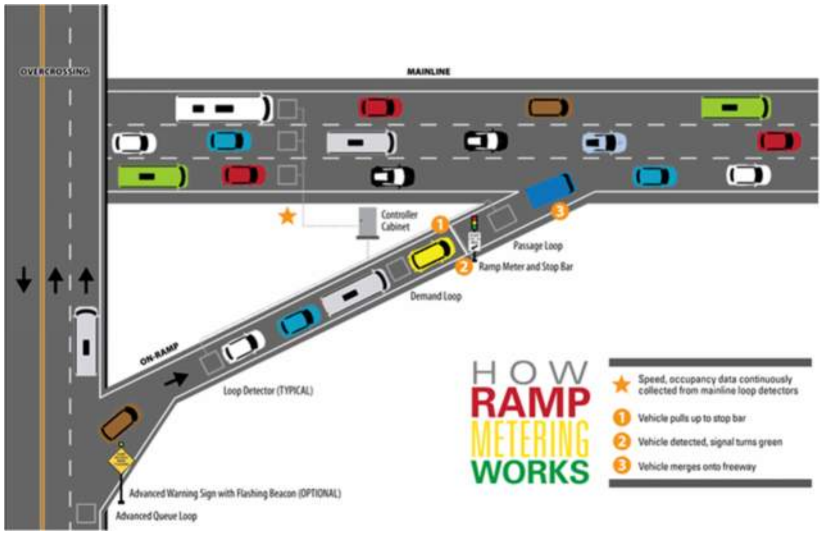

Figure 24. Illustration of Ramp Metering[22]

(iii) Dynamic Speed/Lane Control

Dynamic lane control is a technology that is currently implemented with overhead gantries and DMS signs. These lane-level DMS signs are used to close or open an individual traffic lanes as warranted by real-time traffic flows. It can also be used to provide advance warning of closures using lane control signs to help traffic safely merge into adjoining lanes. Finally, these same signs can be used to adjust speed limits based on real-time traffic, roadway, and/or weather conditions. Ultimately, these types of technologies will become obsolete within the next decade through the adoption of V2I communications.

(iv) Active Arterial Management

Similar to Active Freeway Management, these technologies are designed to improve the flow of traffic along freeway arterials with the goal of ultimately improving throughput and congestion within the corridor. Within this category, two emerging technologies are beginning to be deployed within the U.S.

(v) Adaptive Traffic Signal Controls

Adaptive traffic signal control is a type of technology that includes a traffic signal controller that is coupled with vehicle detection systems such as a camera or radar sensors. Adaptive traffic signal controllers change the traffic signal phases and timing dynamically in response to the actual demand

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[22] US DOT

at the intersection. Typically implemented using video vehicle detection, these systems can be optimized locally or across multiple segments of roadways.

(vi) Decision Support System

A road traffic decision support system refers to a set of computer servers and algorithms that process historical and real-time data to provide guidance to system managers on how the traffic network could be optimized. These systems can be micro, meso, or macro in scale, and are usually set to provide predictive analytics and probabilities associated with a set of conditions or trigger points upon which decisions for optimizing the network are made. Some decision support systems automatically implement decisions when thresholds have been crossed, others simply notify the traffic management center operators of the conditions and provide a recommendation for action.

Figure 25. Illustration of Adaptive Traffic Signals[23]

(b) Transit Management

There are many new technologies emerging with in the transit market. One in particular is the evolution and adoption of autonomous microtransit vehicles as described above for first-mile/last-mile connectivity or for mainline services. At the same time, other technologies are emerging within the transit market that involve real-time operational management of the transit system. Many of these technologies would likely improve traffic conditions and congestion along segments of I-10 if implemented. These technologies include those associated with bus-on-shoulder operations, arterial transit signal priority/preemption, and dynamic dispatch systems.

(i) Bus-on-Shoulder

The concept of running buses on the shoulder of a freeway segment has been around for more than a decade. However, improvements to Global Positioning Satellites (GPS) and other location-based methods such as LIDAR and Radar systems, have made bus-on-shoulder a more cost effective and implementable possibility. With these technologies, transit vehicles can successfully maintain their position within a potentially narrower shoulder.

(ii) Arterial Transit Signal Priority/Preemption

[23] Rhythm Engineering

Arterial transit signal priority and preemption refers to dynamically adjusting the traffic signal timing and/or phasing to give priority or preemption to an arriving transit vehicle. This can be done by extending or shortening a phase or by jumping to a new phase out of sequence to enable the transit vehicle to traverse the intersection without stopping. Traditionally, transit signal priority/preemption was implemented using infrared transponders or RFID transponders. Improvements in technology and connectivity of traffic signals have enabled Wi-Fi and DSRC based implementation. These technologies are designed to improve the flow of traffic on arterials and thereby improve the overall corridor performance.

(iii) Dynamic Transit Dispatch

The objective of dynamic transit dispatch is to equalize the supply of transit with the demand by dynamically introducing or moving transit vehicles from one route to another. Due to the challenges with reducing service on a route, usual deployments involve adding service to routes with higher travel volumes than normal. This operational management approach is designed to enhance the use of transit and therefore reduce the number of vehicles traveling on I-10. New fare collection technologies, such as mobile phone-based fare collection along with technologies associated with Computer Aided Dispatch and vehicle availability and location (CAD/AVL) make this strategy implementable.

3.5 Mode/Travel Demand Change

These technologies facilitate the use of modes other than personally-owned vehicles (POVs) for travel. They also include those technologies that are used to shift transportation demand from peak congestion periods. Many of these technologies have existed for several years and are undergoing evolutionary changes in implementation. Mostly, these technologies are being superseded by technologies involving mobile devices and associated applications such as ridesourcing, traveler information systems, and ridesharing.

4. Federal and State Technology Programs and Initiatives

The Federal Government has a number of initiatives and research activities designed to advance the introduction and utilization of technologies. This section provides a brief summary of some of the most relevant initiatives for the I-10 corridor.

4.1 FHWA Office of Operations Congestion Initiative

(a) Urban Partnership Agreements

The FHWA Office of Operations created the Urban Partnership Agreements (UPA) program in 2007 as part of the agency's Congestion Initiative as a way to evaluate strategies to reduce congestion and travel delays. The cities of Miami, Minneapolis, San Francisco, and Seattle were selected to participate in and receive funding from the UPA program to address the "4 Ts": tolling, transit, telecommuting, and technology[24]. Each of the locations tested different methodologies to reduce urban congestion and impacts were subsequently evaluated to determine the most efficient long-term solutions. Across the four sites the following strategies were implemented:

- Bus Rapid Transit (Miami, Minneapolis)
- Ramp metering (Miami)
- Promotion of alternative work schedules, telecommuting, ridesharing (Miami, Seattle, San Francisco)
- HOV to HOT lane conversions (Minneapolis)
- Dynamic shoulder lanes (Minneapolis)
- Variable pricing (Minneapolis, San Francisco, Seattle).

The impacts of strategies implemented through the UPAs were evaluated to determine their effectiveness in decreasing congestion with mixed results. The UPA program did reveal that pricing does indeed influence travel behavior.

(b) Integrated Corridor Management

The Integrated Corridor Management (ICM) initiative aims to optimize existing infrastructure by dynamically managing corridors with ITS technologies to facilitate the efficient movement of people and goods. The objective of this program is to decrease congestion by improving travelers' awareness of situations, providing more detailed information, enhancing the response to incidents and congestion, and improving the overall corridor performance. The US DOT completed extensive research related to existing ICM methodologies, the feasibility of implementation, and the concepts required to successfully execute the corridor improvements. The initial evaluation was followed by a more in-depth look at the potential benefits of ICM and the development of tools and strategies to be used as the initiative moved forward.

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[24] FHWA, "Urban Partnership Agreements," Available at: https://ops.fhwa.dot.gov/congestionpricing/urb_partner_agree.htm

The USDOT selected eight Pioneer Sites that included some of the country's most congested corridors to develop potential ICM strategies. Two sites were ultimately chosen to model and demonstrate the ICM systems that were developed: US 75 in Dallas, Texas and I-15 in San Diego, CA. These demonstrations were evaluated based on ICM's effects on the corridors' safety, mobility, reliability, and environmental impacts as well as a cost-benefit analysis of the system implementation. Upon completion of the evaluations, the USDOT has shared documentation of the efforts of the eight Pioneer Sites, takeaways of the two ICM demonstration projects, and resources that can be used for future ICM systems.[25]

(i) Relevance to Technology

US-75 is a major corridor that provides a connection between Dallas and the cities to the north. The US-75 ICM demonstration aimed to provide updates and alerts to travelers using all modes along the 28-mile corridor segment. Components of the US-75 ICM Project included:

1. A Decision Support System to examine and analyze real-time transportation network data, recommend a response plan, and evaluate the effectiveness of the response plan.
2. A SmartNET Subsystem to communicate the status of various elements of the transportation system to travelers within the network and conveniently inform the public of system modifications.
3. A SmartFusion Subsystem to collect, store, and distribute data.
4. Dallas Area Rapid Transit's (DART) parking management system at all of the park-and-ride lots.
5. A regional 511 traveler information system.

The second ICM demonstration was completed on a 21-mile segment of I-15 that connects downtown San Diego with the northern city of Escondido. The goals of this project center on the collaborative management of all modes of travel along the corridor and improved integration with area stakeholders. Elements of the I-15 ICM project included[26]:

1. A Decision Support System to assess and predict system conditions and endorse potential response plans.
2. Real-time condition and rerouting information provided to travelers using changeable message signs.
3. An arterial monitoring system to observe traffic conditions.
4. Upgrades to traffic signal systems on two parallel arterial streets.
5. The enhancement of the existing Integrated Transportation Management System.

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[25] USDOT, "Integrated Corridor Management, Research Progress and Insights," Available at: https://www.its.dot.gov/research_archives/icms/icm_progress.htm

[26] USDOT, "Analysis, Modeling, and Simulation for the Interstate 15 Corridor in San Diego, California - Post-Deployment Analysis Plan," Available at: https://ntl.bts.gov/lib/60000/60400/60489/FHWA-JPO-16-393.pdf

6. The adjustment of ramp meter timing.

(ii) Lessons Learned

The I-75 ICM project in Dallas resulted in peak-hour travel time reductions of 143 person hours per day. While the ICM had positive impacts on peak-hour conditions, no notable improvements were seen when ICM strategies were applied outside of peak hours. The majority of travelers were found to have benefited from the program for 8 out of 10 scenarios. During congestion, benefits were concentrated in the immediate area of the incident causing the disruption for the peak direction of flow. Analysis indicates that use of the ICM system during a severe incident could increase transit ridership by up to 5.5 percent.[27]

The I-15 ICM deployment in San Diego resulted in a reduction of 1,403 person hours of travel per day. Travel time reliability was increased and the majority of travelers were found to have benefited from 6 out of 8 scenarios. The scenario including the allowed use of Express Lanes for all traffic during the period of an incident was not found to improve conditions.[28]

The ICM strategies improved coordination and communication between the various stakeholders and supported the use of performance measures to strengthen the decision-making process. The comprehensive approach to corridor management resulted in broader impacts and large-scale operational improvements. Moving forward, analysis of the data collected through ICM systems can assist in informed, proactive reactions to future corridor conditions.

4.2 Smart City

The USDOT introduced the Smart City Challenge in late 2015 as a call for applications for the funding of one city's transformation into America's first 'Smart City'. The goal was to solicit innovative solutions to enhance transportation systems using advanced techniques and emerging and future technologies. The USDOT provided a prioritized list of vision elements that were to be considered during the development of the Smart City applications. These 12 vision elements are shown in Error! Reference source not found..

[27] USDOT, "Analysis, Modeling, and Simulation for the U.S.-75 Corridor in Dallas, Texas – Post-Deployment Assessment Report," Available at: https://ntl.bts.gov/lib/60000/60400/60490/FHWA-JPO-16-396.pdf

[28] USDOT, "Analysis, Modeling, and Simulation for the I-15 Corridor in San Diego, California – Post-Deployment Assessment Report," Available at: https://ntl.bts.gov/lib/61000/61100/61131/FHWA-JPO-16-403.pdf

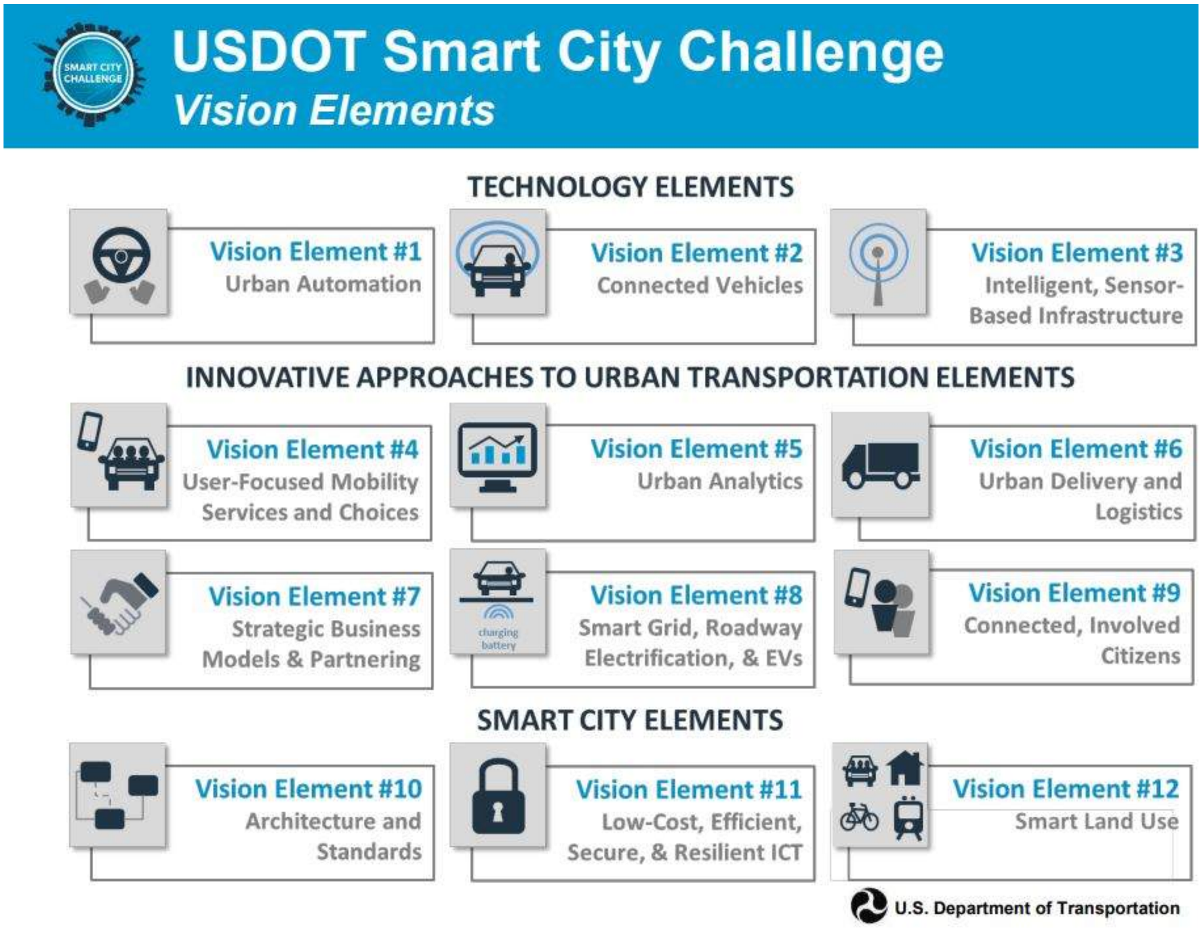

Figure 26. US DOT Smart City Vision Elements[29]

The response to the Smart City Challenge was greater than expected with a total of 78 first-round applicants. After evaluating all applications, the USDOT narrowed the field to seven finalist cities that were asked to further develop their ideas into a final proposal. Columbus was announced as the ultimate winner in June 2016 and received $40 million from the USDOT and $10 million from Vulcan, Inc. to complement the additional $90 million that was raised by the City from private partnerships. The successful application included the creation of a connected vehicle environment, the installation of smart street lights, and a transit pedestrian collision avoidance system. One main reason the City of Columbus was selected was the inclusion of an initiative to provide an underserved community with one of the highest infant mortality rates in the country with access to healthcare through subsidized transportation options. This component of the Smart City plan helped to unite the community's stakeholders, leading to the increased funding that strengthened the potential impacts of the successful Smart City designation.

Although only one city was selected as the winner of the USDOT's Smart City Challenge, many of the other applicants benefitted greatly from the application process. Partnerships were formed or strengthened with multiple public and private entities and many of the proposed elements are still

[29] US DOT

being pursued or considered as part of long-range strategic plans. While Columbus was awarded with the initial round of funding, additional investment opportunities for advanced transportation technology and strategies continue to be made available.

4.3 Congestion Mitigation and Air Quality

The FHWA's Congestion Mitigation and Air Quality Improvement (CMAQ) program was established to implement surface transportation projects that aim to reduce congestion while improving air quality. Local and State governments in areas that do not meet the National Ambient Air Quality Standards (NAAQS) for ozone, carbon monoxide, or particulate matter nonattainment areas and maintenance areas are eligible to receive funding through the CMAQ program for projects that will reduce air pollution. At this point in time, over $2 Billion has been authorized for each fiscal year through 2020[30].

CMAQ funding may be used for a variety of air pollution reduction strategies that fit four broad categories: new transit service, system or service expansion, new vehicles, or fare subsidies. New transit services and system expansion projects increase transit ridership by introducing additional transportation options or increasing the number of accessible origins and destinations. New vehicles allow the opportunity for more environmentally friendly selections and fare subsidies use financial incentives to encourage transit over other modes of transportation.

Although the main focus of the CMAQ program is improved air quality, there are a number of projects containing advanced technology elements that meet application requirements. For example, equipment and installation costs for things such as V2I communications, traveler information systems, eco-drive, Congested Intersection Adjustment, and signal phasing and timing (SPaT) could all be eligible for CMAQ funding.[31]

4.4 Connected Vehicle Pilot Deployment Program

The Connected Vehicle Pilot Deployment program was initiated by the USDOT Intelligent Transportation Systems Joint Program Office (ITS JPO) in an effort to support the development and testing of connected vehicle applications and technologies. Significant advancements in these technologies had been made in recent years and real world deployment was the most logical next step. The goals of the program are to support and accelerate early deployments of connected vehicle technologies, measure the impacts and benefits of the deployment, and enhance the development of the technologies by resolving issues throughout the deployment.

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[30] USDOT, "Congestion Mitigation and Air Quality Improvement Program," Available at: https://www.fhwa.dot.gov/fastact/factsheets/cmaqfs.cfm

[31] USDOT, "2015 FHWA Vehicle to Infrastructure Deployment Guidance and Products," Available at: https://www.its.dot.gov/meetings/pdf/V2I_DeploymentGuidanceDraftv9.pdf

After considering the characteristics and needs of multiple cities, states, and regions, the USDOT selected three locations to serve as initial pilot deployment sites: New York City, Wyoming, and Tampa, Florida. Each pilot site proposed a detailed deployment concept that included the implementation of multiple connected vehicle technologies and applications to improve the unique transportation systems. Performance measures were developed based on individual needs of each system.

Phase 1 of the USDOT's CV Pilot Deployment Program, the Pre-Deployment Phase, included the initiation of efforts to prototype and demonstrate connected vehicle applications. The prototype design and development aimed to meet the objectives and requirements determined as part of conceptual design. Records related to the prototyping efforts for select connected vehicle applications including concepts of operations, system requirements, algorithms, design documents, and source code have been published by the USDOT. Once the prototypes were developed, they were demonstrated and field tested to evaluate the safety, mobility and environmental impacts to gain insight on the potential impacts of widespread deployment. These prototypes were then finalized and carried forward into deployment efforts.

Real world deployments were initiated during the second phase of the CV Pilot Deployment program. Each of the three pilot programs incorporated concepts that leveraged USDOT-funded research and advanced data collection and communication technology.

The New York City CV Pilot Deployment Program builds upon the City's Vision Zero initiative with an aim to increase the safety of drivers, passengers, and pedestrians and greatly reduce the associated injuries and fatalities. The project area includes sections of the densely populated boroughs of Manhattan and Brooklyn and was proposed to utilize DSRC technology to provide safety information and warnings to vehicles and pedestrians. This pilot supports the deployment of many safety-related CV applications that focus on using V2I and V2V technology to address specific concerns such as Curve Speed Compliance, Blind Spot Warning (BSW), Lane Change Warning/Assist (LCA), Pedestrian in Signalized Crosswalk, and an Intelligent Traffic Signal System (I-SIGCVDATA). In order to accomplish the pilot's goals, 353 RSUs, 8,000 vehicles, and 100 pedestrians will be equipped with connected vehicle communication technology or devices.

The focus of the Wyoming CV Pilot Program is the enhancement of I-80, the state's major east-west freight corridor that spans southern Wyoming. The main issue on this corridor is the extreme wind speeds during the winter months that significantly increase the number of truck collisions and turnovers that result in road closures. The CV applications proposed as a part of this effort are centered on the needs of commercial vehicles and include Distress Notification (DN), Spot Weather Impact Warning (SWIW), I2V Situational Awareness, and Forward Collision Warning (FCW). An estimated 75 RSUs and 400 OBUs will be utilized during this deployment.

In Tampa, the main transportation issues were identified to be peak-hour collisions, congestion, pedestrian safety, streetcar conflicts, and wrong-way drivers on the Selmon Reversible Express Lanes (REL). The pilot deployment program aims to address these safety and traffic issues with multiple connected vehicle applications including Wrong Way Entry (WWE), Vehicle Turning Right in Front of a Transit Vehicle (VTRFTV), End of Ramp Deceleration Warning (ERDW), Intersection Movement Assist (IMA), and Probe-enabled Data Monitoring (PeDM). DSRC communication technology will be used by 40 RSUs and over 1,600 OBUs to achieve the goals of this CV pilot deployment program.

4.5 U.S. DOT Automated Driving System Demonstration Grants

On December 21, 2018, the U.S. Department of Transportation (U.S. DOT) announced the notice of funding opportunity for automated driving system demonstration grants. This funding totaled $60 Million dollars for projects that test the safe integration of automated driving systems (ADS) on the nation's roadways. No single grant application could receive more than $10 Million dollars. The grants aim to gather significant safety data to inform rulemaking, foster collaboration amongst state and local government and private partners, and test the safe integration of ADS on our nation's roads.[32] Goals of the ADS Demonstration grants:

- Safety: Test the safe integration of ADS into the Nations on-road transportation system. Fund projects that demonstrate how challenges to the safe integration of ADS into the Nations on-road transportation system can be addressed.
- Data for Safety Analysis and Rulemaking: Ensure significant data gathering and sharing of project data with USDOT and the public throughout the project in near real time, either by streaming or periodic batch updates, and demonstrate significant commitment to leveraging the demonstration data and results in innovative ways. Fund demonstrations that provide data and information to identify risks, opportunities, and insights relevant for USDOT safety and rulemaking priorities needed to remove governmental barriers to the safe integration of ADS technologies.
- Collaboration: This program seeks to work with innovative State and local governments, as well as universities and private partners, to create collaborative environments that harness the collective expertise, ingenuity, and knowledge of multiple stakeholders. These projects should include early and consistent stakeholder engagement, including early coordination with law enforcement, local public agencies, industry, transportation-challenged populations, the public, and other relevant stakeholders as applicable to conduct these demonstrations on terms that work for all parties.[33]

Over 70 applications were received by the U.S. DOT with submittals coming from Universities, State Department of Transportation agencies and cities. Award recipients are expected to be announced during the summer of 2019.

[32] https://www.transportation.gov/briefing-room/us-department-transportation-announces-notice-funding-opportunity-automated-driving

[33] http://www.grantsoffice.com/GrantDetails.aspx?gid=54519

4.6 Federal Transit Authority (FTA) Integrated Mobility Innovation

FTA's Integrated Mobility Innovation (IMI) Program funds projects that demonstrate innovative and effective practices, partnerships and technologies to enhance public transportation effectiveness, increase efficiency, expand quality, promote safety and improve the traveler experience.[34] FTA's IMI 2019 funding opportunity provides $15 million for demonstration projects focused on three areas of interest:

Mobility on Demand, Strategic Transit Automation Research and Mobility Payment Integration to:

- Explore new business approaches and technology solutions that support mobility
- Enable communities to adopt innovative mobility solutions that enhance transportation efficiency and effectiveness
- Facilitate the widespread deployment of proven mobility solutions that expand personal mobility

The application filing date for this funding opportunity was August 6th, 2019.

4.7 State Technology Programs

(a) Road X

The Colorado Department of Transportation (CDOT) created the Road X program with a vision of using advanced technologies to increase the safety and reliability of the state's transportation system. CDOT teamed up with public and private entities to invest in the most promising ideas focused on one or more of the defined action areas of commuting, sustainability, transport, safety, and connection. In 2016, the state committed $20 million to initiate the Road X program and plans to continue to provide funds as worthwhile projects that fit the program's mission are developed. Current projects include smart truck parking, smart pavement, communication systems and infrastructure, and developing a plan for statewide electric vehicle charging stations. CDOT continues to accept ideas from the public for consideration for the RoadX program through their website.[35]

(b) Road to Tomorrow

In 2015, the Missouri Department of Transportation (MoDOT) introduced the Road to Tomorrow initiative that aims to prepare the state's transportation systems for emerging technologies and find innovative ways to fund the transformative projects. A mission of the program is to design the next generation of highways. Topics that have been considered as a part of this program are related to alternative energy, the Internet of Things, smart pavement, truck platooning, and EV infrastructure.

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[34] https://www.transit.dot.gov/IMI

[35] Colorado DOT, "RoadX," Available at: https://www.codot.gov/programs/roadx/programs/roadx

In 2016, the Road to Tomorrow program was awarded with AASHTO's President's Award for its efforts to further MoDOT and advance the future of transportation.[36]

(c) California PATH

In the 1980s, many universities developed programs to conduct research about emerging transportation technology. One of the most prominent programs was the California Program on Advanced Technology for the Highway (PATH), which was a collaboration between the University of California at Berkeley and the California Department of Transportation (Caltrans). This program aims to address issues with the State's transportation systems and continues to be an active leader in the research of transportation technology. A portion of PATH's research focuses specifically on connected and automated vehicles, including operational strategies, advanced driving features and systems, and contributing to the creation of a connected vehicle test bed along a signalized arterial between San Jose and San Francisco.[37]

(d) I-95 Corridor Coalition

The I-95 Corridor Coalition is composed of transportation agencies, toll authorities, public safety organizations, and other related stakeholder groups along the I-95 corridor from Maine to Florida. Affiliate members are located in Canada. The purpose of the volunteer-based Coalition is to combine the forces of all of the partner agencies to address the key widespread issues with transportation system management and operations. The Coalition's structure includes four program track committees that include travel information services, incident management and safety, intermodal freight and passenger movement, and innovation in transportation. The organization aims to support the efficient transfer of people and goods across all modes of transportation and improve coordination between agencies during normal system operations as well as in response to regional incidents. Past and ongoing projects include focuses like the Regional Integrated Transportation Information System (RITIS), electronic tolling, interoperability and enforcement reciprocity, and connected and automated vehicles.

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[36] Missouri DOT, "Road to Tomorrow." Available at: http://www.modot.org/road2tomorrow/

[37] University of California, Berkley, "California Path – Partners for Advanced Transportation Technology," Available at: http://www.path.berkeley.edu/

5. Technology Assessment and Recommendations

Technology adoption within the transportation space is moving rapidly. While autonomous and connected vehicle deployments seem certain, what is not clear is the rate of adoption and the resulting speed at which technology improvements need to be made by TxDOT. In light of these uncertainties, TxDOT should strive to balance the maintenance of existing ITS infrastructure that is predominantly orientated to human drivers with emerging technologies that will be needed as the shift in transportation occurs. This chapter includes two sets of assessments and recommendations that are divided between existing ITS components and emerging technologies.

5.1 Enhancements to Existing ITS Technologies

As discussed above, the I-10 Corridor already has a significant deployment of ITS equipment including CCTV, DMS, radar and Bluetooth vehicle detection equipment throughout the corridor. Additionally, travelers on the corridor have access to cellular communications as well as trip planning applications and information dissemination mechanisms that allow for travelers to select alternative routes, modes, and time-of-day for their travel. At the same time, there are potential enhancements that could be made to the traditional ITS components that would strengthen their impact on reducing congestion and improving mobility. This section provides recommendations for potential near-term enhancements that could be made by TxDOT to increase the impact of existing ITS infrastructure on reducing congestion and improving mobility.

(a) Power and Communications Upgrades

Dedicated power and a communications backhaul are the cornerstones of ITS deployments and are even more critical for emerging technologies. In preparation for emerging technologies, TxDOT should consider enhancing the existing power and communications links to include the following:

- Dedicated power with secondary power backup for ITS components.
- Inclusion of Power-over-Ethernet (PoE) as a power source at ITS deployment locations.
- Upgrades or installation of fiber-optic strands for ITS components linked to a Traffic Management Center. These fiber-optic strands should be at least 144 strands with 10 Gbps capabilities.

(b) Improvements to Closed Circuit Television Cameras

TxDOT has coverage of the I-10 freeway in this corridor. However, this coverage is not universal throughout the corridor even on I-10. Additional camera coverage could be added to include more segments of I-10 as well as additional coverage of arterials and alternative routes such as SR 62 and SR 375. The coverage of additional road segments will enable TxDOT to more quickly identify and clear incidents as well as monitoring traffic on I-10 and alternative arterials.

The existing CCTV cameras as well as any additional cameras should be digital, IP based cameras that avoid the need for direct linkages to a TMS. Moving to a digital camera platform will enable TxDOT to deploy software-based technologies that can automatically process the digital images using advanced computer analytics to identify traffic incidents, perform vehicle classification and counts, and to provide information on traffic speeds.

(c) Improvements to Dynamic Message Signs

There is coverage of I-10 and SR 62 with respect to DMS but other potential alternative routes such as SR 375 are lacking DMS components. Understanding that DMS as a technology will be rendered obsolete by V2V and V2I communications within the next two decades, there is still a role for DMS in the next 10-15 years to provide information to drivers of manually operated vehicles. TxDOT could consider replacing DMS components as they reach the end of their service life with high resolution full color LED instead of the existing monochrome displays.

(d) Integrated Trip Planning Applications

Travelers along the I-10 Corridor have a number of trip planning applications and information sources as previously described. However, these are not integrated into a single, comprehensive mobile application that combines traffic information on I-10 and arterials with real-time transit information. TxDOT should consider developing or supporting the development of such an integrated trip planning and real-time traffic reporting application. As an alternative, TxDOT could consider entering into agreements with large aggregators of traffic and trip information such as Waze™ and others.

(e) Streetlight Improvements

Streetlights are not typically considered to be ITS components. However, advances in streetlights include conversion to LED as well as dynamically controlled lighting based upon motion and the amount of ambient light. New streetlights also include the ability for additional sensors, such as weather sensors, to be added. When performing routine replacement of existing streetlights in the I-10 corridor, TxDOT should ensure that the replacements have the ability to add sensors (e.g., inclusion of 5-pin or 7-pin ports on the top of the light for plug in modules).

5.2 Investments for Emerging Technologies

Not all emerging technologies will have an immediate impact on congestion, mobility, and travel time reliability. However, these technologies will emerge rapidly and it is important for TxDOT to be in a position to capitalize upon these technologies when the market saturation is such that they will have a significant impact.

(a) Autonomous and Connected Vehicle Technology

Currently, the Tornillo/Guadalupe Port of Entry in El Paso is a partner in the Texas Autonomous Vehicle Proving Ground Partnership, which was designed as a National Autonomous Vehicle Proving Ground in 2017. This designation provides an opportunity for technology deployment and testing along the I-10 corridor as part of a larger initiative within the State of Texas. One key sensor that enables truly autonomous vehicles is V2I communications of some sort.

Despite the ongoing debate regarding the use of DSRC versus 5G or other cellular communications for V2I and V2V communications, several researchers have suggested that the potential benefits in the short term far outweigh the costs for later conversion should that be necessary. For example, McGurrin (2017) suggests:

> *"The results show that there are substantial benefits to be gained by moving forward with deployment. However, an argument for waiting is that C-V2X may prove to be superior in one or more ways, and therefore it would be advantageous to wait. To address this concern, this paper proposes a new approach, called "Dual-Mode Transition," where the nation moves forward with DSRC-based deployment, but transitions through a dual-mode deployment for several years before converting to purely C-V2X, should the latter prove superior in some way. The costs significantly outweigh the additional costs. Although further analysis is needed, such as refinement of the cost-benefit analysis, confirmation of the technical feasibility of the dual-mode approach, and further assessment of the impact of the increased in-vehicle costs, this analysis provides quantitative data supporting moving forward with a DSRC-based deployment, regardless of whether C-V2X proves to offer advantages in the longer term. However, it is also important to realize that further delay in deploying V2V safety comes at a cost in terms of lost lives, more injuries, and increased property damage. Not making a decision is equivalent to making a decision to delay.[38]"*

Many States, Cities, and Municipalities are currently investing and deploying connected vehicle technologies, particularly DSRC RSEs along Interstate and Highway corridors as part of other initiatives or as standalone deployments. Within the realm of autonomous and connected vehicles there are several potential areas where investing in autonomous and connected vehicle technologies would potentially improve congestion and mobility along the I-10 corridor.

(i) Establishing a Baseline Connected Vehicle Corridor

Although mature, DSRC technologies represent a relatively new type of technology for many State DOTs. The provisioning of RSEs and the capture and analysis of resulting messages from V2I communications is different than traditional data collection activities. With DSRC, vehicles will be broadcasting a Basic Safety Message (BMS) at a frequency of 10Hz. Other types of V2I communications at less frequent intervals would include Travel Advisory Messages and Roadside Alert Messages. TxDOT could use these messages in the I-10 corridor to supplement existing traveler information dissemination and alerting from existing, traditional ITS components such as DMS.

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[38] Michael McGurrin, McGurrin Consulting, "DSRC vs. Waiting for C-V2V: Lost Benefits and a Proposed Dual-Mode Solution," December 2017, available at https://www.mcgurrin.com/docs/dual_mode.pdf

HDR recommends that TxDOT consider implementing DSRC RSEs to be co-located with existing DMS equipment on the I-10 corridor. By utilizing these existing locations, TxDOT could tap into existing power and communications networks at minimal costs. Ultimately, HDR believes that investing in DSRC technology is recommended as it represents a relatively low risk opportunity for TxDOT while maximizing the existing and previous investments. For example, in the future if 5G technologies or some other communication protocol rises to dominance such as Miracast Wi-Fi, these radio units can be “retuned” to operate as Wi-Fi routers or can have cellular modems added to transform them into 5G transponders. As new Dynamic Mobility Applications and Connected Vehicle applications are developed, having some coverage in the I-10 Corridor will enable TxDOT to implement these applications and further improve safety and mobility of travelers and workers. For example, one application previously tested by US DOT but has yet to be deployed due in part to DSRC coverage issues is the Response Emergency Staging Uniform Management and Evacuation application (R.E.S.C.U.M.E.). Among other things, this application provides real-time alerts to first responders and work crews when oncoming vehicles are determined to be a threat of entering an active incident zone. Establishing some coverage is a significant step to enabling these kinds of applications. The following table summarizes the proposed locations for DSRC RSEs along the I-10 Corridor.

Table 4. Proposed RSE Locations along I-10 Corridor

Eastbound		Westbound	
RSE ID	Cross-Street Reference	RSE ID	Cross-Street Reference
RSE 1	Piedras	RSE 13	Horizon
RSE 2	Raynolds	RSE 14	Eastlake
RSE 3	Airway	RSE 15	Lomaland
RSE 4	Lee Trevino	RSE 16	McRae
RSE 5	Americas	RSE 17	Airway
RSE 6	Van Horn	RSE 18	Trowbridge
RSE 7	McRae	RSE 19	Piedras
RSE 8	Executive Center	RSE 20	Prospect
RSE 9	Buena Vista	RSE 21	Executive Center
RSE 10	Mesa	RSE 22	Resler
RSE 11	Artcraft	RSE 23	Artcraft
RSE 12	Vinton	RSE 24	Vinton
		RSE 25	Zaragoza

Table 5 presents a conceptual-level cost estimate of the proposed RSEs along I-10 that would establish an initial coverage. This cost estimate is based on installing 25 RSEs with connectivity to existing power and communications backhaul. Other assumptions include:

- The RSEs can be mounted onto the existing DMS infrastructure
- The RSE cost per unit does not increase from $1,400.
- The yearly maintenance includes a check on each RSE quarterly and major support and maintenance of 2 units per year (10 percent of the units).

Table 5. RSE Installation and Operation Costs for Recommended Locations

Item	#	Cost	Total	Justification
RSE Radio	25	$1,400	$35,000	Quote
RSE Mounting Brackets and Ethernet Wire, and POE Injector	25	$370	$9,300	Quote
RSE Installation Support			$421,800	Based Upon Wyoming CV Regional Pilot Costs
Yearly Maintenance			$56,300	Based Upon Wyoming CV Regional Pilot Costs and Assumptions
25% Contingency			$130,600	25% Contingency

(ii) Facilitating Commercial Vehicle Movements

Although they have been considered as parts of long-range planning efforts in multiple states, there are very few exclusive truck lanes that exist today in the United States. Two instances can be found in California on northbound and southbound I-5 in Los Angeles County and southbound I-5 in Kern County. These lanes are all less than 2.5 miles in length and are used to address specific needs of separating slower traffic on a grade and forcing truck traffic to merge downstream of a junction. Many highways restrict truck use to certain lanes but allow other vehicles to use all lanes, eliminating many of the benefits associated with exclusive truck lanes. Corridors such as I-10 near El Paso are ideal locations for this traffic management technique due to high traffic volumes and truck percentages, especially during peak periods.

As a potential pilot project, TxDOT could deploy temporary dedicated lanes on I-10 for through truck traffic. These exclusive lanes will provide freight vehicles with dedicated interchanges with entrance and exit ramps from the ports of entry and major intersections on the I-10 corridor, especially to the various industrial areas in El Paso. The length and location of the Pilot truck lanes will be determined based on existing conditions, roadway capacity, and feasibility. The utilization of lower cost temporary barriers could be utilized in order to provide a definite separation of the exclusive lanes while allowing TxDOT the flexibility to evaluate multiple potential configurations and locations. Where applicable, signage could be used to indicate the entry point to the dedicated lanes and the point at which trucks merge back in with traditional traffic. Existing traffic patterns within the corridor should be analyzed to ensure that any signing modifications or detour routes needed throughout the Pilot project are provided to both truck traffic and general-purpose traffic. If permanent dedicated truck lanes are implemented, one long term goal may include the construction of dedicated highway ramps for truck traffic at key locations where local truck traffic is high. If an incident occurs on the general-purpose lanes, the exclusive truck lanes will continue to provide free flowing access, reduce delivery travel time and increase fuel efficiency. If an incident occurs on an exclusive truck lane, general purpose traffic will not be affected.

The effectiveness of this Pilot project could be enhanced if paired with the Truck Platooning Pilot. Exclusive truck lanes allow for simplified testing of truck platooning techniques by eliminating the variables involved with general traffic patterns and distracted drivers. A combined dedicated truck lane and truck platooning pilot would provide a unique opportunity to gain insight on the potential impacts that these traffic management methods may have on transportation in the future.

(b) Dynamic Lane Assignment

While roadways have typically been designed to last up to 50 years, emerging transportation technologies have the potential to make long-term development decisions more difficult than ever. Agencies must anticipate major changes to travel behavior and infrastructure needs as advancements continue to be made with connected and autonomous vehicles. Dynamic lane assignment strategies are being proposed as a way to plan for a variety of potential future states. The concept of dynamic lane assignment allows for various types of traffic to travel efficiently on a roadway by allocating specific travel lanes based on a variety of factors such as a vehicle's type, passenger load, and technological capabilities. The assignments can be dynamically managed to account for the throughput level as well as expected and unexpected congestion. This flexibility allows the lane configuration to be effective through all phases of technological development.

A potential pilot implementation of dynamic lane assignments would help the El Paso region explore the potential benefits of this unique traffic management technique. The lane assignments could be modified to address the specific needs of the I-10 corridor. For example, high occupancy vehicle and dedicated transit lanes could be implemented during peak hours to encourage more efficient modes of transportation. The direction of travel could be made to be reversible for some lanes during strategic periods of time such as major sporting events. Once vehicle technology continues to advance, lanes could be assigned to autonomous and connected vehicles as well as platooning freight vehicles. Lane assignments could be adjusted at any time in order to keep up with the needs of the transportation system.

The implementation of dynamic lane assignments has the potential to provide predictable travel times for commuters, improve transportation operations, and accommodate for future transportation technologies. Future plans for dynamic lanes include more advanced ideas such as dynamic lane quantities and widths and future advancements in pavement, striping, and lighting technologies.

Long-term benefits of dynamic lane assignment include potentially drastic safety and capacity improvements as well as cost savings from reduced capacity expansion needs.

(c) Truck Parking and Port of Entry (POE) Reservation System

TxDOT could implement a truck parking and port of entry (POE) reservation pilot system along the I-10 corridor. This system would utilize smart truck parking signs which would display available parking spaces near the I-10 corridor between the Anthony Travel Center and Fabens Area Rest Areas. These smart truck parking signs would display available truck parking spots at designated truck parking lots (segments). This system would need to be developed in coordination with local area businesses such as private operated travel centers and plazas, large big-box retailers and other area businesses to ensure that there is capacity to handle the truck parking spots as well as installing technology to automatically determine parking availability. Currently, there are a number of technology solutions on the market that can be installed to track the number of available parking spots. The trucks could use these parking spaces as a way to make local deliveries more efficient and reduce the driving time and emissions emitted by trucks trying to find available overnight parking.

In addition, these parking spaces could be used as a staging area for border crossing. Trucks that are parked at these locations could wait until they receive their reserved border inspection time and then travel to the POE at that time. Allowing for trucks to be parked before moving through their POE could reduce driver time in the truck, reduce fuel consumption, reduce idling time at the border and reduce truck emissions.

If this system were to be contemplated, a baseline of data would need to be gathered, if not already known, to determine the additional driving time, costs and emissions looking for a parking spot as well as the time, costs and emissions generated waiting to pass through the POE. This data would then need to be compared to the pilot generated data to determine if there has been any measurable decrease in time, cost and emissions. If there is a positive effect on time, cost and emissions, the pilot could be potentially expanded.

(d) Speed Harmonization and Queue Warning

The objective of speed harmonization is to minimize the variability in vehicle speed that results from incidents, weather or road conditions, or general congestion in order to reduce the negative impacts of the event on the transportation network. This application could utilize V2V and V2I communication technology to collect information that helps identify when traffic conditions are being affected by an event of some kind and speed harmonization may need to be implemented. However, it could also be implemented using the existing vehicle detection and ITS components in the I-10 corridor. Once real-time speeds and vehicle volume are determined, a TMC application formulates a response plan for upstream traffic that includes speed and lane recommendation strategies and communicates the plan to upstream traffic through an effective manner. This information is then manifested to the traveling public using DMS or V2I communications. TxDOT may need to supplement the existing DMS signage along I-10 to facilitate Speed Harmonization.

The effectiveness of the speed harmonization is directly dependent on the compliance level of the advisory speed limits that are communicated to the travelers. Successful past variable speed limit implementations used various techniques to maximize speed limit compliance such as advisory mandatory limits as well as enforcement through automatic and photo radar systems. An effective speed harmonization system will reduce crashes, decrease speed and speed variance, increase travel time reliability, and potentially cause an increase to the throughput.

A similar application would be to provide travelers with Queue Warnings, again using existing DMS and V2I technologies. Queue warning provides travelers with warnings related to existing and future queuing conditions. The goal is to minimize the negative effects of queues, most notably safety concerns such as rear-end collisions and introducing shockwaves that cause upstream traffic disruption. Vehicles within the queue automatically broadcast information about the status of the queue to the upstream traffic or the surrounding infrastructure via V2V and V2I communications or through triggering an existing Bluetooth or other vehicle detection monitor. Recently, new technologies, such as the iCone™ are being used for queue warnings in work zones. The key data transmitted through queue warnings includes deceleration rates, the disabled status of vehicles, and lane location. By providing travelers with this information in a timely manner, secondary collisions and traffic flow shockwaves will be minimized.

6. Summary and Conclusions

The I-10 Corridor is a heavily traveled corridor by both passenger and commercial vehicles and experiences heavy congestion, especially during peak periods. There is a significant amount of existing ITS technologies that are deployed along the corridor that provide a solid basis for traffic operations and congestion relief. At the same time, many of these ITS components are aging and are becoming outdated. As resources permit, TxDOT should aggressively seek opportunities to upgrade existing ITS components including:

- Expanding coverage, density (number of pairs), and bandwidth of fiber-optics along the corridor.
- Converting existing DMS to multi-color LED from monochrome text.
- Replacing analog CCTV cameras with digital, IP-based camera systems.
- Implementing vehicle detection, counting, and classification through software- based systems based upon digital video images instead of additional radar, Bluetooth, or other vehicle detection systems.
- Integration of trip planning and real-time traffic conditions across all available modes within the corridor.
- Ensuring that streetlight replacements include provisions and capabilities for mounting additional sensors at future dates (i.e., include five or seven-pin peripheral ports).

We recommend that TxDOT invest and deploy a modest number of V2I Roadside Equipment using connected vehicle Dedicated Short Range Communications radios to be co-located at existing DMS locations. This equipment could be used to provide additional Traveler Information Messages, Road Hazard Warnings, and to capture information from vehicle-broadcasted Basic Safety Messages. Implementing this relatively small number of RSEs would provide TxDOT an opportunity to prepare for the rapidly emerging V2V and V2I technologies as well as the next generation of autonomous vehicles that is expected to include V2V and V2I communications of some sort.

TxDOT could further leverage existing ITS assets and the recommended V2I technologies through implementation of speed harmonization, queue warnings, dynamic lane control, and exclusive truck lanes/platooning.

6.1 5G

TxDOT will want to consider deploying a 5G network in order to test connected vehicle to everything (C-V2X) technology along the I-10 corridor in conjunction with other stakeholders. 5G is the latest enabling technology that allows communication between devices, while C-V2X is a critical application that allows for the connectivity between vehicles and everything else. C-V2X, which was standardized in 2017, is designed to connect vehicles to each other, to roadside infrastructure, to other road-users and to cloud-based services.

The goal of the 5G C-V2X project would be to determine:

- Whether the use of C-V2X technology in conjunction with a 5G network can reduce congestion;
- Whether the use of C-V2X technology in conjunction with a 5G network can increase traffic speed and throughput;
- Whether the use of C-V2X technology in conjunction with a 5G network can reduce traffic incidents, accidents and fatalities.

A portion of the I-10 corridor in El Paso has been identified as having the potential for a deployment of 5G C-V2X technology to test the various V2X technologies. The corridor, which stretches from Schuster Avenue to Copia Street is approximately 4 miles. A 5G cell network covering the span of I-10 from Schuster Avenue to Copia Street utilizing different types of cells, Picocells or Microcells, is being proposed for the pilot project.

Based on past deployments of cellular technology, the City of El Paso and the I-10 corridor is not expected to have 5G cellular service deployed until 2021. The almost 2-year timeframe should allow for a project plan to be put together and stakeholders engaged and committed. In addition, grant funding that could pay for some of the cost of the pilot project could be applied for. Launching a pilot project in the spring or summer of 2021 should not be out of the realm of possibilities. TxDOT will want to determine, in conjunction with the project partners, the length of the pilot, which could run for months in order to properly assess the technology in all type of driving conditions. Performance measurements to accurately assess the impact of the pilot would include:

- Number of vehicles connected and participating in the pilot
- Measuring the signal speed, both sending and receiving data, from the 5G cells
- Speed of traffic along the I-10 corridor to determine whether there has been an increase/decrease in overall throughput and travel times
- Capturing other traffic data including measuring traffic incidents (near misses that may be determined by analyzing driving data), traffic accidents and fatalities

6.2 Electrification Corridor

TxDOT will want to consider deploying an electric vehicle electrification pilot project along the I-10 corridor. The goal of the pilot would be to gather data to determine:

- Whether the addition of additional charging stations will lead to an increase in the number of electric vehicles that are owned and operated in El Paso.
- Whether public installation of charging stations will spur additional investment from private electric vehicle charging station operators

- Whether the additional increase in electric vehicles has a measurable impact on lowering emissions in the I-10 corridor area.

Three different use cases for deploying electric vehicle charging stations have been developed including installing charging stations at rest stops on I-10, converting an I-10 lane as HOV EV lane and installing charging stations at major area employers along the I-10 corridor.

6.3 I-10 Rest Area Electric Vehicle Charging Station Pilot

Rest stops on I-10 at the Anthony Travel Center and Fabens Area Rest Areas were selected for installing electric vehicle charging stations over others because they are owned and operated by TxDOT, have a high enough volume of vehicles due to easy access to I-10, and are at a location that encourages vehicles to remain idle for a period of time. Constructing charging infrastructure in facilities where travelers are already stopping and potentially dwelling for a substantial amount of time, provides an opportunity to offer both consumer facing and commercial facing charging facilities.

6.4 I-10 HOV EV Lanes Pilot

While the concept of managed lanes is growing in El Paso, there is an opportunity to combine the use of HOV lanes with Electric Vehicles as a way to incentive the increased purchase and use of Electric Vehicles along the I-10 corridor. Along a 4-mile corridor on I-10, from Schuster Ave to Copia St., TxDOT should dedicate one lane in either direction as a dedicated HOV EV lane. The use of HOV EV lanes would reduce current and future traffic congestions for drivers of electric vehicles that drive in the HOV EV lane. If successful, the length of the HOV EV lanes could be expanded beyond Schuster Avenue and Copia Street to further encourage adoption of electric vehicles.

6.5 Install Charging Stations at Major Area Employers along the I-10 Corridor Pilot

In addition to installing charging stations at rest areas along the I-10 corridor, TxDOT should consider partnering with major local area employers, near the I-10 corridor, to deploy electric vehicle charging stations. TxDOT, in conjunction with major employers, both public and private, should deploy electric vehicle charging stations at work locations throughout El Paso near the I-10 corridor. Considerations for TxDOT to determine the right employer partners would include:

- Number of employees
- Proximity to I-10
- Number of visitors/customers
- Other attributes

Major industries to consider are healthcare organizations, education and Fort Bliss. In addition, other companies in the electric industry may also be good employer partners for this pilot.

6.6 UAS Incident Management

TxDOT may want to consider developing a pilot for the use of Unmanned Aerial Systems (UAS) to aid in the event of a traffic incident or accident along the I-10 corridor. Significant regulatory requirements, both from a federal and state level, limit the type of pilot project that can be recommended. Regulations from a federal standpoint are governed under the Federal Aviation Administration (FAA) which controls how a vehicle operates within the airspace, and at the state level, Texas regulations and laws control who can use UAVs and for what specific activities or purposes they can be used with privacy being a significant concern. While these rules and regulations are being updated based on technology development and feedback from industry and learnings from approved pilots, the suggested pilots should be able to comply with both federal and state regulatory requirements as they exist today.

While regulatory considerations are important when considering an UAS pilot project, current technology constraints also acts as a limiting factor. Current mobile UASs allow for aerial drones to operate up to 1 hour in a range of up to 6 miles with sustained winds of less than 40 miles per hour. These mobile systems are intended to be used by people at an incident scene. In addition to mobile systems, stationary systems allow for drones to be deployed from a fixed point, which can reduce the time it take so deploy a drone from a mobile location. These stationary systems can come with a tethered which allows for the drone to remain in a fixed position but allows for a longer use based on a battery management system remaining on the ground. In addition, stationary systems also have the flexibility to release a drone to fly, similar to a mobile drone system, but allows for the drone to be housed in a weather-protected port while it is being stored and charged.

Currently, there are a number of UASs being tested in a variety of different use cases around North America. In Ontario, the Ontario Provincial Police (OPP) Traffic Safety and Operational Support Command has been using UAS since 2012 to enhance search and rescue operations and map collision scenes for the Highway Safety Division (HSD). In North Carolina, the state is utilizing UAS to support construction inspections and reconstruct accident scenes in order to open travel lanes more quickly. In Texas, the Texas Department of Public Safety has developed a UAS program with systems in operation across Texas. The Texas program has provided support to local law-enforcement to develop UAS programs and has developed a policy for how those operations should take place.

The first pilot project would involve the use of a mobile UAS along the I-10 corridor when there is a traffic incident or accident. The UAS is operated by a pilot on-scene and is used to gain a higher vantage point of the incident, allowing a better view of the on-ground details. These systems have been successful in this use, as they can give the first responders a better situational awareness of the area, better understand the extent of the accident, better detect the extent of spilled fluids and accident debris, and give a clearer picture of the position and location of evidence available for reconstruction.

The second pilot project would involve the deployment of stationary UASs along the I-10 corridor where they can be deployed in the event of a traffic incident or accident. The second pilot is a system of stationary UASs located along the corridor that could deploy quickly in response to an accident to give a better understanding of an incident scene. In this scenario, the vehicle would only operate vertically from the base station and would rely on the high resolution of the camera to capture the imagery from an incident. This system could cut the time required to get a camera on an incident, but it would also come at the expense of the greater detail that would come from a first responder operating the UAV.

A ConOps or Operational Deployment Protocol will need to be developed specifically for use along the El Paso I-10 corridor. This will inform the basic operation of the program, who is responsible for what, how communications and coordination between agencies will be managed, and different operational protocols for different scenarios. Additionally, it should define how the UAS program is integrated with the existing Traffic Management Center and operations. Finally, performance measures such as vehicle control and operation, communication, image quality, response time and maintenance should all be analyzed during the pilot.

6.7 Truck Platooning

TxDOT has an opportunity to develop a truck platooning pilot to improve safety, reduce environmental impacts, and alleviate congestion along the I-10 corridor. The El Paso area is home to the third busiest truck border port in the United States and serves as a commercial freight, truck and air hub for the region. Truck freight uses the I-10 corridor and surrounding street network and is distributed throughout El Paso in one of four ways: 1) through trips; 2) POE destinations; 3) local destinations; and 4) intermodal destinations such as rail yards and the airport.

Many states prohibit truck platooning through following-too-closely (FTC) statutes but over 20 states, including Texas, have enacted FTC exemptions to allow for truck platooning. While the regulatory environment is open for piloting, testing and innovation, the technology component which will allow for the safe usage of truck platooning technology is just being developed. Platooning technology allows multiple vehicles to virtually couple such that vehicles can accelerate and brake simultaneously based on the steering, acceleration, and braking inputs of the lead vehicle. The connection between vehicles can be done via dedicated short-range communications or 5G connected vehicle technology, with the vehicle controls for platooning vehicles being automated. In addition, Vehicle-to-Vehicle (V2V) safety applications utilize communication between vehicles to prevent crashes while Vehicle-to-Infrastructure (V2I) safety applications integrate roadside communication infrastructure and vehicle data to enhance safety to drivers. Truck platooning is expected to improve capacity through reduced headways, decrease collisions, and increase fuel economy due to increased connectivity and automating among vehicles. Platooning technology requires trucks that are of similar size, that are new models and include required technology, and by similar manufacturers that allow shared use of proprietary technology.

There are a number of truck platooning pilot project that have either been completed or are currently underway. Several companies have completed demonstrations in Texas, Michigan, North Carolina, Florida, and other locations. Volvo Trucks North America and FedEx are running truck platoons in North Carolina and report fuel savings when operating along long distances on interstate environments. In addition, Peloton Technology recently unveiled technology for truck platooning that allows a single driver to drive a pair of vehicles. Peloton's proprietary technologies link pairs of heavy trucks for connected driving that improves aerodynamics, fuel economy and safety, using V2V communications and radar-based active braking systems, combined with vehicle control algorithms. While still in development, truck platooning technology may be ready for a pilot project in the I-10 corridor in the near term.

I-10 is uniquely located across a major metropolitan area, along a regional and national east-west corridor, and adjacent to the U.S.-Mexico border. These characteristics provide opportunities for truck platooning use cases that will improve efficiency for truckers, commercial companies, and the local economy.

6.8 Drayage Operations

There are over 2 dozen drayage operations, freight that is shipped over relatively short distances, along I-10 in El Paso. Truck platooning will provide coordinated travel reliability that enhances efficiency. Through the use of a dynamic freight staging application, vehicles within a specified area will communicate their origins and destinations. The system will analyze the information provided and coordinate Dynamic Freight Staging. Dynamic freight staging will introduce the capability to group trucks at their origin or destination for a short period of time before, during or after a delivery. Drivers and shippers will be incentivized to use this service by the time and fuel savings afforded through signal priority. The application could be designed with the capability to build in reservation of delivery windows at El Paso International Airport and other area freight facilities.

6.9 Border Operations

Cross-border truck volumes continue to increase with hundreds of thousands of trucks passing through the El Paso border each year. Through enhanced coordination of multiple trucks traveling similar paths and distances, truck platoons can improve cross-border travel reliability and efficiency. With an eye towards future Port of Entry (POE) Reservation, truck platoons could reduce queuing at border crossings. This deployment will build off of the improvements in drayage operations with signals along Airway Boulevard and Montana Avenue to be upgraded to include new controllers and DSRC. Through dynamic matching based on origin and destination, trucks will be organized into non-autonomous “guided platoons” or road trains of three to five vehicles with similar routes. This use case will showcase many of the benefits of semi-autonomous platooning without the need for cooperative adaptive cruise control, a technology that has yet to become adopted widespread. The establishment of platoons will also serve as a basis for enacting signal priority, which will be requested through cellular technology.

6.10Long Haul Trucking

Approximately 55 miles of the 880-mile I-10 corridor are located in the study area. Through the use of cooperative adaptive cruise control, trucks equipped with proper technology and of suitable size and condition will be able to form platoons at the eastern and western ends of the study area. At the western end of the study area, Exit 0 in Anthony, Texas provides Flying J Travel Plaza, Pilot Travel Center, and Love's Travel Stop suitable for truck staging. At this location trucks coming from the west can stop, rest, and connect in a platoon for the travel east through the study area. At the eastern end of the study area, Exit 49 in Fabens, Texas provides Fast Trak travel center with amenities for truckers. At this location trucks from the east can stop, rest, and connect in a platoon for the travel west through El Paso. Long haul trucking will benefit from fuel savings during platooning across this approximately 55 mile stretch of interstate. The associated benefit to El Paso will be improved air quality from fewer emissions from trucks passing through the region.

Truck platooning deployments will rely on a combination of public and private partnerships. Traffic signal improvements along Airway Boulevard and Montana Avenue to include new controllers and DSRC will be a public sector responsibility while implementation of 5G technology will require investments from the private sector. Performance measures identified for the proposed truck platooning pilot would analyze the following data before and after the pilot to determine whether there has been a measurable change:

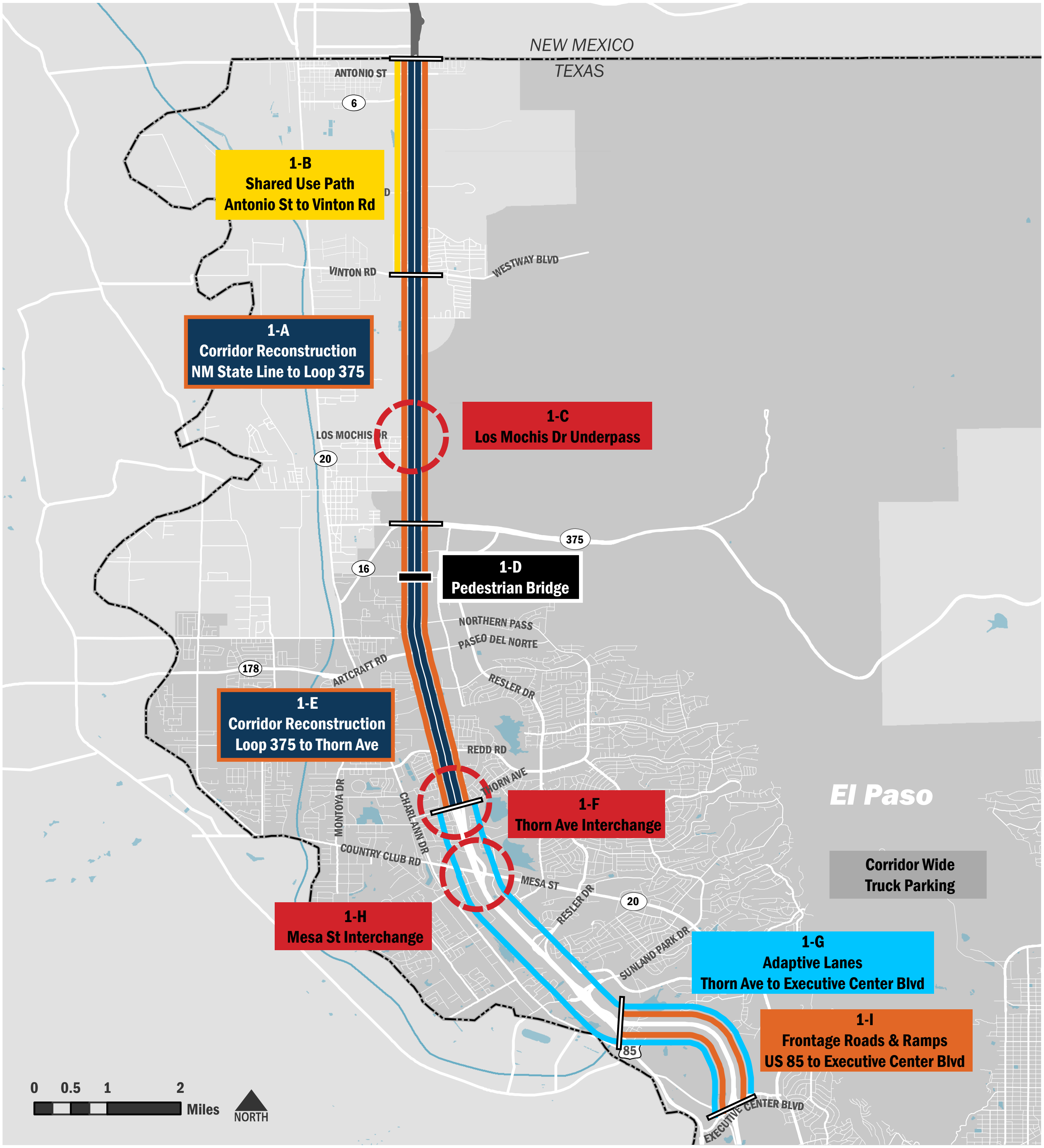
- Number of crashes
- Fuel usage
- Delivery time
- Emissions

Appendix H

Break Out Projects

BREAK OUT PROJECTS

Segment-Project ID	Project Description	Location/Limits	Improvement Type	County	Construction Costs	Engineering Costs	ROW Costs	Preliminary Cost Estimates	Length (mi)	Lanes	Timeframe
1-A	Corridor reconstruction	NM State Line to Loop 375	Add mainlanes, relocate ramps, reconstruct interchanges	El Paso	$ 197,500,000.00	$ 15,000,000.00	$ 37,500,000.00	$ 250,000,000.00	6.4	12	Long
1-B	Shared use path	Antonio St to Vinton Rd	Add shared use path	El Paso	$ 7,900,000.00	$ 600,000.00	$ 1,500,000.00	$ 10,000,000.00	2.8	N/A	Long
1-C	Los Mochis Dr underpass	I-10 at Los Mochis Dr	Construct new underpass	El Paso	$ 23,700,000.00	$ 1,800,000.00	$ 4,500,000.00	$ 30,000,000.00	0.1	N/A	Mid
1-D	Pedestrian bridge	I-10 at Canutillo High School	Add pedestrian bridge across mainlanes	El Paso	$ 7,900,000.00	$ 600,000.00	$ 1,500,000.00	$ 10,000,000.00	0.2	N/A	Long
1-E	Corridor reconstruction	Loop 375 to Thorn Ave	Add mainlanes, relocate ramps, reconstruct interchanges	El Paso	$ 158,000,000.00	$ 12,000,000.00	$ 30,000,000.00	$ 200,000,000.00	4.0	14	Mid
1-F	Thorn Ave interchange	1-10 at Thorn Ave	Reconstruct interchange and add bypasses	El Paso	$ 23,700,000.00	$ 1,800,000.00	$ 4,500,000.00	$ 30,000,000.00	0.5	2	Mid
1-G	Adaptive lanes	Thorn Ave to Executive Center Blvd	Construct adaptive lanes and flyovers	El Paso	$ 59,250,000.00	$ 4,500,000.00	$ 11,250,000.00	$ 75,000,000.00	5.8	2	Mid
1-H	Mesa St interchange	I-10 at Mesa St	Reconstruct interchange	El Paso	$ 39,500,000.00	$ 3,000,000.00	$ 7,500,000.00	$ 50,000,000.00	0.5	N/A	Long
1-I	Frontage roads and ramps	US 85 to Executive Center Blvd	Add frontage roads and relocate ramps	El Paso	$ 39,500,000.00	$ 3,000,000.00	$ 7,500,000.00	$ 50,000,000.00	2.0	4	Mid
2-A	Corridor reconstruction	Executive Center Blvd to Schuster Ave	Shift mainlane alignment, add mainlanes and adaptive lanes, add frontage roads, relocate ramps, reconstruct interchanges	El Paso	$ 197,500,000.00	$ 15,000,000.00	$ 37,500,000.00	$ 250,000,000.00	2.0	17	Long
2-B	Corridor reconstruction	Schuster Ave to Copia St	Shift mainlane alignment, add mainlanes and adaptive lanes, add frontage roads, relocate ramps, reconstruct interchanges	El Paso	$ 553,000,000.00	$ 42,000,000.00	$ 105,000,000.00	$ 700,000,000.00	4.0	20	Mid
3-A	Corridor reconstruction	Copia St to Paisano Dr	Shift mainlane alignment, add mainlanes and adaptive lanes, add frontage roads and CD roads, relocate ramps, reconstruct interchanges	El Paso	$ 355,500,000.00	$ 27,000,000.00	$ 67,500,000.00	$ 450,000,000.00	1.7	20	Long
3-B	Corridor reconstruction	Paisano Dr to Airway Blvd	Shift mainlane alignment, add mainlanes and adaptive lanes, relocate ramps, reconstruct interchanges	El Paso	$ 276,500,000.00	$ 21,000,000.00	$ 52,500,000.00	$ 350,000,000.00	1.9	22	Long
3-C	Corridor reconstruction	Airway Blvd to Yarbrough Dr	Shift mainlane alignment, add mainlanes and adaptive lanes, relocate ramps, reconstruct interchanges	El Paso	$ 355,500,000.00	$ 27,000,000.00	$ 67,500,000.00	$ 450,000,000.00	3.3	18	Long
3-D	Corridor reconstruction	Yarbrough Dr to Eastlake Blvd	Shift mainlane alignment, add mainlanes and adaptive lanes, add adaptive lane flyovers and reconstruct DCs, relocate ramps, reconstruct interchanges	El Paso	$ 553,000,000.00	$ 42,000,000.00	$ 105,000,000.00	$ 700,000,000.00	6.5	18	Long
4-A	Eastlake Blvd interchange	I-10 at Eastlake Blvd	Reconstruct interchange	El Paso	$ 39,500,000.00	$ 3,000,000.00	$ 7,500,000.00	$ 50,000,000.00	0.5	2	Long
4-B	Corridor reconstruction	Eastlake Blvd to Horizon Blvd	Add mainlanes, relocate ramps	El Paso	$ 79,000,000.00	$ 6,000,000.00	$ 15,000,000.00	$ 100,000,000.00	2.4	6	Long
4-C	Horizon Blvd interchange	I-10 at Horizon Blvd	Reconstruct interchange	El Paso	$ 39,500,000.00	$ 3,000,000.00	$ 7,500,000.00	$ 50,000,000.00	0.5	2	Long
4-D	Corridor reconstruction	Horizon Blvd to Darrington Rd	Add mainlanes, relocate ramps	El Paso	$ 79,000,000.00	$ 6,000,000.00	$ 15,000,000.00	$ 100,000,000.00	4.9	4	Long
4-E	New interchange	MM 40-41	Construct new interchange	El Paso	$ 23,700,000.00	$ 1,800,000.00	$ 4,500,000.00	$ 30,000,000.00	0.1	N/A	Mid
4-F	Darrington Rd interchange	I-10 at Darrington Rd	Reconstruct interchange	El Paso	$ 23,700,000.00	$ 1,800,000.00	$ 4,500,000.00	$ 30,000,000.00	0.1	N/A	Long
4-G	Frontage roads	Darrington Rd to FM 3380	Add frontage roads	El Paso	$ 118,500,000.00	$ 9,000,000.00	$ 22,500,000.00	$ 150,000,000.00	13.0	4	Long
4-H	Mainlane reconstruction	Darrington Rd to FM 3380	Add mainlanes, relocate ramps	El Paso	$ 118,500,000.00	$ 9,000,000.00	$ 22,500,000.00	$ 150,000,000.00	13.0	4	Long
4-I	Fabens Rd interchange	I-10 at Fabens Rd	Reconstruct interchange	El Paso	$ 23,700,000.00	$ 1,800,000.00	$ 4,500,000.00	$ 30,000,000.00	0.1	N/A	Long
4-J	FM 3380 interchange	I-10 at FM 3380	Reconstruct interchange	El Paso	$ 23,700,000.00	$ 1,800,000.00	$ 4,500,000.00	$ 30,000,000.00	0.1	N/A	Long
Corridor Wide	Truck parking	TBD	Add truck parking facility	El Paso							Mid

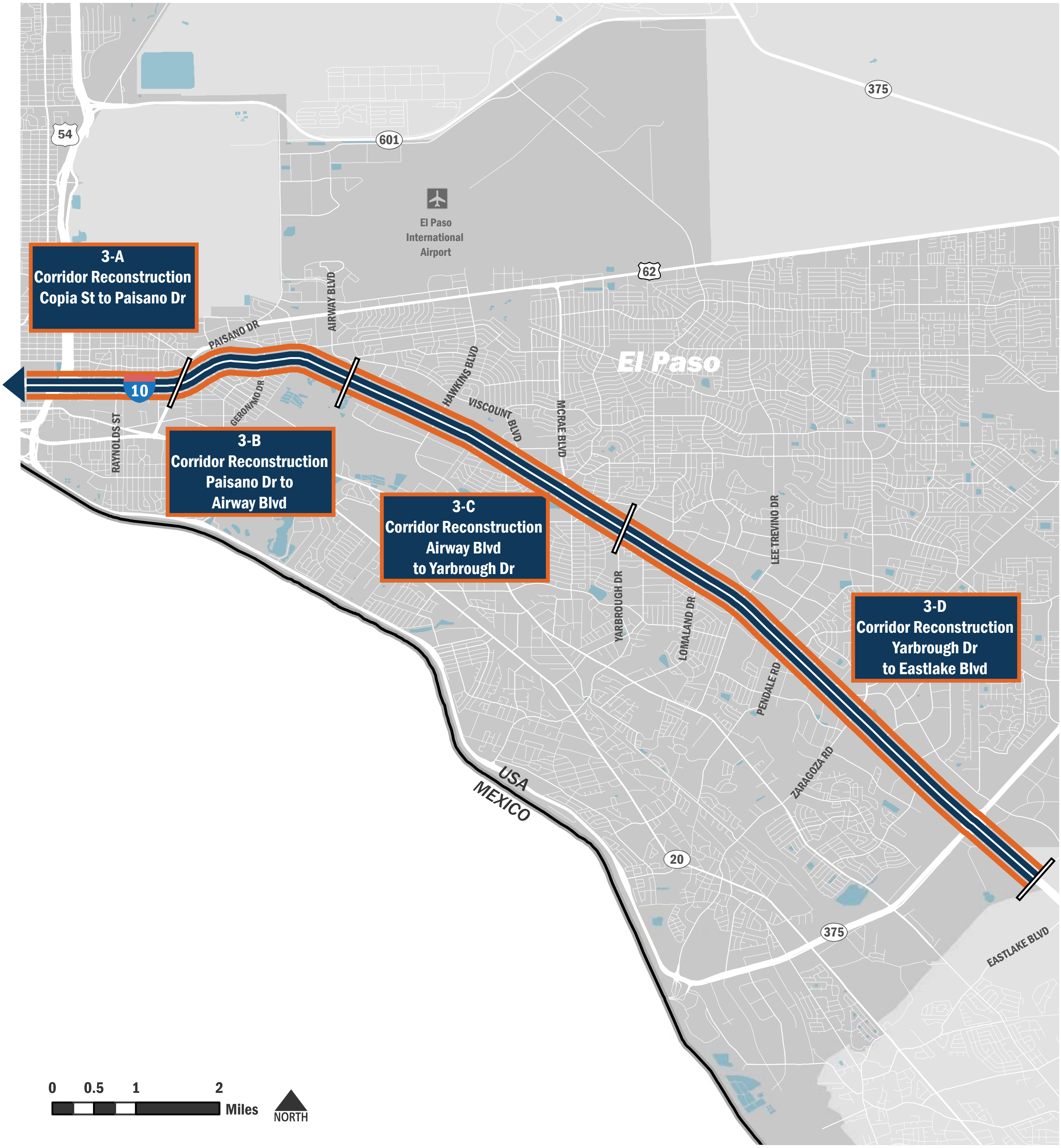


Implementation Plan - Break Out Projects

Segment 1: Northern Gateway

Implementation Plan - Break Out Projects

Segment 2: Downtown



Implementation Plan - Break Out Projects

Segment 3: Airport

REIMAGINE El Paso 10

Implementation Plan - Break Out Projects

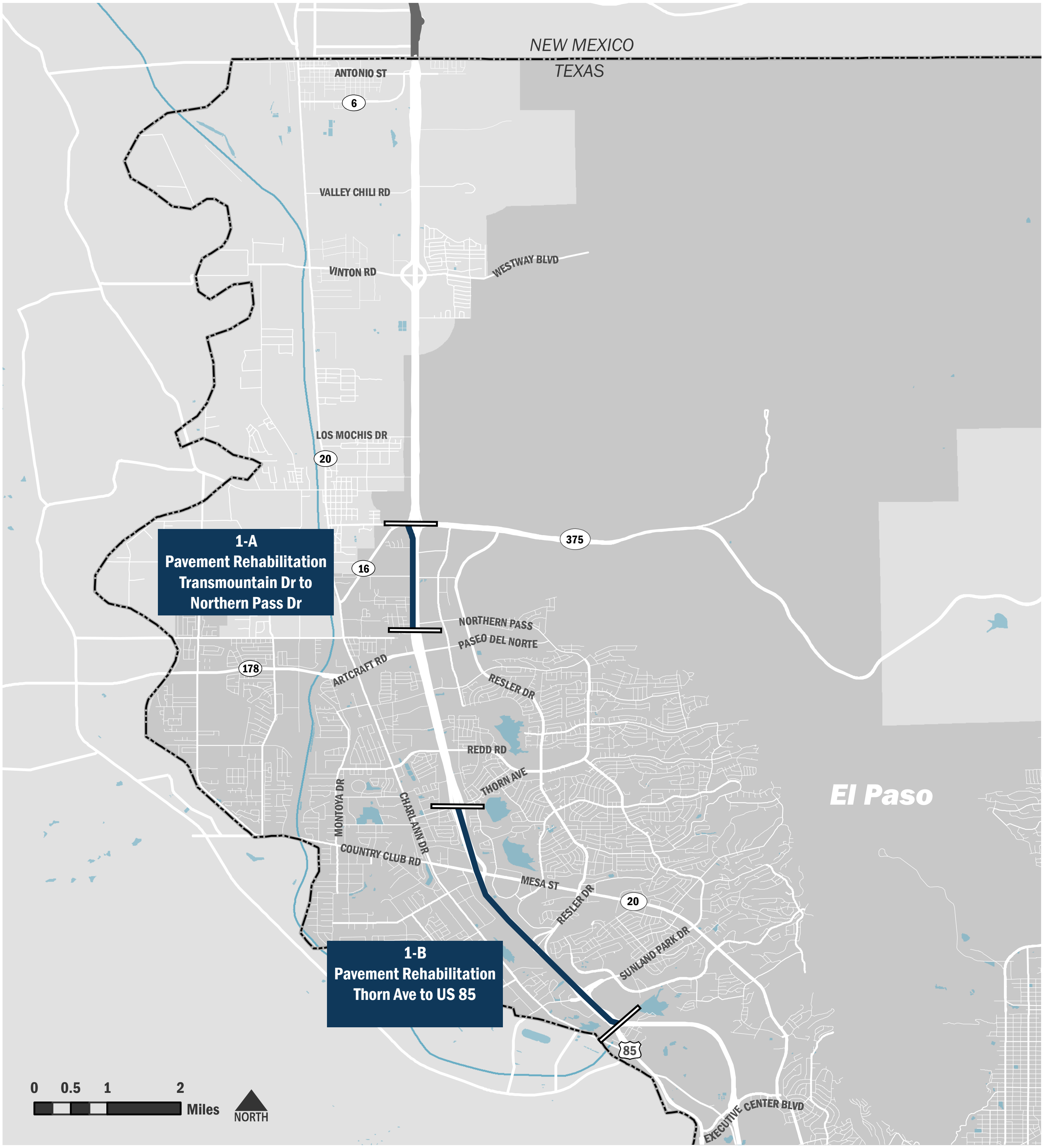
Segment 4: Southern Gateway

Appendix I

Interim Improvements

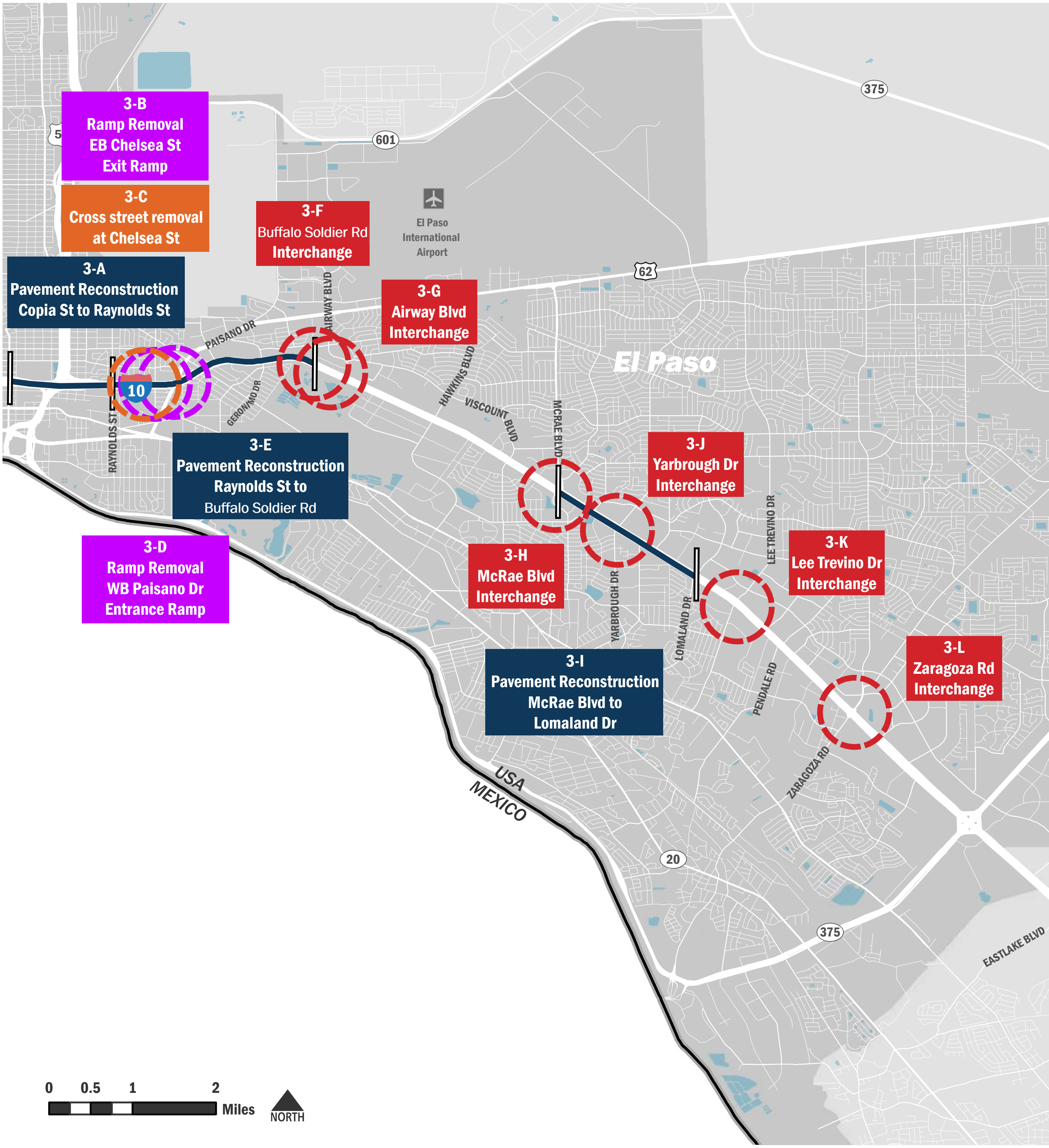
INTERIM IMPROVEMENTS

Segment-Project ID	Project Description	Location/Limits	Improvement Type	County	Preliminary Cost Estimates	Length (mi)	Timeframe
1-A	Pavement rehabilitation	Transmountain Dr to Northern Pass Dr	Rehabilitate mainlane pavement	El Paso	$ 1,000,000.00	1.4	Short
1-B	Pavement rehabilitation	Thorn Ave to US 85	Rehabilitate mainlane pavement	El Paso	$ 10,000,000.00	3.5	Short
3-A	Pavement reconstruction	Copia St to Raynolds St	Reconstruct mainlane pavement	El Paso	$ 12,000,000.00	1.1	Short
3-B	Ramp removal	EB Chelsea St exit ramp	Remove ramp	El Paso	$ 1,000,000.00	0.1	Short
3-C	Cross street removal	I-10 at Chelsea St	Remove cross street	El Paso	$ 1,000,000.00	0.1	Short
3-D	Ramp removal	WB Paisano Dr entrance ramp	Remove ramp	El Paso	$ 1,000,000.00	0.1	Short
3-E	Pavement reconstruction	Raynolds St to Robert E Lee Rd	Reconstruct mainlane pavement	El Paso	$ 24,000,000.00	2.2	Short
3-F	Robert E Lee Rd interchange	I-10 at Robert E Lee Rd	Intersection operational improvements	El Paso	$ 1,000,000.00	0.1	Short
3-G	Airway Blvd interchange	I-10 at Airway Blvd	Intersection operational improvements	El Paso	$ 500,000.00	0.1	Short
3-H	McRae Blvd interchange	I-10 at McRae Blvd	Intersection operational improvements	El Paso	$ 1,000,000.00	0.1	Short
3-I	Pavement reconstruction	McRae Blvd to Lomaland Dr	Reconstruct mainlane pavement	El Paso	$ 17,000,000.00	1.7	Short
3-J	Yarbrough Dr interchange	I-10 at Yarbrough Dr	Intersection operational improvements	El Paso	$ 1,000,000.00	0.1	Short
3-K	Lee Trevino Dr interchange	I-10 at Lee Trevino Dr	Intersection operational improvements	El Paso	$ 500,000.00	0.1	Short
3-L	Zaragoza Rd interchange	I-10 at Zaragoza Rd	Intersection operational improvements	El Paso	$ 1,000,000.00	0.1	Short
4-A	Eastlake Blvd interchange	I-10 at Eastlake Blvd	Intersection operational improvements	El Paso	$ 1,000,000.00	0.1	Short
4-B	Horizon Blvd interchange	I-10 at Horizon Blvd	Intersection operational improvements	El Paso	$ 1,000,000.00	0.1	Short
4-C	Ramp capacity	WB Eastlake Blvd Entrance	Add capacity to ramp	El Paso	$ 5,000,000.00	0.2	Mid
4-D	Ramp capacity	WB Horizon Blvd Entrance	Add capacity to ramp	El Paso	$ 5,000,000.00	0.2	Mid
4-E	Ramp capacity	EB Horizon Blvd Exit	Add capacity to ramp	El Paso	$ 5,000,000.00	0.2	Mid



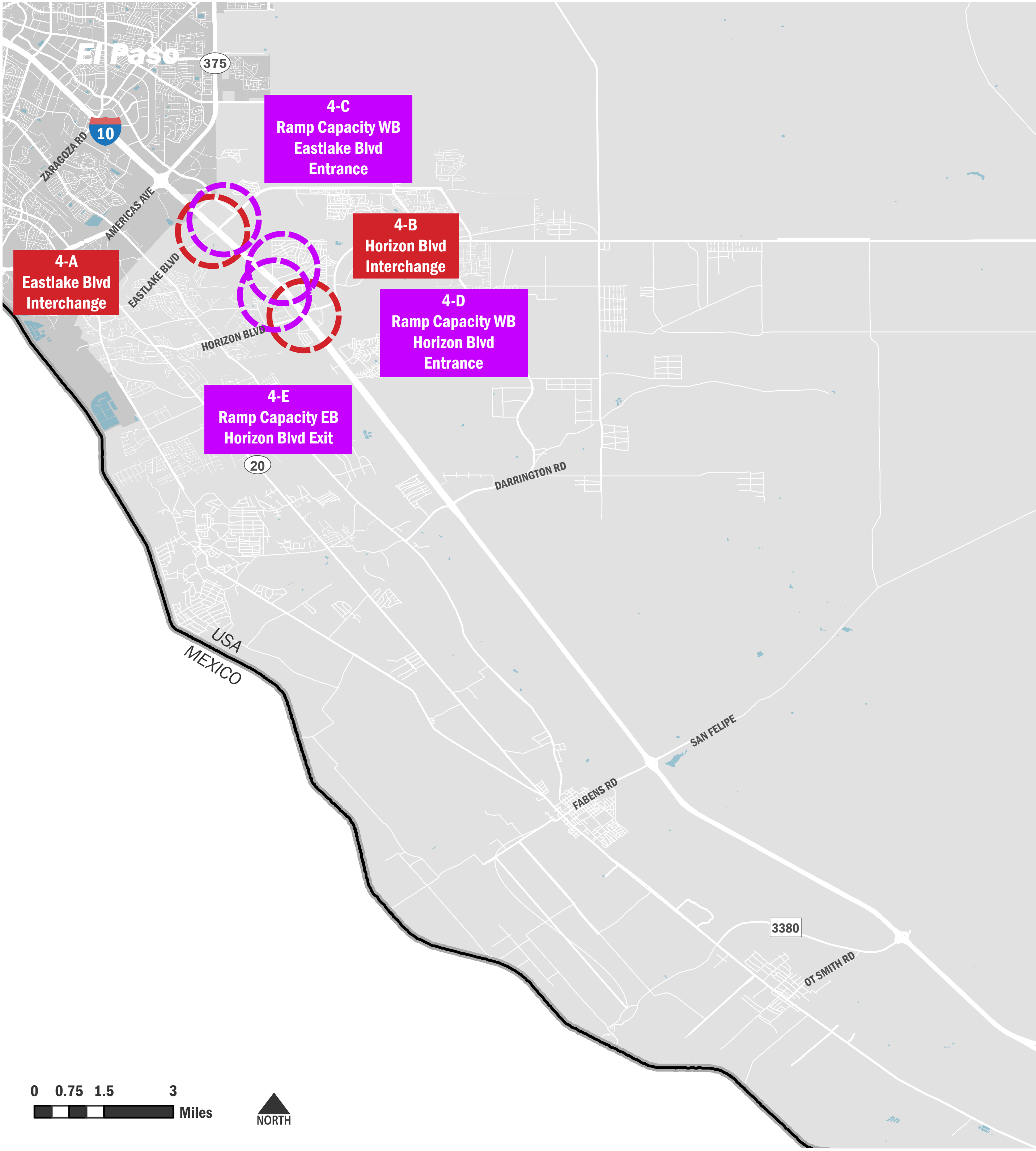
Implementation Plan - Interim Projects

Segment 1: Northern Gateway



Implementation Plan - Interim Projects

Segment 3: Airport



Implementation Plan - Interim Projects

Segment 4: Southern Gateway

Appendix J

ASEDs

Annual Scope & Estimate Documentation Spreadsheet

Date: 5/11/2018
District: El Paso
County: El Paso
Project No.:
Highway: I-10
UTP Authority: FEASIBILITY

Consultant **(if applicable):** HDR
TxDOT Project Manager: Hugo Hernandez
TxDOT Project Manager Office: APD
CCSJ: 2121-01-095 **CSJ:**
Construct Categories: Not Funded for Construction
FY of Current Costs: 2018 **Est Let FY:** 2025

Limits From: New Mexico State Line (MM 0)
Limits To: Executive Center Blvd (MM 16)

Current DCIS Scope:

Revised Scope: Add 1 additional lane and reconstruct I-10.

Existing Facility:				**Proposed Facility:**			
No Mainlanes	4	Type	*F-Urb Frwy	No Mainlanes	6	Type	*F-Urb Frwy
No Frontage Lanes	0/6	Type	/U	No Frontage Lanes	0/6	Type	/U

Estimate:

I.	**Design**	$54,562,800	(Not included in total costs)
II.	**Earthwork and Landscape Subtotal**	$104,610,000	
III.	**Subgrade Treatments and Base Subtotal**	$94,140,000	
IV.	**Surface Courses and Pavement Subtotal**	$169,480,000	
V.	**Structures Subtotal**	$405,440,000	
VI.	**Miscellaneous Construction Subtotal**	$97,720,000	
VII.	**Lighting, Signing, Markings and Signals Subtotal**	$37,990,000	
VIII.	**Force Accounts**	$0	
IX.	**Toll Integration**	$0	
VIII.	**Right of Way & Environmental Mitigation**	$90,938,000	(Not included in total costs)
IX.	**Utility Bid Items** **(separate ROW CSJ)**	$90,938,000	(Not included in total costs)
☑ **New Project**	**Current Estimate Total**	**$909,380,000**	

Estimate Type Feasibility Study
Feasibility Study % Complete 50%

Last ASED Amount
Percent Change [(Current-Last Yr's)/Last Yrs]
Inflated Current Estimate $1,196,682,041

Inflation is calculated at 4% per fiscal year.

Explanation of Change from Last Year's Total

Bob Bielek **Area Engineer**	**Date**	**Eddie Valtier** **Director of TP&D**	**Date**

TxDOT

May 2018

Verison 5

Removals

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
104	6001	REMOVING CONC (PAV)	SY	2,128,860	$ 12.00	$ 25,546,320
104	6022	REMOVING CONC (CURB AND GUTTER)	LF	348,000	$ 3.00	$ 1,044,000
104	6024	REMOVING CONC (RETAINING WALLS)	SY	158,667	$ 35.00	$ 5,553,333
104	6037	REMOVE CONC (RAIL)	LF	87,000	$ 14.00	$ 1,218,000
105	6008	REMOVING STAB BASE AND ASPH PAV (6")	SY	89,840	$ 19.00	$ 1,706,960
496	6010	REMOV STR (BRIDGE 100-499 FT LENGTH)	EA	14	$ 100,000.00	$ 1,400,000
496	6011	REMOV STR (BRIDGE 500-999 FT LENGTH)	EA	1	$ 150,000.00	$ 150,000
496	6012	REMOV STR (BRIDGE 1000 FT OR GREATER)	EA	7	$ 200,000.00	$ 1,400,000
					Contingency (30%)	$ 11,405,584
			Subtotal			$ 49,430,000

Earthwork and Landscape

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
110	6001	EXCAVATION (ROADWAY)	CY	4,023,333	$ 10.00	$ 40,233,333.33
132	6007	EMBANKMENT (FINAL)(ORD COMP)(TY D)	CY	4,023,333	$ 10.00	$ 40,233,333.33
					Contingency (30%)	$ 24,140,000
			Subtotal			$ 104,610,000

Subgrade Treatments and Base

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
275	6001	CEMENT	TON	89,840	$ 220.00	$ 19,764,800
		Mainlanes		53,020		
		Ramps		1,000		
		Frontage Roads		29,450		
		Cross Streets		6,370		
275	6019	CEMENT TREAT (SUBGRADE) (6")	SY	2,193,470	$ 7.50	$ 16,451,025
		Mainlanes		1,294,600		
		Ramps		24,370		
		Frontage Roads		718,940		
		Cross Streets		155,560		
341	6022	D-GR HMA TY-C PG64-22	TON	482,590	$ 75.00	$ 36,194,250
		Mainlanes		284,820		
		Ramps		5,370		
		Frontage Roads		158,170		
		Cross Streets		34,230		
					Contingency (30%)	$ 21,723,023
			Subtotal			$ 94,140,000

Surface Courses and Pavement

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
310	6006	PRIME COAT (CSS-1H)	GAL	438,710	$ 6.00	$ 2,632,260
		Mainlanes		258,920		
		Ramps		4,880		
		Frontage Roads		143,790		
		Cross Streets		31,120		
360	6007	CONC PVMT (CONT REINF - CRCP) (13")	SY	2,128,860	$ 60.00	$ 127,731,600
		Mainlanes		1,275,260		
		Ramps		17,770		
		Frontage Roads		680,270		
		Cross Streets		155,560		
					Contingency (30%)	$ 39,109,158
			Subtotal			$ 169,480,000

Structures

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
423	6001	RETAINING WALL (MSE)	SF	1,428,000	$ 75.00	$ 107,100,000
		BRIDGE - GPITX	SF	1,980,500	$ 63.00	$ 124,771,500
		DRAINAGE	LM	16	$ 5,000,000.00	$ 80,000,000
					Contingency (30%)	$ 93,561,450
						$ 405,440,000

Miscellaneous Construction

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
450	6014	RAIL (TY 551)	LF	87,000	$ 48.00	$ 4,176,000
529	6002	CONC CURB (TY II)	LF	348,000	$ 9.00	$ 3,132,000
531	6003	CONC SIDEWALKS (6")	SY	1,044,000	$ 65.00	$ 67,860,000
					Contingency (30%)	$ 22,550,400
						$ 97,720,000

Lighting, Signing, Markings, and Signals

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
		Lighting	LM	16	$ 500,000.00	$ 8,238,636
		ITS	LM	16	$ 1,000,000.00	$ 16,477,273
		Intersections	EA	18	$ 250,000.00	$ 4,500,000
					Contingency (30%)	$ 8,764,773
			Subtotal			$ 37,990,000

Annual Scope & Estimate Documentation Spreadsheet

Date:	5/11/2018	**Consultant** (if applicable):	HDR
District:	El Paso	**TxDOT Project Manager:**	Hugo Hernandez
County:	El Paso	**TxDOT Project Manager Office:**	APD
Project No.:		**CCSJ:** 2121-01-095	**CSJ:**
Highway:	I-10	**Construct Categories:**	Not Funded for Construction
UTP Authority:	FEASIBILITY	**FY of Current Costs:** 2018	**Est Let FY:** 2029

Limits From: Executive Center Blvd (MM 16)
Limits To: Chelsea St (MM 23)

Current DCIS Scope:

Revised Scope: Add 1 additional lane and reconstruct I-10.

Existing Facility:				**Proposed Facility:**			
No Mainlanes	6	Type	*F-Urb Frwy	No Mainlanes	8	Type	*F-Urb Frwy
No Frontage Lanes	0/6	Type	/U	No Frontage Lanes	0/6	Type	/U

Estimate:

I.	**Design**	$45,262,200	(Not included in total costs)
II.	**Earthwork and Landscape Subtotal**	$109,820,000	
III.	**Subgrade Treatments and Base Subtotal**	$46,290,000	
IV.	**Surface Courses and Pavement Subtotal**	$83,120,000	
V.	**Structures Subtotal**	$449,510,000	
VI.	**Miscellaneous Construction Subtotal**	$41,560,000	
VII.	**Lighting, Signing, Markings and Signals Subtotal**	$24,070,000	
VIII.	**Force Accounts**	$0	
IX.	**Toll Integration**	$0	
VIII.	**Right of Way & Environmental Mitigation**	$113,155,500	(Not included in total costs)
IX.	**Utility Bid Items** (separate ROW CSJ)	$113,155,500	(Not included in total costs)
☑ **New Project**	**Current Estimate Total**	**$754,370,000**	

Estimate Type Feasibility Study   **Last ASED Amount**

Feasibility Study % Complete 50%   **Percent Change** [(Current-Last Yr's)/Last Yrs]

Inflated Current Estimate $1,161,317,956   Inflation is calculated at 4% per fiscal year.

Explanation of Change from Last Year's Total

Bob Beliek	**Date**	**Eddie Valtier**	**Date**
Area Engineer		**Director of TP&D**	

TxDOT

Removals

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
104	6001	REMOVING CONC (PAV)	SY	1,047,620	$ 12.00	$ 12,571,440
104	6022	REMOVING CONC (CURB AND GUTTER)	LF	148,000	$ 3.00	$ 444,000
104	6024	REMOVING CONC (RETAINING WALLS)	SY	123,778	$ 35.00	$ 4,332,222
104	6037	REMOVE CONC (RAIL)	LF	37,000	$ 14.00	$ 518,000
105	6008	REMOVING STAB BASE AND ASPH PAV (6")	SY	44,180	$ 19.00	$ 839,420
496	6010	REMOV STR (BRIDGE 100-499 FT LENGTH)	EA	10	$ 100,000.00	$ 1,000,000
496	6011	REMOV STR (BRIDGE 500-999 FT LENGTH)	EA	4	$ 150,000.00	$ 600,000
496	6012	REMOV STR (BRIDGE 1000 FT OR GREATER)	EA	14	$ 200,000.00	$ 2,800,000
					Contingency (30%)	$ 6,931,524.67
			Subtotal			$ 30,040,000

Earthwork and Landscape

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
110	6001	EXCAVATION (ROADWAY)	CY	4,223,556	$ 10.00	$ 42,235,555.56
132	6007	EMBANKMENT (FINAL)(ORD COMP)(TY D)	CY	4,223,556	$ 10.00	$ 42,235,555.56
					Contingency (30%)	$ 25,341,333.33
			Subtotal			$ 109,820,000

Subgrade Treatments and Base

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
275	6001	CEMENT	TON	44,180	$ 220.00	$ 9,719,600
		Mainlanes		31,820		
		Ramps		640		
		Frontage Roads		8,530		
		Cross Streets		3,190		
275	6019	CEMENT TREAT (SUBGRADE) (6")	SY	1,078,380	$ 7.50	$ 8,087,850
		Mainlanes		776,890		
		Ramps		15,550		
		Frontage Roads		208,160		
		Cross Streets		77,780		
341	6022	D-GR HMA TY-C PG64-22	TON	237,270	$ 75.00	$ 17,795,250
		Mainlanes		170,920		
		Ramps		3,430		
		Frontage Roads		45,800		
		Cross Streets		17,120		
					Contingency (30%)	###########
			Subtotal			$ 46,290,000

Surface Courses and Pavement

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
310	6006	PRIME COAT (CSS-1H)	GAL	215,690	$ 5.00	$ 1,078,450
		Mainlanes		155,380		
		Ramps		3,110		
		Frontage Roads		41,640		
		Cross Streets		15,560		
360	6007	CONC PVMT (CONT REINF - CRCP) (13")	SY	1,047,620	$ 60.00	$ 62,857,200
		Mainlanes		768,660		
		Ramps		9,460		
		Frontage Roads		191,720		
		Cross Streets		77,780		
					Contingency (30%)	$ 19,180,695.00
			Subtotal			$ 83,120,000

Structures

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
416	6009	DRILL SHAFT (66 IN)	LF	133,400	$ 685.00	$ 91,379,000
423	6001	RETAINING WALL (MSE)	SF	714,000	$ 75.00	$ 53,550,000
423	6022	RETAINING WALL (SOIL NAIL) (FACIA)	SF	400,000	$ 48.00	$ 19,200,000
		BRIDGE - GPITX	SF	1,623,239	$ 63.00	$ 102,264,057
		BRIDGE - GPIDSB	SF	439,422	$ 101.00	$ 44,381,622
		DRAINAGE	LM	7	$ 5,000,000.00	$ 35,000,000
					Contingency (30%)	############
						$ 449,510,000

Miscellaneous Construction

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
450	6014	RAIL (TY 551)	LF	37,000	$ 48.00	$ 1,776,000
529	6002	CONC CURB (TY II)	LF	148,000	$ 9.00	$ 1,332,000
531	6003	CONC SIDEWALKS (6")	SY	444,000	$ 65.00	$ 28,860,000
					Contingency (30%)	$ 9,590,400.00
						$ 41,560,000

Lighting, Signing, Markings, and Signals

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
		Lighting	LM	7	$ 500,000.00	$ 3,503,788
		ITS	LM	7	$ 1,000,000.00	$ 7,007,576
		Intersections	EA	32	$ 250,000.00	$ 8,000,000
					Contingency (30%)	$ 5,553,409.09
			Subtotal			$ 24,070,000

Annual Scope & Estimate Documentation Spreadsheet

Date: 5/11/2018
District: El Paso
County: El Paso
Project No.:
Highway: I-10
UTP Authority: FEASIBILITY

Consultant **(if applicable):** HDR
TxDOT Project Manager: Hugo Hernandez
TxDOT Project Manager Office: APD
CCSJ: 2121-01-095 **CSJ:**
Construct Categories: Not Funded for Construction
FY of Current Costs: 2018 **Est Let FY:** 2035

Limits From: Chelsea St (MM 23)
Limits To: Loop 375 (MM 35)

Current DCIS Scope:

Revised Scope: Reconstruct I-10 and conduct operational improvements

Existing Facility:			
No Mainlanes	6	Type	*F-Urb Frwy
No Frontage Lanes	0/6	Type	/U

Proposed Facility:			
No Mainlanes	8	Type	*F-Urb Frwy
No Frontage Lanes	0/8	Type	/U

Estimate:

I.	**Design**	$53,579,400	(Not included in total costs)
II.	**Earthwork and Landscape Subtotal**	$252,140,000	
III.	**Subgrade Treatments and Base Subtotal**	$74,130,000	
IV.	**Surface Courses and Pavement Subtotal**	$133,770,000	
V.	**Structures Subtotal**	$332,990,000	
VI.	**Miscellaneous Construction Subtotal**	$67,400,000	
VII.	**Lighting, Signing, Markings and Signals Subtotal**	$32,560,000	
VIII.	**Force Accounts**	$0	
IX.	**Toll Integration**	$0	
VIII.	**Right of Way & Environmental Mitigation**	$133,948,500	(Not included in total costs)
IX.	**Utility Bid Items (separate ROW CSJ)**	$133,948,500	(Not included in total costs)
☑ **New Project**	**Current Estimate Total**	**$892,990,000**	

Estimate Type Feasibility Study
Feasibility Study % Complete 50%

Last ASED Amount
Percent Change [(Current-Last Yr's)/Last Yrs]
Inflated Current Estimate $1,739,455,664
Inflation is calculated at 4% per fiscal year.

Explanation of Change from Last Year's Total

Bob Beliek	**Date**	**Eddie Valtier**	**Date**
Area Engineer		**Director of TP&D**	

TxDOT

Removals

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
104	6001	REMOVING CONC (PAV)	SY	1,680,380	$ 12.00	$ 20,164,560
104	6022	REMOVING CONC (CURB AND GUTTER)	LF	240,000	$ 3.00	$ 720,000
104	6024	REMOVING CONC (RETAINING WALLS)	SY	170,000	$ 35.00	$ 5,950,000
104	6037	REMOVE CONC (RAIL)	LF	60,000	$ 14.00	$ 840,000
105	6008	REMOVING STAB BASE AND ASPH PAV (6")	SY	70,760	$ 19.00	$ 1,344,440
496	6010	REMOV STR (BRIDGE 100-499 FT LENGTH)	EA	13	$ 82,146.00	$ 1,067,898
496	6011	REMOV STR (BRIDGE 500-999 FT LENGTH)	EA	2	$ 136,175.00	$ 272,350
496	6012	REMOV STR (BRIDGE 1000 FT OR GREATER)	EA	9	$ 188,400.00	$ 1,695,600
					Contingency (30%)	$ 9,616,454
			Subtotal			$ 41,680,000

Earthwork and Landscape

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
110	6001	EXCAVATION (ROADWAY)	CY	9,697,556	$ 10.00	$ 96,975,555.56
132	6007	EMBANKMENT (FINAL)(ORD COMP)(TY D)	CY	9,697,556	$ 10.00	$ 96,975,555.56
					Contingency (30%)	$ 58,185,333
			Subtotal			$ 252,140,000

Subgrade Treatments and Base

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
275	6001	CEMENT	TON	70,760	$ 220.00	$ 15,567,200
		Mainlanes		38,870		
		Ramps		2,050		
		Frontage Roads		23,010		
		Cross Streets		6,830		
275	6019	CEMENT TREAT (SUBGRADE) (6")	SY	1,727,220	$ 7.50	$ 12,954,150
		Mainlanes		948,970		
		Ramps		49,860		
		Frontage Roads		561,720		
		Cross Streets		166,670		
341	6022	D-GR HMA TY-C PG64-22	TON	380,000	$ 75.00	$ 28,500,000
		Mainlanes		208,780		
		Ramps		10,970		
		Frontage Roads		123,580		
		Cross Streets		36,670		
					Contingency (30%)	$ 17,106,405
			Subtotal			$ 74,130,000

Surface Courses and Pavement

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
310	6006	PRIME COAT (CSS-1H)	GAL	345,470	$ 6.00	$ 2,072,820
		Mainlanes		189,800		
		Ramps		9,980		
		Frontage Roads		112,350		
		Cross Streets		33,340		
360	6007	CONC PVMT (CONT REINF - CRCP) (13")	SY	1,680,380	$ 60.00	$ 100,822,800
		Mainlanes		935,640		
		Ramps		43,020		
		Frontage Roads		535,050		
		Cross Streets		166,670		
					Contingency (30%)	$ 30,868,686
			Subtotal			$ 133,770,000

Structures

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
423	6001	RETAINING WALL (MSE)	SF	1,530,000	$ 75.00	$ 114,750,000
		BRIDGE - GPITX	SF	1,371,266	$ 63.00	$ 86,389,758
		DRAINAGE	LM	11	$ 5,000,000.00	$ 55,000,000
					Contingency (30%)	$ 76,841,927
						$ 332,990,000

Miscellaneous Construction

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
450	6014	RAIL (TY 551)	LF	60,000	$ 48.00	$ 2,880,000
529	6002	CONC CURB (TY II)	LF	240,000	$ 9.00	$ 2,160,000
531	6003	CONC SIDEWALKS (6")	SY	720,000	$ 65.00	$ 46,800,000
					Contingency (30%)	$ 15,552,000
						$ 67,400,000

Lighting, Signing, Markings, and Signals

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
		Lighting	LM	11	$ 500,000.00	$ 5,681,818
		Utilities	LM	11	$ 1,000,000.00	$ 11,363,636
		Intersections	EA	32	$ 250,000.00	$ 8,000,000
					Contingency (30%)	$ 7,513,636
			Subtotal			$ 32,560,000

Annual Scope & Estimate Documentation Spreadsheet

Date: 5/11/2018
District: El Paso
County: El Paso
Project No.:
Highway: I-10
UTP Authority: FEASIBILITY

Consultant **(if applicable):** HDR
TxDOT Project Manager: Hugo Hernandez
TxDOT Project Manager Office: APD
CCSJ: 2121-01-095 **CSJ:**
Construct Categories: Not Funded for Construction
FY of Current Costs: 2018 **Est Let FY:** 2035

Limits From: Loop 375 (MM 35)
Limits To: Tornillo Rd (MM 58)

Current DCIS Scope:

Revised Scope: Add 1 additional lane and reconstruct I-10.

Existing Facility:			
No Mainlanes	4	Type	*F-Urb Frwy
No Frontage Lanes	0/4	Type	/R

Proposed Facility:			
No Mainlanes	6	Type	*F-Urb Frwy
No Frontage Lanes	4	Type	/U

Estimate:

I.	**Design**	$52,869,000	(Not included in total costs)
II.	**Earthwork and Landscape Subtotal**	$30,650,000	
III.	**Subgrade Treatments and Base Subtotal**	$186,160,000	
IV.	**Surface Courses and Pavement Subtotal**	$338,720,000	
V.	**Structures Subtotal**	$143,850,000	
VI.	**Miscellaneous Construction Subtotal**	$134,340,000	
VII.	**Lighting, Signing, Markings and Signals Subtotal**	$47,430,000	
VIII.	**Force Accounts**	$0	
IX.	**Toll Integration**	$0	
VIII.	**Right of Way & Environmental Mitigation**	$88,115,000	(Not included in total costs)
IX.	**Utility Bid Items** **(separate ROW CSJ)**	$88,115,000	(Not included in total costs)
☑ **New Project**	**Current Estimate Total**	**$881,150,000**	

Estimate Type Feasibility Study
Feasibility Study % Complete 50%

Last ASED Amount
Percent Change [(Current-Last Yr's)/Last Yrs]
Inflated Current Estimate $1,716,392,522 Inflation is calculated at 4% per fiscal year.

Explanation of Change from Last Year's Total

Bob Beliek **Area Engineer**	**Date**
Eddie Valtier **Director of TP&D**	**Date**

Removals

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
104	6001	REMOVING CONC (PAV)	SY	4,255,720	$ 12.00	$ 51,068,640
104	6022	REMOVING CONC (CURB AND GUTTER)	LF	478,400	$ 3.00	$ 1,435,200
104	6024	REMOVING CONC (RETAINING WALLS)	SY	68,000	$ 35.00	$ 2,380,000
104	6037	REMOVE CONC (RAIL)	LF	119,600	$ 14.00	$ 1,674,400
105	6008	REMOVING STAB BASE AND ASPH PAV (6")	SY	177,660	$ 19.00	$ 3,375,540
496	6010	REMOV STR (BRIDGE 100-499 FT LENGTH)	EA	6	$ 82,146.00	$ 492,876
					Contingency (30%)	$ 18,127,997
			Subtotal			$ 78,560,000

Earthwork and Landscape

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
110	6001	EXCAVATION (ROADWAY)	CY	1,178,667	$ 10.00	$ 11,786,666.67
132	6007	EMBANKMENT (FINAL)(ORD COMP)(TY D)	CY	1,178,667	$ 10.00	$ 11,786,666.67
					Contingency (30%)	$ 7,072,000
			Subtotal			$ 30,650,000

Subgrade Treatments and Base

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
275	6001	CEMENT	TON	177,660	$ 220.00	$ 39,085,200
		Mainlanes		111,930		
		Ramps		5,150		
		Frontage Roads		57,850		
		Cross Streets		2,730		
275	6019	CEMENT TREAT (SUBGRADE) (6")	SY	4,338,030	$ 7.50	$ 32,535,225
		Mainlanes		2,733,320		
		Ramps		125,530		
		Frontage Roads		1,412,510		
		Cross Streets		66,670		
341	6022	D-GR HMA TY-C PG64-22	TON	954,390	$ 75.00	$ 71,579,250
		Mainlanes		601,340		
		Ramps		27,620		
		Frontage Roads		310,760		
		Cross Streets		14,670		
					Contingency (30%)	$ 42,959,903
			Subtotal			$ 186,160,000

Surface Courses and Pavement

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
310	6006	PRIME COAT (CSS-1H)	GAL	867,630	$ 6.00	$ 5,205,780
		Mainlanes		546,670		
		Ramps		25,110		
		Frontage Roads		282,510		
		Cross Streets		13,340		
360	6007	CONC PVMT (CONT REINF - CRCP) (13")	SY	4,255,720	$ 60.00	$ 255,343,200
		Mainlanes		2,706,740		
		Ramps		122,960		
		Frontage Roads		1,359,350		
		Cross Streets		66,670		
					Contingency (30%)	$ 78,164,694
			Subtotal			$ 338,720,000

Structures

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
423	6001	RETAINING WALL (MSE)	SF	612,000	$ 75.00	$ 45,900,000
		BRIDGE - GPITX	SF	115,024	$ 63.00	$ 7,246,512
		DRAINAGE - RURAL	LM	23	$ 2,500,000.00	$ 57,500,000
					Contingency (30%)	$ 33,193,954
						$ 143,850,000

Miscellaneous Construction

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
450	6014	RAIL (TY 551)	LF	119,600	$ 48.00	$ 5,740,800
529	6002	CONC CURB (TY II)	LF	478,400	$ 9.00	$ 4,305,600
531	6003	CONC SIDEWALKS (6")	SY	1,435,200	$ 65.00	$ 93,288,000
					Contingency (30%)	$ 31,000,320
						$ 134,340,000

Lighting, Signing, Markings, and Signals

Item No.	Description Code	Description	Unit	Quantity	Unit Price	Amount
		Lighting	LM	23	$ 500,000.00	$ 11,325,758
		ITS	LM	23	$ 1,000,000.00	$ 22,651,515
		Intersections	EA	10	$ 250,000.00	$ 2,500,000
					Contingency (30%)	$ 10,943,182
			Subtotal			$ 47,430,000

Appendix K

Benefit-Cost Analysis

Results Summary of the Benefit-Cost Analysis

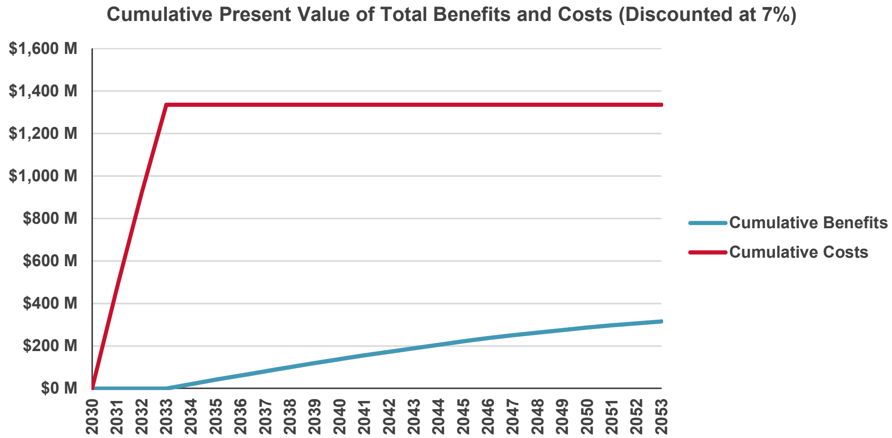
Summary of Results Over the Study Period. All Values in Millions of 2018$

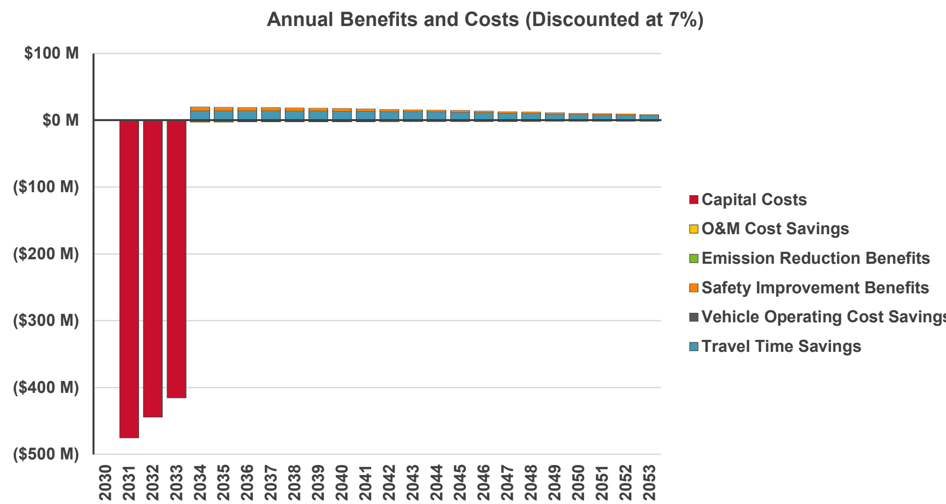
Impact Categories	NPV Over 20 Years of Operations	
	Undiscounted	7%
Benefits		
Travel Time Savings	$1,071.4 M	$209.9 M
Vehicle Operating Cost Savings	($146.9 M)	($28.8 M)
Avoided Trucking Costs	$274.4 M	$53.8 M
Safety Improvement Benefits	$295.2 M	$61.4 M
Emission Reduction Benefits	($2.1 M)	($0.5 M)
O&M Cost Savings	($45.4 M)	($9.4 M)
PV Benefits	**$1,446.6 M**	**$286.4 M**
Costs		
Capital Costs	$3,437.9 M	$1,335.3 M
PV Costs	**$3,437.9 M**	**$1,335.3 M**
Net Present Value (NPV)	**($1,991.3 M)**	**($1,048.9 M)**

Summary of Key Financial Metrics. All Values in Millions of 2018$

Key Financial Metrics	Undiscounted	7%
Total Benefits	$1,446.62 M	$286.42 M
Total Costs	$3,437.89 M	$1,335.31 M
Net Present Value (NPV)	($1,991.27 M)	($1,048.89 M)
Return on Investment (ROI)	-58%	-79%
Benefit-Cost Ratio (BCR)	0.42	0.21
Payback Period (years)	>20 yrs	>20 yrs
Internal Rate of Return (IRR)	-7.2%	

Key Quantified Impacts	Total Over Study Period	
	Unit	Value
Travel Impacts		
Avoided Auto Travel Distance	miles	-433,012,848
Avoided Truck Travel Distance	miles	-42,825,446
Avoided Auto Travel Time	hours	46,722,903
Avoided Truck Travel Time	hours	4,620,946
Safety Impacts per KABCO Scale		
K - Killed	accidents	22
A - Incapacitating	accidents	57
B - Non-Incapacitating	accidents	393
C - Possible Injury	accidents	708
O - No Injury	accidents	4,430
Environmental Impacts		
Avoided CO_2 Emission	tons	-172,997
Avoided NOx Emission	tons	-93.55
Avoided VOC Emission	tons	-7.77
Avoided PM Emission	tons	-3.38
Avoided SO_2 Emission	tons	-1.27





Demand Assumptions Table

Variable	Units	Year	Value	Source
Demand Assumptions				
Percent of Truck Traffic	%	2020 - 2053	9.0%	Project Team Analysis
Percent of Auto Traffic			91.0%	
No-Build Scenario Assumptions				
Vehicle Miles Traveled	vehicle-miles traveled / day	2020	19,915,470	Project Team Analysis
		2045	25,589,475	
Vehicle Hours Traveled	hours / day	2020	508,715	
		2045	681,486	
Estimated Crashes per KABCO Scale				
K - Killed	accidents / year	2020 - 2053	6.0	Project Team Analysis
A - Incapacitating			15.5	
B - Non-Incapacitating			105.7	
C - Possible Injury			188.9	
O - No Injury			722.2	
Build Scenario Assumptions				
Vehicle Miles Traveled	vehicle-miles traveled / day	2020	19,915,470	Project Team Analysis
		2045	25,664,571	
Vehicle Hours Traveled	hours / day	2020	508,715	
		2045	673,383	
Estimated Crashes per KABCO Scale				
K - Killed	accidents / year	2020 - 2053	6.0	Project Team Analysis
A - Incapacitating			15.5	
B - Non-Incapacitating			105.7	
C - Possible Injury			188.9	
O - No Injury			722.2	

Benefit Assumptions Table

Variable	Units	Year	Value	Source
Travel Time Savings				
Passenger Vehicle Occupancy - All Travel	people / vehicle	2020 - 2053	1.67	US DOT, BCA Guidance January 2020; 2017 National Household Travel Survey
Truck Vehicle Occupancy			1.00	Assuming trucks only have the driver
Value of Time for Automobile Driver and Passenger	2018$ / hour	2020 - 2053	$16.60	US DOT, BCA Guidance January 2020; Revised Departmental Guidance on Valuation of Travel Time in Economic Analysis.
Value of Time for Truck Driver			$29.50	
Vehicle Operating Costs				
Vehicle Operating Costs for Light Duty Vehicles	2018$ / mile	2020 - 2053	$0.41	US DOT, BCA Guidance January 2020; American Automobile Association, Your Driving Costs – 2018 Edition (2018)
Avoided Trucking Costs				
Average Marginal Cost of Trucking	2018$ / hour	2020 - 2053	$71.78	Value based on Average Marginal Cost per Hour. Data from: An Analysis of the Operational Cost of Trucking: 2019 Update. American Transportation Research Institute. November 2019
Safety				
KABCO Accident Valuation				
K - Killed	2018$ / event	2020 - 2053	$9,600,000	Guidance on Treatment of the Economic Value of a Statistical Life in U.S. Department of Transportation Analyses (2016) https://www.transportation.gov/officepolicy/transportation-policy/reviseddepartmental-guidance-on-valuation-of-astatistical-life-in-economic-analysis
A - Incapacitating			$459,100	
B - Non-Incapacitating			$125,000	
C - Possible Injury			$63,900	
O - No Injury			$3,200	
Emissions				
Emission Factors (Autos)	grams / mile	2020 - 2053	Varies by Speed and Year	Based on MOVES average annual emission factors for passenger vehicles for El Paso County, Texas. Moves model run in March 2020.
Emission Factors (Trucks)	grams / mile	2020 - 2053	Varies by Speed and Year	Based on MOVES average annual emission factors for trucks for El Paso County, Texas. Moves model run in March 2020.
Carbon Dioxide (CO_2)	2018$ / ton	2020	$0.91	US DOT, BCA Guidance January 2020; The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks (July 2018)
		2021	$0.91	
		2022	$0.91	
		2023	$0.91	
		2024	$0.91	
		2025	$0.91	
		2026	$0.91	
		2027	$0.91	
		2028	$0.91	
		2029	$0.91	
		2030	$0.91	
		2031	$1.09	
		2032	$1.27	
		2033	$1.45	
		2034	$1.63	
		2035	$1.81	
		2036	$1.81	
		2037	$1.81	
		2038	$1.81	
		2039	$1.81	
		2040	$1.81	
		2041	$1.81	
		2042	$1.81	
		2043	$1.81	
		2044	$1.81	
		2045	$1.81	
		2046	$1.81	
		2047	$1.81	
		2048	$1.81	
		2049	$1.81	
		2050+	$1.81	
Nitrogen Oxides (NOx)	2018$ / ton	2020 - 2053	$8,300	US DOT, BCA Guidance January 2020; The Safer Affordable Fuel-Efficient Vehicles Rule for MY2021-MY2026 Passenger Cars and Light Trucks Preliminary Regulatory Impact Analysis (October 2018)".
Volatile Organic Compounds (VOC)	2018$ / ton	2020 - 2053	$2,000	
Particulate Matter (PM)	2018$ / ton	2020 - 2053	$377,800	
Sulfur Dioxide (SO_2)	2018$ / ton	2020 - 2053	$48,900	
Emissions				
I-10 Lane Miles (No-Build)	lane-miles / year	2020 - 2053	626.57	Project Team Analysis
I-10 Lane Miles (Build)	lane-miles / year		893.34	
O&M Cost per Lane-Mile	2018$ / lane-mile		$10,000	