Texas Department of Transportation

Appendix F

Intelligent Transportation Systems

1.0 Introduction

Intelligent Transportation Systems (ITS) can apply to a range of projects and efforts. ITS is generally defined as the use of technology to improve operations by saving time, lives, or resources. A key focus in the deployment of ITS is connecting field elements to Traffic Management Centers (TMCs), as well as fostering connectivity between TMCs for the purpose of sharing and integrating information. Key centers that are involved in the District of El Paso's transportation system include the TxDOT TMC, the City of El Paso TMC and TRANSVISTA.

This memorandum presents the ITS Plan for the Horizon Boulevard (FM 1281) corridor, which was prepared by the Horizon Boulevard study team within the context of the Corridor Master Plan study for the segment from Alameda Avenue (SH 20) to Ascension Street. The project corridor is approximately 9.4 miles long and was split into four segments at major intersections for the purposes of the Corridor Master Plan Study, as shown in **Figure F.1**.

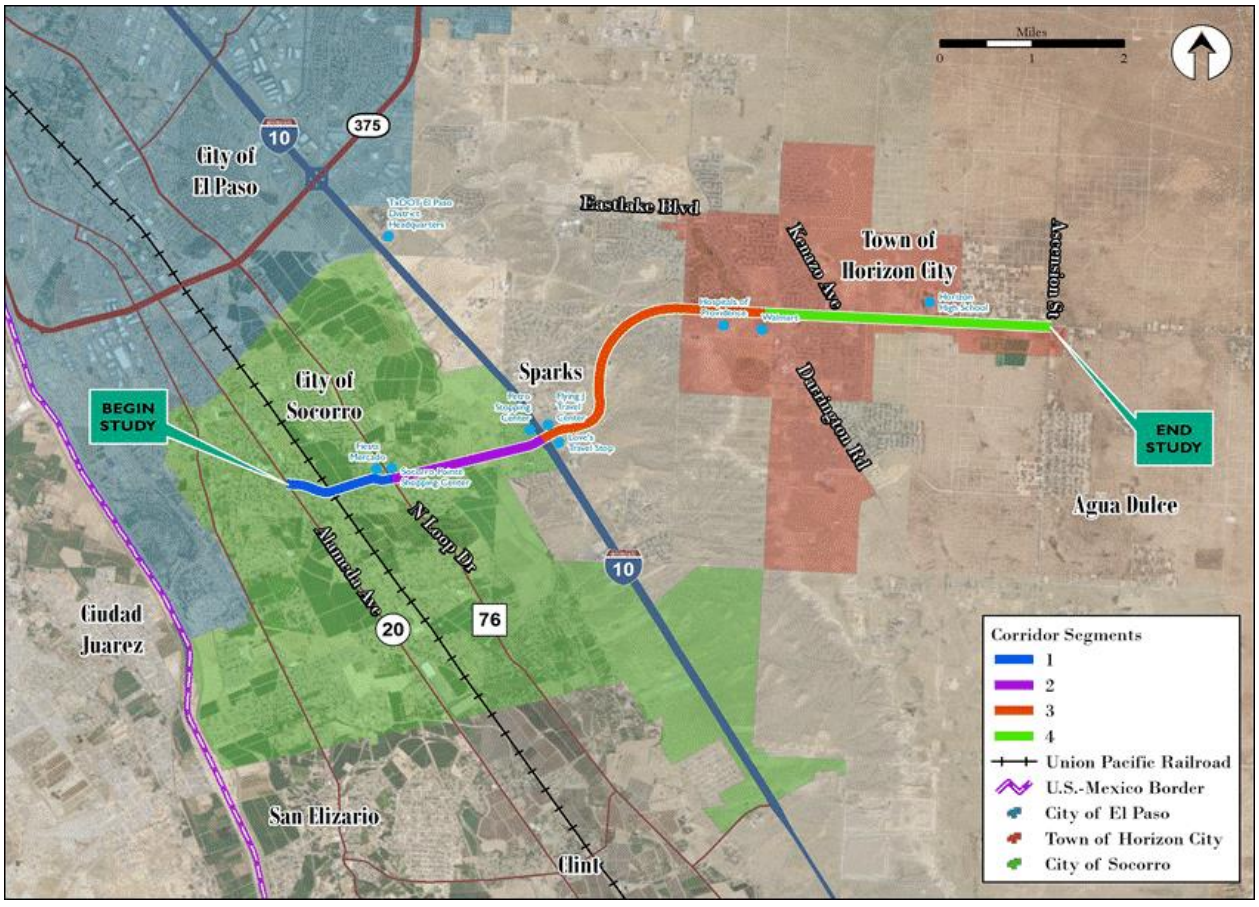

Figure F.1: Study Corridor Limits

The segment limits are defined as:

- Segment 1: Alameda Avenue (SH 20) to North Loop Drive (FM 76)
- Segment 2: North Loop Drive (FM 76) to I-10 (Gateway Boulevard)
- Segment 3: I-10 (Gateway Boulevard) to Darrington Road
- Segment 4: Darrington Road to Ascension Street

The ITS Plan seeks to address existing and future corridor needs, through the lens of using ITS to help achieve the goals outlined in Chapter 3 of the Corridor Master Plan. The plan takes inventory of existing and proposed ITS elements within the study corridor, and outlines potential ITS strategies to be considered in the corridor. The report then recommends corridor-specific ITS applications and presents a timeline for implementing these recommended ITS applications. The memo presents the ITS Plan in the following sections:

- Section 2 presents a summary of existing and future corridor needs
- Section 3 outlines the existing and planned ITS elements in the corridor
- Section 4 presents potential ITS and operational improvement strategies
- Section 5 outlines recommended ITS solutions for the corridor
- Section 6 provides a timeline for the implementation of recommended ITS projects

2.0 Summary of Existing and Future Corridor Needs

This section summarizes existing and future corridor needs identified within the context of the Horizon Boulevard Corridor Master Plan (CMP). The Horizon Boulevard corridor study team facilitated a series of public consultations in order to solicit feedback from stakeholders and the public regarding existing corridor issues and user needs. This feedback was used to identify eight CMP goals, which are summarized in **Figure F.2**.

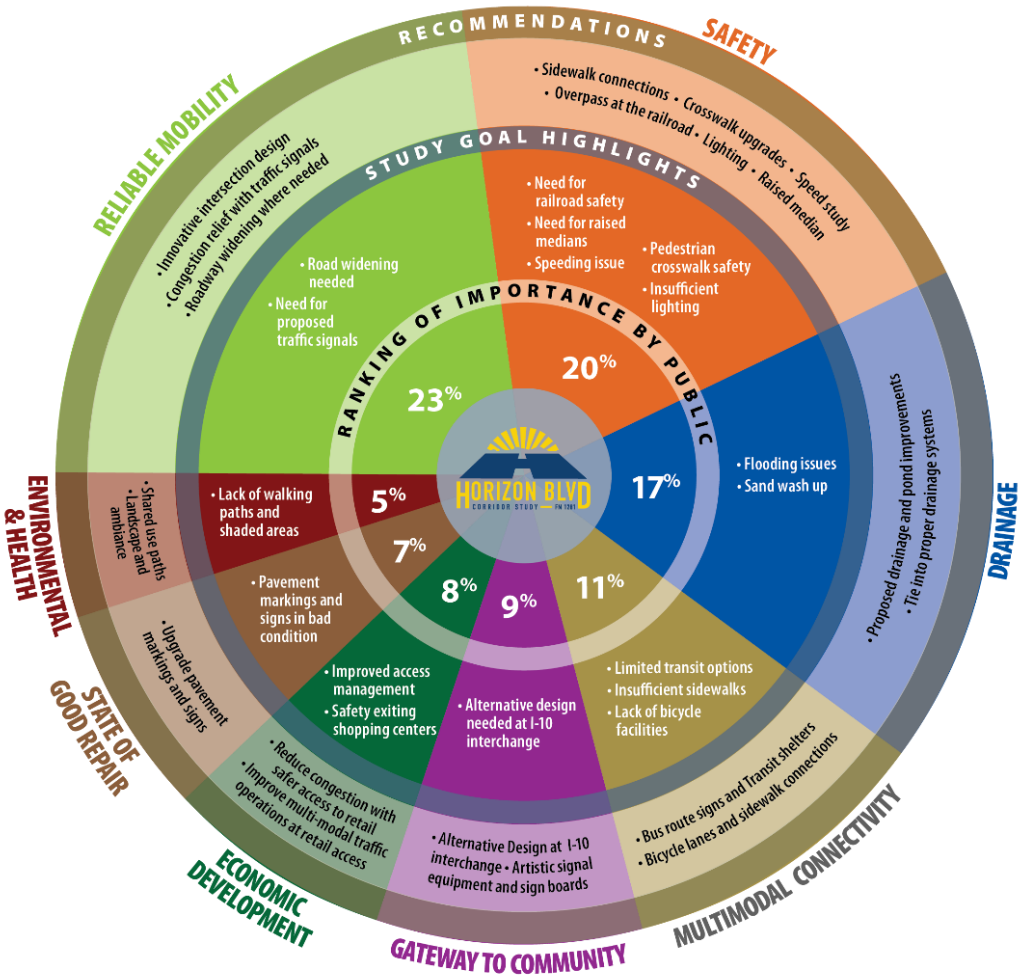

Figure F.2: Summary of Public Input for Corridor Issues and Needs

These goals include reliable mobility, safety, drainage, multimodal connectivity (including transit), gateway to community, economic development, state of good repair, and environment and health. These goals will be used to guide the ITS recommendations outlined in Section 5.

Projected population and employment growth are other important considerations for the corridor ITS plan. There are many planned developments in the Horizon Boulevard corridor study area as a result of recent and anticipated future growth. The corridor will experience additional traffic as a result of these nearby developments, as motorists will utilize Horizon Boulevard to access I-10 and travel to the City of El Paso and other destinations.

Thus, the regional transportation system will need to expand and improve to accommodate future travel demand, and ITS upgrades must be considered to improve traffic operations etc. The Horizon CMP presents a detailed description of recommended roadway improvements in **Chapter 6 – Cross Section Concepts** and **Chapter 7 – Intersection Concepts**, as well as complementary corridor improvements in **Chapter 8 – Complementary Concepts**. The ITS plan recommendations outlined in Section 5 will be considered for integration in **Chapter 8**.

2.1 Existing ITS, Traffic System Management and Operations Infrastructure

The Horizon study corridor is characterized as a dense suburban area, as represented by peak hour traffic conditions and the proportion of passenger cars and commercial vehicles traveling through the corridor. ITS devices and applications in these types of corridors can vary greatly. The study team inventoried the existing ITS devices in the corridor, and summarized the results below:

Dynamic Message Signs (DMS)

The study corridor currently doesn't have any DMS as evidenced by the photographs taken by the study team in 2017, Google Maps Street View, and the El Paso ITS mapping system.

Advanced Signal Systems

The study corridor has signalized intersections with video detection cameras located on the mast arm. It is not clear how the data is communicated and processed to the traffic signal controller for incident detection.

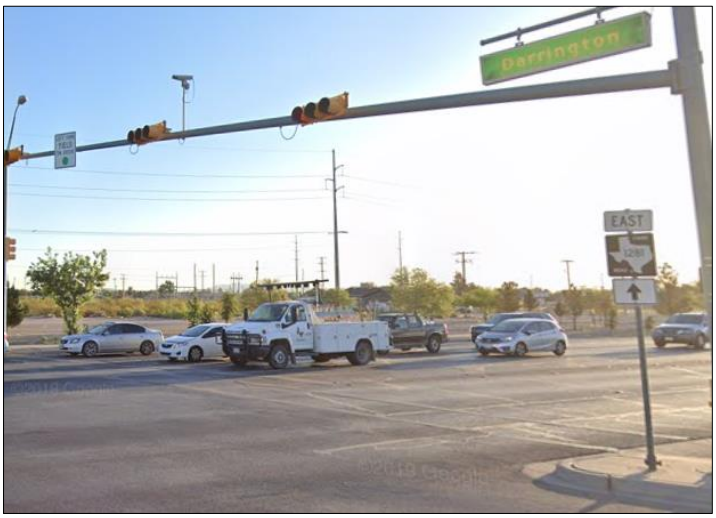

Figure F.3 shows the Google Maps Street View image taken for the intersection of Horizon Boulevard and Darrington Road, which shows that this signalized intersection has traffic cameras mounted on the signal mast arm, however, it's unclear if they are connected to the traffic signal controller for optimizing the signal operation and for emergency signal preemption.

Figure F.3: Video Detection Camera Installed on the Traffic Signal Mast Arm at Horizon Boulevard at Darrington Road

City and county law enforcement agencies have cameras that are used for internal affairs and are dedicated to security and enforcement.

511 or Other Traveler Information Systems

A statewide phone-based traveler information system is managed by the TxDOT 511 system. Specific information on 511 for the study corridor is not available.

Communications infrastructure

An ITS communication architecture plan for the study corridor was not available for review and refinement. It is unclear if such a plan exists.

Traffic Monitoring Center

TRANSVISTA is the traffic monitoring center (TMC) for the El Paso region. It reports current and forecasted traffic information, road and weather conditions, incident information, and other road network status updates. Either raw data, processed data, or some combination of both may be provided by this architecture flow.

TRANSVISTA is connected to various transportation and emergency operation facilities through a fiber optic network. These facilities include the City of El Paso TMC, the City Street Center, the regional Emergency Operation Center[1], the 911 Communications Center, the

[1] Source: https://elpasoready.org/about-us/

TxDOT West Area Maintenance Section and the TxDOT East Area Maintenance Section, and the fire department headquarters. Note: The City of El Paso does not connect to the Town of Horizon City, however it provides for any local agency future connections including county connections.

Transit Systems

Sun Metro Mass Transit and El Paso County Transit currently provide fixed route bus service in the project area, via Route 30 and Route 84. Both transit agencies utilize ITS systems in their daily operations to help enhance the operational efficiency of their fixed route and paratransit transportation services[2].

This is the extent of existing ITS in the corridor. Planned ITS development is discussed in the following section.

2.2 Planned ITS Development

The study team also took inventory of planned ITS developments in the corridor. TxDOT developed a regional strategic ITS expansion plan[3] based on the current and future mobility needs of freeways and arterials maintained by TxDOT within El Paso County. The plan identified several roadway segments on the state highway system within El Paso County for expansion of ITS services to manage existing and future traffic growth. These services include providing access to additional agencies to closed circuit television (CCTV) data, enlarging roadway service patrol area, introducing ITS service to relay travel time on freeways through dynamic message signs.

The strategic plan also identified future staffing needs at TRANSVISTA based on quantifiable parameters, such as existing number of workstations, number of operators required, number of ITS field devices etc. Based on the projection of number of TMC operators, the strategic plan concludes that the current size of the control room is adequate for growth until 2020, if freeway management is not collocated with other agencies for multimodal operation and emergency response. Considering the increasing mobility needs during weekends, TRANSVISTA should be operational on Saturdays during the daytime between 8 am and 12 pm. However, 24/7 operation is still not necessary in a short term. When TRANSVISTA is not operational during nights and weekends, TMC functions could be transferred to other agencies, such as the city's police department. With expanded staff, TRANSVISTA may have the personnel to monitor systems on Horizon Boulevard once the fiber gets connected to the TMC.

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[2]Source:https://www.trapezegroup.com/news/article/sun_metro_uses_trapeze_and_trapeze_its_solutions_from_the_back_office_to_th#http://www.epvgroup.com/whitepaper/Texas_SpecificatioOct2009.pdf

[3] TxDOT, El Paso District, "Development of Strategic Plan to Deploy ITS on state Highway Corridors in the El Paso County Region", May 26, 2010.

As stated in the TxDOT document on the strategic plan to deploy ITS on State Highways, the MPO has recommended installing ITS field devices to relay information to motorists on the segment between Horizon Boulevard and the El Paso County line. The recommended ITS devices include CCTV, DMS, LCS, MVDS, VIVDS, DRUM signs, HAR beacon signs. Further, upgrading the existing TMS software form ATMS to LONESTAR would be considered. The Lonestar software is an advanced traffic management software developed by the TxDOT. The software was primarily designed to replace the older traffic management software named "Advanced Traffic Management System (ATMS)", which is used by the TRANSVISTA, and provide advanced features for TMCs to manage traffic on freeways and arterials. The detailed description can be obtained from the ITS memo document published in May 2010[4].

This summarizes planned ITS development in the corridor. Potential ITS and operational area improvement strategies are outlined in the next section.

3.0 Potential ITS and Operational Improvement Strategies

After inventorying existing and planned ITS and Traffic System Management and Operations Infrastructure, and taking CMP Goals into account, the study team has identified the following potential ITS and operational improvement strategies as meriting further study in the ITS Plan:

- **Safety:** Both vehicle and roadway safety can be improved by developing better crash avoidance, safety performance measures, driver notification mechanisms, commercial motor vehicle safety considerations, infrastructure-based and cooperative safety systems.
- **Mobility:** Transportation system efficiency metrics and management strategies can improve individual mobility.
- **Corridor Operations, Maintenance and Traffic Management:** Corridor operations work best when the associated systems are able to share information through an integrated traffic management and information system. This includes both systems (e.g., traveler information integrated with sensor data) and agencies (state and local). In the Horizon Boulevard corridor context, corridor operations can include areas such as work zones, traveler services, incident clearance, and integration to regional systems.
- **Traffic Performance Measurement:** Performance measurement is essential for successful traffic operations and agency management, as this allows agencies to determine if existing and new systems are working properly. Performance measures also empower transportation agencies to make informed decisions regarding project

[4] TxDOT, El Paso District, "Development of Strategic Plan to Deploy ITS on state Highway Corridors in the El Paso County Region", May 26, 2010.

selections by justifying those that have achieved success in the past and not deploying systems that have not proven themselves to be beneficial.

  - Some traffic performance measurement data is available via historic data records, such as crash data, while other data is available in real time such as data from traffic detectors and weather stations. In most cases, generating the performance measures does not have to be accomplished on a traffic management center computer system, but organized data archiving is important for all data sources.

- **Communications and Power:** Effective communication within ITS and operation systems is essential for responsive transportation network management. There are several communications system options that can be studied, which include publicly owned systems and private sector systems for lease. The possibilities should be thoroughly examined before an approach is selected.

- **Environmental Impacts:** Environmental impacts, particularly air emissions can be reduced by optimizing traffic flow, speed, and congestion. Having advanced traffic signal systems would optimize traffic flow in the corridor. If the signals are working as adaptive ones then vehicles will spend less time stopped at a signal, thereby reducing pollution and environmental impacts.

- **Traveler Information:** Traveler Information is a critical element of ITS, and includes two components, namely:

  - Travel time data from sensors, third party data (e.g., Waze), or other systems is required before travel times can be provided. The same is true with weather and incidents.

  - A traveler information system that assembles and processes the travel time data. In the simplest systems, this can be a controller in a signal cabinet which is connected at a TMC. That center could be a computer at a local agency or part of the larger El Paso or Statewide TMCs. Considering the wide variety of information desired, a TMC is the preferred approach. From the TMC, the information needs to be distributed. This can be via DMS on the road, through social media, or through third-party systems.

- **Emergency Services:** A key aspect of traffic operations is incident management. Incident management can be broken into several components such as notification, verification, response, management, and post incident management. Throughout all the steps, communications are critical.

    - Notification is often a call to 911

- Verification can be through camera images, or through repeated phone calls.

  While any emergency response center will begin their response immediately, camera images can provide additional information such as whether there is a potential for hazmat conditions prior to the emergency responders arriving at the scene. This saves precious time in making sure the right resources respond.

- Proper incident management at the scene is critical for the safety of responders and travelers alike. A large advantage can be gained with simple training of police and fire for traffic control at an incident. The cleanup and safe removal of all vehicles is included as part of the scene management.

- Post incident management is often addressed as "after action reports". The responding parties will get together and discuss the management of the recent incident and try to identify areas for improvement. This could be additional training or support.

This summarizes potential ITS and operational improvement strategies to be considered in the corridor. Recommendations for ITS improvements are outlined in the next section.

4.0 ITS Project Recommendations

This section presents a list of recommended ITS concepts and improvements for the Horizon Boulevard corridor. Note: This ITS Plan document is part of the larger Horizon Boulevard Corridor Master Plan (CMP). As such, the ITS projects described below should all be considered as potential projects within the context of the master plan. However, many of these projects may be superseded due to redundancy or irrelevancy by other recommended projects.

The following ITS concepts are proposed for consideration in the Horizon Boulevard CMP:

- Traffic signal improvements with ITS elements for all twelve signals.
- Upgrade existing signal controllers and addition of traffic loops at every signalized intersections.
- Implement Adaptive Signal Control and optimization technologies at every signalized intersections to improve signal operations and ensure improved travel time performance along the corridor.
- Improve signal coordination and remote control of signal operation using fiber optic connected to the TMC.
- Addition of signal preemption for emergency vehicles.

- Addition of left-turn signal phasing and adjusting left turn signal operation (Permitted versus Protected) based on the queue lengths observed at the intersection for left turning movements.

- For cyclists: For the shared bike lane south of I-10, green bike boxes[5] at the intersections (Alameda Avenue and North Loop Drive) with bike sensitive detection to incorporate bike actuations in signal operation would be beneficial. Bicycle detection is generally used at actuated signals to alert the signal controller of bicycle crossing demand on an approach. Bicycle detection occurs either through the use of push-buttons or by automated means (e.g., in-pavement loops, video, microwave, etc.). Proper bicycle detection meets two primary criteria: 1) accurately detects bicyclists; and 2) provides clear guidance to bicyclists on how to actuate detection (e.g., what button to push, where to stand). Four primary types of bicycle signal detection that may be considered are:

  - Loop - Induction loop embedded in the pavement
  - Video - Video detection aimed at bicyclist approaches and calibrated to detect bicyclists
  - Push-button - User-activated button mounted on a pole facing the street
  - Microwave - Miniature microwave radar that picks up non-background targets

- For Pedestrians: Advanced Technology Systems (motion activated sensors, activated lighting and signage) with flashing crosswalk can be considered at the signalized intersections north and south of I-10. Pedestrian signal indications should be used at traffic signals wherever warranted, according to the MUTCD. The use of WALK/DON'T WALK pedestrian signal indications at signal locations are important in many cases, including when vehicle signals are not visible to pedestrians, when signal timing is complex (e.g., there is a dedicated left-turn signal for motorists), at established school zone crossings, when an exclusive pedestrian interval is provided, and for wide streets where pedestrian clearance information is considered helpful. Use of audible countdown accessible pedestrian signals (APS) at signalized intersections serve both bicyclists and pedestrians, especially visually impaired persons, and are ADA complaint. No APS exists at the signalized intersections along the corridor.

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[5] A bike box is a designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase. It is beneficial where a left turn is required to follow a designated bike route, access a shared use path, or when the bicycle lane moves to the left side of the street. (Source: NACTO)

For unsignalized intersections, pedestrian warning systems such as a Rectangular Rapid-Flashing Beacon (RRFB[6]) a pedestrian-actuated conspicuity enhancement may be used in combination with a pedestrian, school, or trail crossing warning sign to improve safety at uncontrolled, marked crosswalks such as cross streets without a signal.

- Transit signal priority to buses with separate bus lanes. This may benefit El Paso County Rural Transit Route 30 (Horizon) and Sun Metro Transit Route 84 (Mission Del Paso).
- Signal priority to electronic information signs and Variable Message Signs (VMS) signs (if any).
- Install Video Imaging and Vehicle Detection Systems (VIVDS). Adding VIVDs would benefit existing signalized intersections, most of which have more than three approach lanes (including left-turn bays) in one direction with significant volume during peak and off-peak hours.
- Employ systemwide Emergency Vehicle Pre-emption (fire, emergency medical services, and police).
- Implement Smart lighting at major intersections especially with high pedestrian/bicycle volumes. The recommended key locations along Horizon Boulevard are Darrington Road, Gateway Boulevard East, Gateway Boulevard West and North Loop Drive.
- Roadside ITS elements, including CCTVs (upgraded version to full pan/tilt/zoom) in the cities. Implementation of these elements should ensure that other city departments have the capability to access video feeds.
- Strategic placement of Dynamic Message Sign (DMS) on arterial streets. DMS usually displays short information on roadway conditions to motorists using a large electronic screen either installed as a portable, semi-permanent, or permanent sign along the road. DMS can be mounted on overhead gantries or located alongside the roadway as a separate mount. This tool coordinates with other ITS applications to display distance and /or travel times, traffic conditions, road incidents and safety/public

[6] The device includes two rectangular-shaped yellow indications, each with an LED-array-based light source, that flash with high frequency when activated.

service information. Also, installation of DMS devices will assist in incident management specially to provide information to motorists prior to merging with I-10[7].

The recommendation is to add small DMS approaching and leaving Horizon Boulevard at Alameda Avenue, North Loop Drive, eastbound I-10 frontage road, westbound I-10 frontage road, Bowdoin Street, and Darrington Road. These DMS would be controlled by TXDOT but local authorities may be granted control as needed. The DMS entering the communities can be used to inform travelers of incidents ahead in the urban area such as crashes or special events. The DMS leaving the cities should default to travel time information but can be used for incident information, work zone information, or weather-related cautions potentially included recommendations on variable speed limits.

Traveler information is critical in a suburban area where numerous alternate routes are available. Timely information can aid with travelers finding an alternate route to avoid long delays in congested sections.

- Installation of Public Warning Systems such as addition of sensors that activate beacon signs, lane control signs, rail advisory signs, Highway Advisory Radio (HAR) and flood detectors would enhance safety.

- Corridor-wide installation of recording devices such as cameras, wireless sensors, radar units, microwave vehicle detection system (MVDS), video detection system that records traffic data and video feeds.

- Implement system to detect rail crossing closures for Union Pacific Railroad and provide this information to other city departments and the public.

- Road closure and incident information to media, the ability to automatically distribute real-time traffic data to websites, social media feeds, mobile apps, and local television and radio stations are also recommended.

- Intersection collision avoidance systems use sensors to monitor traffic approaching intersections with high frequency of vehicle crashes and warn drivers of approaching cross traffic. The driver warning could be more urgent based on impending signal phasing. Traffic signal controller provides its phase status to the DSRC roadside unit (RSU) continuously, and the RSU broadcasts this information frequently in its signal phase and timing (SPaT) message (10 Hz update rate). Each equipped approaching vehicle receives SPaT messages and identifies which phase applies to its approach and movement. For the applicable phase, the vehicle compares the time remaining to the red onset with the time it will take to reach the stop line if it continues at its

[7] TxDOT, El Paso District, "Development of Strategic Plan to Deploy ITS on State Highway Corridors in the El Paso County Region", May 26, 2010.

current speed and acceleration (based on estimates from its GPS positioning and speed sensors). If it is predicted to reach the stop line after the red onset, the driver is given an audible alert to stop for the red signal. Appropriate locations for the installation of this technology can be obtained from the crash data. The corridor crash data analysis by segment is summarized in **Chapter 4 – Existing Conditions** of the CMP for the five-year period from 2012 to 2016. Based on the crash analysis, Horizon Boulevard north of I-10 had lower crash rates than the segments south of I-10 over the five-year period. Therefore, evaluation of collision avoidance systems for the segment of Horizon Boulevard south of I-10 is recommended.

5.0 Additional Recommendations

This section briefly discusses technologies that may not be ITS solutions in and of themselves, but are important for providing the communications, power, and visual detection required for other potential solutions.

5.1 Power and Communication Networks

All ITS depends on power supply and communication networks, thus these elements need to be evaluated in order to ensure optimal ITS performance.

Power Supply

Apart from the AC power supply available in the corridor, solar power may also be considered as a viable and invaluable option in this area. Solar power technology provides a cleaner and sustainable alternative to other energy sources. The El Paso area, benefits from having 135 clear days per year and ranked 16th among U.S. cities for annual sunlight hours, does not face operations disruptions typical of areas with limited sunlight exposure. On the contrary, solar power is an abundant source in the area. Solar projects are part of the larger proposed ITS projects and as such, no standalone solar power project is defined in this section.

Communication Networks

In addition to power supply considerations, the feasibility of contracting or subsidizing Wi-Fi service along the entire corridor is recommended, as uniform Wi-Fi service would ensure that communications from emergency vehicles and push data/emergency notices to vehicles are successfully transmitted. It would be easier to provide Wi-Fi/WiMAX along the corridor as that could be vendor independent. Provision of Wi-Fi/WiMAX services along the corridor requires installation of fiber optic nodes, cables and pull boxes for improved communication for all ITS components. Fiber optic cable is a technology that allows for the transmission of communications over large distances. Fiber optic infrastructure is generally used as the backbone for CCTV surveillance cameras, DMS, traffic sensors, and other ITS devices. However, installation of fiber lines can be complicated, costly, and time consuming. There are also limitations on the speed of the data based on the physical placement of the cables. Fiber lines are also subject to wear and tear, which presents additional maintenance considerations.

While “Fiber Optics” has become a buzzword tied to the potential of faster Internet speeds up to one gigabyte per second, it is not the only way to send information at that speed. Another common form of data transfer is through microwave communications, known as Fixed Wireless. Fixed Wireless is the process of sending information from one point to another using the microwave radio spectrum. The information is beamed from one central location to a receiving dish. It requires a line-of-sight connection which can potentially be an issue, but the dish is relatively small and easy to place. It is also up to fifty percent faster than fiber optic cables.

There is also a higher rate of latency inherent in fiber optic communication[8]. By comparison, a microwave signal will have a latency of about 5.4 microseconds, while light on a fiber cable travels at 8.01 microseconds per mile. However, the microwave systems need regular monitoring as they are prone to copper theft and vandalism.

Wireless communications can be accomplished through several standards or systems. Dedicated Short Range Communications is an advanced technology that allows automobiles to communicate with other automobiles or the infrastructure using a wireless communications channel. Communications can be through cellular systems (e.g., 5G) or microwave. Therefore, the recommendation is to conduct a detailed engineering study to determine how to address these requirements per location.

All ITS elements need to be connected to a central traffic management system such as the TRANSVISTA TMC. This can be achieved by implementing various communication options discussed above. The future TMC network would connect to multiple ITS communications medium such as fiber cables, microwave radio, point-to-multipoint wireless, or cellular. The system would include signal timing and coordination for twelve traffic signals. It would allow remote operations from the TMC for these signals with the ability to expand the system for future projects. It would also allow for a complete connection of the TRANSVISTA TMC to the El Paso TMC, with possible 911 Center Dispatch integration. The long-term recommendation is to collect all information to a central TMC for better communication and operation. Further investigation is also necessary in order to identify any existing fiber lines to connect it to I-10 or another major arterial so that they can form a connection ring. It is also recommended that TRANSVISTA should expand this capability to other agencies, such as Sun Metro transit operations, Fort Bliss, El Paso International Airport, El Paso Community College, Tourist Information Centers, etc. Currently, TRANSVISTA has camera outputs open for providing direct connection to outside agencies.

[8] Latency is the time it takes for a command to be received and a reply to be sent, and that latency in fiber optic communication increases over longer distances.

5.2 Traffic Surveillance Cameras

Traffic surveillance cameras are a major part of most Intelligent Transportation Systems. On surface roads, they are typically mounted on high poles or masts, sometimes along with streetlights. Cameras permit the operating agency to view traffic conditions, such as congestion, crashes and other events. Cameras can be panned, tilted, or zoomed to provide operators with the best possible view of the roadway. Cameras assist operators and, ultimately, emergency responders with confirming, locating, and managing incidents, construction zones, and congested areas. Cameras can be used in other applications, such as license plate recognition or stopped vehicle detection systems, but these cameras are serving more as a sensor than a surveillance tool. Currently, signalized intersections in the corridor are equipped with surveillance cameras, however it is unknown if these cameras are monitoring incidents or just counting traffic volume. Therefore, recommendation for adding CCTV cameras and connecting them to a TMC is essential to monitor traffic incidents.

5.3 Work Zone Safety Systems

This system enhances safety in and around work zones by alerting construction workers of any vehicle coming nearby and alerting motorists about the ongoing changes on a roadway such as lane configuration change, congestion, alternative routes, and change in speed limit. This system uses various ITS applications like speed compliance systems, dynamic late lane merge systems, queue detection systems, cameras, and Bluetooth detectors to monitor traffic. DMS and integrated traveler information systems can also be used.

Work zones are by nature temporary and as such, no permanent safety systems are recommended. It is recommended that TxDOT require work zone safety systems on all work zones lasting longer than one month. At a minimum, the system should have changeable message sign boards on both approaches that provide real time delay information as well as the requirement that incident information within the work zone be messaged within thirty minutes of verification.

5.4 Emergency Services (ES)

This category includes tools that support, facilitate, and expedite emergency response efforts. Some of the tools identified as relevant to the corridor operations for short- and mid-term implementation.

Next Gen 911 is an updated version of 911 services. In addition to 911 services, it allows the public to send photos, videos, and text messages. This tool allows the dispatcher to identify the caller's location and sends the response teams, thereby providing faster response times. Next Gen 911 allows information sharing and call rerouting with other 911 call centers. This tool requires computer hardware and software improvements and coordination with emergency response agencies (911 call centers, first responders, local hospitals, and others) combined with GIS mapping technology.

5.5 Integrated Traveller Information Systems

This tool helps travelers plan their trip either before it begins or while they are traveling from origin to destination with more efficiency and safety. It collects all types of roadway information (e.g., road and weather conditions, congestion, tourism, real-time transit information) through various devices and transmits the information to the public using various means such as websites, 511, social media, and radio. An integrated traveler information system is more about automated feeds of data from several other systems. For example, real time status of buses from a transit agency. This information is collected and presented in a user-friendly format using a variety of methods including web sites and social media. Current understanding is there are no real time information systems existing in the corridor. Information from other ITS projects will be included in the future.

The recommendation is for TXDOT to continue to examine the available sources and to implement a corridor specific traveler information system at such time in the future when multiple real time sources are available.

6.0 Timeline for Implementation

In summary, the Horizon corridor has relatively few existing ITS assets, which leaves room for improvement. However, some of the operational needs and concerns that have been identified in other tasks and through public outreach may have ITS solutions, including many that enhance safety, mobility, emergency response, and connections between modes. The most important aspects of any ITS project are connection and communication. Implementation of ITS strategies requires an assessment of the level of integration necessary to make them interoperable with the existing TxDOT El Paso District ITS program. This ITS Plan has identified potential ITS projects and recommendations for the Horizon Boulevard corridor based on the timeline shown in **Table F.1**. The next step is to evaluate operations concepts, which is outside of the scope of this work. Therefore, further study is recommended for this step.

Table F.1: Recommended ITS Projects and Implementation Timeframe

ITS Projects	Timeframe
Traffic Signal Operation Improvements including emergency vehicle pre-emption	Short
Bicycle/Pedestrian System	Short
Dynamic Message Signs (DMS)	Short
Intersection collision avoidance systems	Short
Highway Rail Crossing Warning System	Short
Provision of fiber access along corridor study	Medium
Real-time travel time information	Medium
Next Gen 911	Long