1.0 NEED AND PURPOSE FOR THE PROPOSED PROJECT

The Harbor Bridge is located on US Highway 181 (US 181) approximately one-half mile north of the US 181 and Interstate Highway 37 (I-37) interchange in Corpus Christi, Texas (see **Figure 1.0-1** in **Appendix A**). US 181, a six-lane divided highway, is the only continuous state/federal highway facility that provides a direct connection between the Corpus Christi Central Business District (CBD) and the communities of Portland, Gregory, Ingleside, and Aransas Pass to the north. The facility is designated as part of the National Highway System (NHS) by the Federal Highway Administration (FHWA). The Harbor Bridge was designed and built in the 1950s and opened for operation in 1959.

I-37, US 181 and the Crosstown Expressway (also designated as State Highway 286) are the major highways that serve the project area. The project limits extend approximately 2.3 miles along US 181, approximately 0.7 miles along the Crosstown Expressway and approximately 2.5 miles along I-37 and include: US 181 at Beach Avenue on the north; Crosstown Expressway at Morgan Avenue on the south; I-37 and Up River Road on the west; and I-37 and Shoreline Boulevard on the east.

Within the project area, both US 181 and the Crosstown Expressway are divided facilities with three 12-foot travel lanes in each direction. US 181 along the Harbor Bridge and approaches does not have shoulders. I-37 in the project area typically has three 12-foot travel lanes in each direction with 10-foot shoulders. The proposed project would replace the Harbor Bridge and reconstruct the I-37/Crosstown Expressway intersection but would not add capacity. Descriptions of the proposed alternatives are found in **Section 2.4.1.**

The intent of this section is to describe the needs and other problems that have led to the development of this transportation improvement project. From those needs (described in **Section 1.3**), the project team, working with Cooperating and Participating agencies and the public through the project scoping process, prioritized the needs to address in defining the purpose of this project (stated in **Section 1.4**). Recognizing the difficulty inherent in addressing all of the problems in the project area, the project team used the public and agency scoping process to identify objectives that the project will attempt to address (see **Section 1.5**).

1.1 PROJECT INITIATION AND SCOPING

The Texas Department of Transportation (TxDOT) and FHWA, as Joint Lead Agencies, are proposing improvements to US 181 that would include the replacement of the Harbor Bridge and the reconstruction of portions of US 181, I-37 and the Crosstown Expressway. The proposed project was initiated under the efficient environmental reviews section (Title 23 United States Code [U.S.C] §139) of the Safe, Accountable, Flexible, Efficient, Transportation Equity Act: A Legacy for Users (SAFETEA-LU). The FHWA regulations implementing SAFETEA-LU are found in Title 23, Section 771 of the Code of Federal Regulations (CFR) and are commonly referred to as 23 CFR §771. Following 23 CFR §771.123(a), FHWA first issued a Notice of Intent (NOI) in the *Federal Register* on May 20, 2005 for the proposed improvements to US 181 including the replacement of the existing Harbor Bridge and approaches where

US 181 crosses the Corpus Christi Ship Channel. On March 20, 2007, a revised NOI was published to advise the public that the study limits described in the 2005 NOI had been expanded. The primary change was to the southern limit, which would have extended the project along the Crosstown Expressway to SH 358 (South Padre Island Drive). On November 3, 2010, the revised NOI published in 2007 was rescinded, via a notice in the *Federal Register*, because of changes in the scope. On June 22, 2011, FHWA published another NOI announcing its intent to prepare an Environmental Impact Statement (EIS) for the proposed project. A NOI was also published by TxDOT in the *Texas Register* on July 8, 2011. Following the publication of this most recent NOI, FHWA and TxDOT sent letters to other federal, state and local agencies inviting them to become Participating or Cooperating Agencies (or both in the case of Federal Agencies) on the proposed project. Included in the list of agencies invited to be Participating Agencies were the Apache Tribe of Oklahoma, the Comanche Nation of Oklahoma, the Kiowa Indian Tribe of Oklahoma, the Tonkawa Tribe of Indians of Oklahoma, and the Mescalero Apache Tribe. Copies of the letters sent, as well as those received in response, are included in **Appendix B** of this Draft EIS. Following the invitations, three federal agencies agreed to become Cooperating Agencies: the Coast Guard (USCG), the Environmental Protection Agency (EPA), and the Department of Housing and Urban Development (HUD). An additional five federal agencies, two state agencies, and seven local agencies are considered Participating Agencies on the proposed project. A complete list of Cooperating and Participating Agencies is included in **Section 8.0**. Among the federal approvals necessary to implement the proposed project would be a US Coast Guard Bridge Permit.

With the Cooperating and Participating Agencies identified, FHWA and TxDOT held public and agency scoping meetings on two separate occasions in the fall of 2011. The first scoping meeting was August 9, 2011, and the second was held October 27, 2011; agencies were invited for a session in the afternoon while the general public was invited in the evening. Summary details of these meetings are included in **Section 8.0** and copies of the presentations are on file and available for viewing at the TxDOT Corpus Christi office.

The primary objectives of the scoping meetings included the following:

- Establish agency-to-agency communication protocols and to document these and other Draft EIS review procedures in a Coordination Plan developed for the proposed project;
- Provide agencies and the public an opportunity for involvement in the development of the need and purpose for the proposed project;
- Provide agencies and the public an opportunity for involvement in the identification of a range of alternatives for the proposed project;
- Determine, in collaboration with Cooperating and Participating Agencies, the appropriate methodologies to be used and the level of detail required for the analysis of alternatives; and
- Determine potentially significant environmental issues to be analyzed in depth in this Draft EIS.

The collaborative scoping process resulted in a need and purpose and additional objectives being established for the proposed project; these are described in detail in **Sections 1.3** through **1.5** below.

The scoping process also resulted in a range of alternatives to consider; these are described in **Section 2.0** of this Draft EIS. With respect to study methodologies and level of detail required for the analysis, the scoping process was a starting point for discussions with various agencies and many of these discussions continued throughout the schematic development phase and the development of this Draft EIS. **Section 8.0** describes the points of coordination that have occurred thus far with Cooperating and Participating agencies as well as the areas of concern expressed by these agencies as part of the coordination.

1.2 TRANSPORTATION PLANNING AND FUNDING

The US 181 Harbor Bridge project is listed in the Corpus Christi Metropolitan Planning Organization's (MPO) Metropolitan Transportation Plan (MTP) 2010-2035 as construction of a new bridge over the Corpus Christi Ship Channel. The project is also listed in the August 2013 quarterly revision to the 2013-2016 Statewide Transportation Improvement Program (STIP) (see **Appendix C**); before FHWA and TxDOT take final action on the proposed project the STIP will be updated to reflect the funding sources and a project description consistent with the 2010-2035 MTP. The project is also listed in the 2014 Unified Transportation Program (UTP) under Category 2: Metropolitan and Urban Corridor Projects, Category 6: On-System Structures Replacement and Rehabilitation, Category 7: Metropolitan Mobility & Rehabilitation, and Category 12: Strategic Priority; TxDOT has set aside $12.6 million under Category 2, $291 million under Category 6, $19.2 million under Category 7, and $310 million under Category 12. A total of $632,800,000 has been set aside by TxDOT for the proposed project in the UTP. An additional $100 million has been dedicated by local sources, including the City of Corpus Christi, Nueces County, San Patricio County and the Port of Corpus Christi Authority. The estimated construction cost (in 2013 dollars) for the proposed project ranges from $558 to $679 million with an initial year of expenditure of 2015. The total project cost as listed in the UTP is $869,763,968. The estimated date of completion is 2020.

1.3 NEED FOR THE PROPOSED PROJECT

The following underlying transportation needs have been identified with the Harbor Bridge and US 181 in the project area: 1) maintaining the long-term operation of a US 181 crossing of the Corpus Christi Ship Channel; and 2) safety risks caused by design deficiencies.

1.3.1 Maintaining the Long-Term Operation of a US 181 Crossing of the Corpus Christi Ship Channel

The Harbor Bridge is a fracture-critical structure, meaning the key structural elements supporting the bridge are not themselves supported by additional and redundant elements. This means that if a key support fails, the bridge would be in danger of collapse. This does not mean the bridge is inherently unsafe, only that the bridge design does not include additional structural members to carry loads in the event of a single member's failure.

There are currently at least 280 fracture-critical members on the existing bridge. Fracture-critical members include link pins, deck truss sway frames (including the diagonal members and gusset plates),

and floor beams for the deck truss and cantilever truss units. A fracture-critical member is defined by FHWA's National Bridge Inspection Standards as "as a steel member in tension, or with a tension element, whose failure would probably cause a portion of or the entire bridge to collapse."

The bridge's main span had a Fracture-critical Inspection in September 2007 and a Bridge Condition Survey in December 2008 resulting in the following major findings:

- Significant section loss of some gusset plates (metal plates used to connect multiple detour members of a truss), particularly gussets connecting top chords to verticals in the bridge's deck trusses;
- Missing or broken rivets and anchor bolts;
- Corrosion, pack rust, and section loss in deck sway bracing;
- Floorbeam and stringer stiffener section loss;
- Sagging lateral bracing under the deck;
- Leaking deck joints; and
- Widespread rusting, with pack rust, knife edging, and paint failure prevalent throughout the bridge.

The 2007 Fracture-critical Inspection and 2008 Bridge Condition Survey did not include the pre-stressed girder or plate-girder approach spans. In response to the bridge's deteriorated condition, TxDOT undertook immediate critical repairs to the bridge's steel members in early 2009, with a more extensive rehabilitation between 2010 and 2012. The rehabilitation was designed to provide 15 to 20 years of additional service life while long-term plans could be developed for the Harbor Bridge.

The 2010-2012 rehabilitation addressed immediate safety concerns. However, the bridge's most recent inspection, conducted in September 2012, noted continuing or reoccurring corrosion issues almost immediately following rehabilitation, underscoring the bridge's ongoing maintenance and operability issues. Specifically, the following conditions of the bridge's primary components were noted in the 2012 inspection.

- Deck – Condition Rating 6 (Satisfactory Condition – limited minor deterioration of structural elements): Minor cracks in deck soffit in most spans; some delamination and spalling with exposed rebar in three spans; moderate to severe fracturing and spalling of concrete median rail.
- Superstructure – Condition Rating 5 (Fair Condition – extensive minor deterioration of structural elements): Main truss members have pitting corrosion losses throughout and at gusset plate connections. Losses are extensive and corrosion is continuing, but recent painting during rehabilitation has greatly reduced rate of corrosion.
- Substructure – Condition Rating 6 (Satisfactory Condition): Extensive cracking in four bent caps and in concrete columns in two bents. Minor cracks in most other bent caps, columns, and backwalls.

- Channel – Condition Rating 8 (Very Good Condition): No comments noted.
- Approaches – Condition Rating 7 (Good Condition – some minor problems): Minor cracks in south approach retaining walls; minor pavement wear.

While the 2012 inspection noted some conditions that received ratings of 5 to 8, it should be noted that scores any lower than 5 reflect deterioration that "seriously affects structural capacity." This evaluation also reflects the condition of the bridge almost immediately after the 2010-2012 rehabilitation; despite the recent work on the bridge, elements quickly exhibited evidence of deterioration, corrosion, and cracking. Additionally, the 2012 inspection was only performed on accessible components of the bridge, and did not include ultrasonic investigations.

Today the structure carries higher dead loads (the weight of the bridge itself) and live loads (the weight of vehicular traffic, wind, water and other factors) than the loads for which it was originally designed in 1959. Live loads have increased with increased traffic volumes and greater weight of typical vehicular traffic, particularly for commercial trucks and heavy-load vehicles that use the bridge. The dead load on the structure was increased in 1987, when the original lightweight concrete deck was partially replaced with a normal-weight deck. Structural modifications undertaken in a rehabilitation project in the late 1980s provided additional reinforcement and strengthening, with changes to the truss's structural configuration, addition of thicker gusset plates, and replacement and upgrade of many connections. Over the life of a bridge structure, these excess loadings fatigue the bridge members and, in turn, shorten the life span of the structure. The joints and connection members will continue to deteriorate beyond repair and will ultimately have to be replaced, even if continued maintenance efforts are performed (TxDOT 2012a).

In addition, corrosion is a major factor to overcome in maintaining the structural integrity of the Harbor Bridge. The steel bridge resides in a saltwater environment, requiring routine cleaning and painting to minimize corrosion. The combination of salt-laden air, year-round windy conditions, and warm air temperatures increases the potential for steel corrosion to occur (TxDOT 2012a).

The structural rehabilitation necessary to extend the service life of the existing Harbor Bridge another 15 to 20 years was completed in 2011. Since 1980, maintenance costs have exceeded $70 million. An analysis by the TxDOT Bridge Division found that extending the service life of the current Harbor Bridge to 2086 would cost an estimated $279,471,206 in 2012 dollars (or $401,430,000 using probable 2012 net present value) (HDR, Inc. 2012). Periodic major rehabilitation or reconstruction projects will be required to maintain operability beyond the 15 to 20 years of additional service life provided by the 2011 rehabilitation. The September 2012 inspection illustrates the recurring deterioration of structural and secondary members and the bridge's ongoing maintenance needs. Future rehabilitation projects will need to address secondary members, lateral gusset plates, and other members that were not repaired in 2011. Even with repairs of this magnitude, however, the bridge will remain a fracture-critical structure over salt-water.

1.3.2 Safety Risks Caused by Design Deficiencies

The current US 181 facility, including the Harbor Bridge, does not meet current FHWA and TxDOT roadway and bridge design standards. FHWA's Design Standards for Highways (23 CFR §625) and TxDOT's Roadway Design Manual and Bridge Design Manual provide guidelines for various elements of roadway and bridge design, including traffic characteristics; shoulder widths; horizontal and vertical alignment; and on- and off-ramp access. Several elements of the current US 181 facility do not meet these standards, as detailed below.

1. Neither the existing Harbor Bridge main span nor the US 181 approaches have shoulders, contributing to increased levels of congestion when even minor traffic accidents and breakdowns occur. The lack of shoulders also means the clearance between the travel lanes and the railing on the existing bridge does not meet current standards (TxDOT 2010a, Figure 3-15). Shoulders are of considerable value on high-speed facilities such as US 181. In addition to serving as emergency parking areas, shoulders lend lateral support to travel lane pavement structure, provide a maneuvering area, increase sight distance of horizontal curves, and give drivers a sense of a safe, open roadway (TxDOT 2010a, 2-44).
2. The existing US 181 approaches to the Harbor Bridge are on a 5 percent vertical grade that, when combined with the horizontal curvature on both the north and south ends of the existing bridge, creates a situation where vehicles can be traveling at downhill speeds entering into sharp "S" curves at speeds faster than posted speed limits. The design standard for the US 181 facility within the project limits is a maximum 4 percent grade (TxDOT 2010a, Table 3-15).
3. Certain ramp lengths within the project limits do not provide sufficient acceleration or deceleration distances to meet current design standards for freeway ramps (TxDOT 2010a, Figure 3-36). The US 181 northbound entrance ramp from Spur 544/Mesquite Street in Downtown Corpus Christi does not provide the acceleration distance prescribed under current design standards for traffic to merge as desired with traffic from the adjacent Antelope Street on-ramp and the US 181 northbound main lanes. This ramp provides vehicles with an acceleration distance of 400 feet, whereas the TxDOT design standards require an acceleration distance 550 feet for this type of ramp. The US 181 southbound exit ramp to the Port Area (Power Street) has a deceleration distance of 350 feet, which, when combined with this ramp's horizontal curvature and the steep vertical grade coming down off of the Harbor Bridge, makes it difficult for vehicles, particularly large trucks, to decelerate as desired under current standards before merging with local traffic on the service road. The standard deceleration distance for this type of ramp is 455 feet. The US 181 southbound exit ramp to downtown Corpus Christi does not provide sufficient distance for motorists to decelerate as desired under current standards before reaching the signalized intersection at Spur 544. This ramp provides vehicles with a deceleration distance of 500 feet, whereas the design standard for deceleration distance for this type of ramp is 800 feet.

4. The current configuration of US 181 southbound just south of the Harbor Bridge does not meet current design standards for exit ramp spacing (TxDOT 2010a, Figure 3-37). Approaching downtown Corpus Christi from the north, motorists are presented with a choice of three separate destinations via US 181 (downtown Corpus Christi, I-37/Crosstown Expressway, and Staples Street) from the same point on the highway. The spacing between these three exit ramps does not comply with current design criteria, which call for a minimum of 1,000 feet between successive exit ramps. In addition, the ramp to downtown Corpus Christi is an undesirable left-hand exit, which the TxDOT Roadway Design Manual describes as a "[violation] of driver expectancy" which "may adversely affect operation and safety characteristics."

Both US 181, including the Harbor Bridge, and I-37 within the project area are designated major hurricane evacuation routes (TxDOT 2011b). US 181 is the primary evacuation route for San Patricio County and an alternate route to I-37 for the city of Corpus Christi. During storm events, I-37 is used for evacuation until the traffic volumes reach the maximum highway capacity, which includes the use of the shoulder evacuation lane and contraflow lanes (reversing the southbound lanes). Once the traffic volume on I-37 reaches capacity, traffic is directed to US 181. A major evacuation would use both the Harbor Bridge and the Joe Fulton Trade Corridor (Navigation Boulevard, Market Street and Causeway Boulevard) running from US 181 along the north side of the Inner Harbor to Carbon Plant Road, which connects to I-37. Given the design deficiencies outlined above, there would be an increased risk of US 181 becoming unnecessarily congested during an emergency hurricane evacuation due to the lack of shoulders on the Harbor Bridge and approach sections.

1.4 PURPOSE OF THE PROPOSED PROJECT

The purpose of the proposed project is to:

1. Maximize the long-term highway operability of the US 181 crossing of the Corpus Christi Ship Channel; and
2. Improve safety for the traveling public, including during hurricane evacuations.

1.5 PROJECT OBJECTIVES

In addition to the primary purpose outlined above, TxDOT and FHWA seek to achieve the following objectives, to some degree, in implementing the proposed action:

1. Provide the transportation infrastructure to support the economic opportunities in the area; and
2. Consider the connectivity of US 181 to the local roadway system and address its effect on adjacent neighborhoods.

These objectives are important in the overall context of the proposed project in that they address additional underlying problems, described below, associated with the Harbor Bridge and US 181 in the project area.

1.5.1 Provide the Transportation Infrastructure to Support Economic Opportunities in the Area

The Corpus Christi MPO identifies the replacement of deficient bridges as a type of project intended to achieve the goals of its MTP. Specifically, the MPO lists as a goal of the streets and highways plan, to "[p]rovide new facilities, improved facilities and transportation services that expand the economic opportunities in the area" (Corpus Christi MPO 2011). The MTP lists the replacement of the Harbor Bridge—prioritized partly on the basis of its use as a hurricane evacuation route—as one of the projects whose implementation would be expected to achieve this goal. In addition, the MTP describes US 181 as a critical connection for the region's efficient movement of freight and emergency evacuation.

With respect to regional connectivity, the MPO considers US 181 a priority corridor in the future expansion of Interstate Highway 69 (I-69) to connect directly to the Port of Corpus Christi, the seventh largest port in the United States in total tonnage and the primary economic engine for the Coastal Bend. TxDOT and FHWA will consider multiple modes of transportation in the development of the proposed project, including waterborne freight, and consider these modes in the context of a 75- to 100-year project design life.

1.5.2 Consider the Connectivity of US 181 to the Local Roadway System and Address its Effect on Adjacent Neighborhoods

The combination of US 181 and I-37, constructed in the late 1950s to early 1960s, modified the local roadway network, making access to uptown and downtown Corpus Christi from the residential areas north of I-37 more lengthy and less direct. Locally, this has had the effect of creating a barrier between those neighborhoods and the Corpus Christi CBD. In addition, more recently, access to the city's Sports, Entertainment, and Arts District (SEA District), including Bayfront Science Park on the east side of US 181 as well as major traffic generators on the west side (Whataburger Field professional baseball stadium, the Concrete Street Amphitheater, and the Congressman Solomon P. Ortiz International Center) is not direct and results in congestion on US 181 and local downtown roadways during major events. The design of the proposed project will consider access to and from the facility with respect to the adjacent neighborhoods as well as the downtown area, including the placement of entrance and exit ramps, the configuration of local cross-streets within the right of way, and the accommodation of other modes of transportation, including bicycle and pedestrian accommodations.