

2.0 ALTERNATIVES

This section describes the full range of preliminary alternatives considered for the proposed action and discusses the screening process to determine which alternatives are considered reasonable and why they were advanced for further study. A discussion of the other alternatives and the rationale for their elimination from further consideration is also included. A description of the design characteristics and the underlying engineering considerations of the reasonable alternatives are provided following the screening discussion. This section also provides a detailed summary comparing the alternatives considered and provides the rationale for the identification of the Recommended Alternative for the proposed project (see **Section 2.8**).

2.1 PROCESS USED TO DEVELOP AND EVALUATE ALTERNATIVES

Pursuant to 23 USC §139, TxDOT and FHWA, as joint lead agencies, have involved Cooperating and Participating agencies and the public in a formal scoping process for the US 181 Harbor Bridge EIS. federal, state, and local agencies and the public have been afforded the opportunity to participate in defining the need and purpose and determining the range of alternatives to be considered for the proposed project. Cooperating and Participating agencies have also had the opportunity to collaborate on the methodologies to be used and level of detail required in the analysis of the alternatives (see **Section 8.0** for a list of the Cooperating and Participating agencies on the proposed project). **Section 1.1** describes the primary objectives of the scoping process and a summary of the process is included in **Section 8.0**.

2.1.1 Development of Alternatives

Through this formal scoping process, a preliminary set of alternatives for the replacement of the Harbor Bridge was established (**Figure 2.1-1** in **Appendix A**). These alternatives include the No Build Alternative, six separate build alternatives (Blue, Green, Red, Orange, Tunnel and West) and a Transportation System Management (TSM) alternative (not depicted on **Figure 2.1-1** since it is not an alignment which can be graphically shown). The No Build Alternative is included per 40 CFR §1502.14(d), which requires that the EIS include the consideration of taking no action. Because the transportation network, including the crossing of the Inner Harbor, is well-established, the geographic extent of the alternatives considered for the proposed project necessarily centered on the location of the existing bridge. One of the alternatives (the Green Alternative) would follow the existing alignment and would replace the bridge in nearly the same location. Other alternatives were then conceptualized along alignments both to the east and west of the existing US 181 alignment. The interchange at I-37 and the Crosstown Expressway (alternately known and interchangeably referred to herein as State Highway 286) was a major engineering consideration, and therefore preliminary alternatives were designed to factor in the connection to that existing interchange (the Red and Orange Alternatives). With the existing alignment occurring so close to Corpus Christi Bay, the only feasible way of designing an alternative to the east of US 181 was to carry it out into the bay to connect to US 181 north of the existing bridge (the Blue Alternative). The Tunnel and West Alternatives were recommended by the

public at the August 9, 2011, scoping meeting and were considered along with the other preliminary alternatives.

Since the Harbor Bridge system (comprised of the Harbor Bridge and six other highway bridges that carry US 181 in the project area) is eligible for the National Register of Historic Places (NRHP), the requirements of 23 CFR §774 (regulations for implementing Section 4(f) of the Department of Transportation Act) apply to the project. As a result, additional alternatives were considered in order to comply with Section 4(f) regulations. These additional Section 4(f) alternatives are not screened here, using the criteria to be described below, but rather are analyzed in the Final Section 4(f) Evaluation (**Section 5.0**) using the feasible and prudent screening criteria defined in 23 CFR §774.17. Based on collaboration with Cooperating and Participating agencies and the public, and the analysis presented in **Section 5.4**, none of the alternatives that would avoid the use of Section 4(f) properties, including the Harbor Bridge system, were determined to be feasible and prudent.

2.1.2 Screening Criteria

TxDOT and FHWA have considered a range of alternatives for the proposed action, in accordance with 40 CFR §1502.14. In addition, FHWA's Section 4(f) regulations [23 CFR §774.3(d)] are applicable to the development of project alternatives because the proposed project involves the replacement (use) of the Harbor Bridge system, which is eligible for NRHP listing. Therefore, a method for determining the reasonable alternatives used two screening criteria. The first criterion is that an alternative is considered reasonable and was carried forward for detailed evaluation in the Draft EIS if the alternative met the need and purpose for the project; meeting the project objectives is not required for an alternative to be considered reasonable. The second criterion is that an alternative must avoid the use of Section 4(f) properties, unless there is no feasible and prudent way to do so (refer to **Section 5.4** and 23 CFR §774.17). (Note that a prudent alternative would by definition meet the need and purpose for the project.)

To determine whether an alternative met the need and purpose of the project, measures of effectiveness established by the joint-lead agencies through collaboration with Cooperating and Participating agencies and the public during the formal scoping process were applied. **Section 2.1.3** below describes these measures of effectiveness.

Alternatives that did not meet the need and purpose for the project, or were not feasible and prudent Section 4(f) avoidance alternatives, were eliminated from detailed consideration in the Draft EIS.

2.1.3 Measures of Effectiveness

To evaluate whether a preliminary alternative serves the purpose of the proposed project and thereby addresses the identified needs (see **Section 1.1**), the joint lead agencies developed the following measures of effectiveness. **Table 2.1-1** identifies a set of criteria for each project purpose, along with detailed measures for evaluating the effectiveness of each alternative in meeting those criteria.

To maximize the long-term highway operability of the US 181 crossing of the Corpus Christi Ship Channel, an alternative would need to reduce the cost and frequency of structure maintenance relative to the existing condition and extend the operational life of the structure well beyond the life of the existing bridge. To meet these criteria, the proposed structure would be designed with non-corrodible building or maintenance materials (such as concrete) and other elements requiring less maintenance over the life of the structure; the bridge would not be designed as a fracture-critical structure; and the design-life of the proposed structure would be 75 to 100 years.

To improve safety for the public traveling on US 181 and to establish a reliable, long-term hurricane evacuation route, an alternative would need to correct the existing design deficiencies and upgrade the facility to current National Highway System (NHS) standards (23 CFR §625.4) and the standards in TxDOT's Roadway Design Manual and Bridge Design Manual where appropriate. These improvements would include providing shoulders on the bridge and approaches, reducing the vertical grade and horizontal curvature, providing longer ramps where needed and providing adequate spacing between ramps. To serve as a reliable, long-term hurricane evacuation route, the proposed improvements would be designed to meet the State's standards for determining transportation routes for hurricane evacuation in the Corpus Christi area.

Project Purpose	Criterion	Measure
Maximize the long-term highway operability of the US 181 crossing of the Corpus Christi Ship Channel	Reduces the cost and frequency of structure maintenance	Uses non-corrodible building or maintenance materials (such as concrete) and other elements to limit the extent, frequency and cost of routine and structural maintenance over the life of the structure
	Extends the operational life of the structure well beyond the expected life of the existing bridge	Uses a non-fracture-critical design and a 75-100-year design-life for the proposed structure
Improve safety for the traveling public, including during hurricane evacuations	Corrects design deficiencies	Adds shoulders to the structure and approach sections; reduces the vertical grade and corrects sharp horizontal curves; provides ramp lengths commensurate with design speed; provides sufficient spacing for exit ramps
	Upgrades facility to current design standards where appropriate, allowing for a minimal number of design exceptions when justified due to design or environmental constraints	Proposed design meets FHWA standards for the National Highway System (23 CFR 625.4) and TxDOT's Roadway Design Manual and Bridge Design Manual, including associated references
	Serves as a reliable, long-term hurricane evacuation route	Meets State standards for determining transportation routes for hurricane evacuation in the Corpus Christi area

Source: US 181 Harbor Bridge EIS Team 2013

2.2 DESCRIPTION OF PRELIMINARY ALTERNATIVES

The EIS scoping process began with four preliminary build alternatives (Blue, Green, Red and Orange), the No Build Alternative and the TSM Alternative. These alternatives originated as part of the *U.S. 181 (Harbor Bridge) Feasibility Study* prepared for the proposed project and completed in 2003. The No Build Alternative and the TSM Alternatives are required to be considered in this Final EIS by 40 CFR §1502.14 and FHWA Technical Advisory T6640.8a, respectively. In response to comments received from the public and Cooperating and Participating agencies at the first scoping meeting, held August 9, 2011, two new build alternatives (the Tunnel Alternative and the West Alternative) were added to the preliminary set.

The following sections provide a brief description of each preliminary alternative. Each of the alternatives described below, if implemented, with the exception of the No Build Alternative and the TSM Alternative, would remove the existing Harbor Bridge and replace it with a new structure. Existing and proposed access points are discussed in **Section 4.2**.

2.2.1 Blue Alternative

The Blue Alternative begins at Beach Avenue on US 181 and generally follows the existing alignment of US 181 to just north of Burleson Street. The alignment then veers east across Corpus Christi Beach and out into Corpus Christi Bay, passing to the north of the USS *Lexington* museum. The alignment continues south across the bay and crosses the ship channel at 205 feet above mean high water (MHW), turning west and crossing Shoreline Drive at Spur 544. The alignment then follows I-37 west to North Staples Street. The total length of the Blue Alternative is 3.04 miles.

2.2.2 Green Alternative

The Green Alternative begins at Beach Avenue on US 181 and follows the existing alignment of US 181 south to Burleson Street. The alignment then veers approximately 145 feet to the west of the existing Harbor Bridge and crosses the Inner Harbor at a height of 207 feet, continuing on the west side of existing US 181 to I-37 and following the existing alignment of I-37 to the interchange with the Crosstown Expressway. The total length of the Green Alternative is 5.06 miles.

2.2.3 Red Alternative

The Red Alternative begins at Beach Avenue on US 181, veers west of existing US 181 just north of Burleson Street and then crosses the Inner Harbor (216 foot clearance) approximately 1,000 feet west of existing US 181. The alignment then extends south to I-37 at the interchange with the Crosstown Expressway, continuing south along the Crosstown Expressway ending at Laredo Street. The total length of the Red Alternative is 5.98 miles.

2.2.4 Orange Alternative

The Orange Alternative begins at Beach Avenue on US 181, veers west of US 181 at Burleson Street and then crosses the Inner Harbor (210 foot clearance) approximately 175 feet west of existing US 181. The

alignment then veers west again and extends south, crosses I-37, and follows the Crosstown Expressway south ending at Laredo Street. The total length of the Orange Alternative is 6.0 miles.

2.2.5 Tunnel Alternative

The Tunnel Alternative begins at Beach Avenue on US 181 and follows the existing alignment of US 181 south to Burleson Street where the north entrance to the tunnel would be located. The alignment then veers slightly to the west of the existing US 181, continuing west of the existing highway and Harbor Bridge and underneath the Inner Harbor at an approximate depth of 65 feet. From the south tunnel entrance, the alignment then continues south on the west side of the existing US 181 to I-37 and follows I-37 to North Staples Street. The total length of the Tunnel Alternative is 2.24 miles.

2.2.6 West Alternative

The West Alternative begins at Beach Avenue on US 181 and then veers to the west nearly parallel to the Inner Harbor. The alternative then turns south, crossing Navigation Boulevard and the Inner Harbor (206 foot clearance) approximately 6,700 feet west of existing US 181 and continuing south generally parallel and to the east of Nueces Bay Boulevard to I-37. Along I-37, the transition for the West Alternative extends west to Up River Road and east to North Staples Street. Along the Crosstown Expressway, the transition for the West Alternative extends south ending between Comanche Street and Laredo Street. The total length of the West Alternative is 7.59 miles.

2.2.7 Transportation System Management

The TSM Alternative takes into consideration the overall operation of the roadway, including various modes of transportation. The objective of implementing a TSM Alternative is to improve traffic flow and reduce travel delay by maximizing the efficiency of the existing facility with limited reconstruction activity. Typical TSM elements include ridesharing, high-occupancy vehicle lanes, traffic signal timing optimization and restriping of existing pavement sections. The TSM Alternative is limited to traffic management improvements within the existing right of way.

2.2.8 No Build Alternative

The No Build Alternative would involve taking no action to address the safety and other problems identified in the need for the proposed project as discussed in **Section 1.3**. Routine maintenance of the US 181 facility and the Harbor Bridge structure would continue, including pavement work, structural repairs, painting and other rehabilitation efforts.

2.3 ALTERNATIVES SCREENING SUMMARY

This section is organized by project purpose and by the criteria established under each individual purpose. The build alternatives are discussed relative to whether they satisfy the established measures of effectiveness for each criterion. The No Build Alternative and the TSM Alternative were screened along with the build alternatives, and since these alternatives do not satisfy any of the established measures of effectiveness they do not meet the need and purpose for the project. The No Build

Alternative, however, is carried forward for full consideration in the Final EIS for comparison purposes in accordance with 40 CFR §1502.14(d). Various alignment shifts and design changes relative to the reasonable build alternatives have also been evaluated in an effort to avoid or minimize impacts to properties to which Section 4(f) applies, such as parks and recreational facilities or wildlife and waterfowl refuge lands. (See **Section 5.0** for a detailed evaluation of the alternatives to the use of Section 4(f) properties).

2.3.1 Evaluation With Respect to Project Need and Purpose

2.3.1.1 Maximize the Long-term Highway Operability of the US 181 Crossing of the Corpus Christi Ship Channel

Criterion: Reduces the cost and frequency of structure maintenance

Corrosion is a major factor to overcome in maintaining the structural integrity of the Harbor Bridge. The current 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, although the bridge will still require routine maintenance. Over the past 30 years, maintenance costs have exceeded \$70 million, and 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.

To reduce the need for frequent and costly maintenance of the structure, each of the build alternatives proposing a new Harbor Bridge structure (Blue, Green, Red, Orange and West) would be designed with primarily concrete and other non-corrodible materials, with exceptions for structural stability. Maintenance would still be required with any of the build alternatives, including the Tunnel Alternative. However, by eliminating materials susceptible to corrosion, the criterion to reduce the cost and frequency of maintenance would be satisfied.

The No Build Alternative and the TSM Alternative would not replace the existing Harbor Bridge; therefore the routine maintenance to prevent corrosion and the anticipated structural maintenance to extend the operational life of the structure would still be needed. The No Build Alternative and the TSM Alternative would not satisfy this criterion and would not meet the need and purpose for the project.

Criterion: Extends the operational life of the structure well beyond the expected life of the existing bridge

As stated under the previous criterion, even with major structural maintenance, the bridge would remain fracture-critical, and therefore the design-life of the existing bridge would remain uncertain.

Each of the build alternatives, with the exception of the TSM Alternative, would be designed with a non-fracture-critical bridge and a 75- to 100-year life. Routine maintenance costs would be incurred over the life of any new structure (including a tunnel), although structural repairs of the type required for maintaining the integrity of the existing structure are not expected during the design-life of a non-fracture critical, non-steel structure.

The No Build Alternative and the TSM Alternative would not replace the existing structure, and the fracture-critical, steel structure would remain in place. Therefore, the No Build Alternative and the TSM Alternative would not satisfy this criterion and would not meet the need and purpose for the project.

2.3.1.2 Improve Safety for the Traveling Public, Including During Hurricane Evacuations

Criterion: Corrects design deficiencies

The Blue, Green, Red, Orange, Tunnel and West Alternatives would correct design deficiencies associated with the existing facility and upgrade the facility to current FHWA and TxDOT design standards. Specifically, each of these alternatives would provide shoulders on the proposed structure and approach sections; reduce the vertical grade and minimize or eliminate the horizontal curvature on both the north and south ends of the existing bridge; provide entrance and exit ramps with acceleration and deceleration distances as recommended by the standards for the safety of motor vehicles; and provide sufficient spacing between exit ramps.

In the case of the Blue, Red, Orange and West Alternatives, these design deficiencies (as described in **Section 1.3.2**) would primarily be corrected by placing US 181 on a new location alignment and removing the existing US 181 facility between the areas of Beach Avenue and the US 181/I-37 interchange, where the majority of design deficiencies are found. The Green Alternative and the Tunnel Alternative, which essentially follow the existing alignment, would address the horizontal curvature by proposing to straighten the highway alignment as much as practicable. The Green Alternative would address the exit ramp spacing by designing a standard right-hand exit to Staples Street and a dedicated u-turn lane at that intersection to return to the downtown area via a new eastbound frontage road. The Tunnel Alternative would utilize the existing left-hand exit for US 181 southbound to downtown Corpus Christi.

The TSM alternative would be designed to correct minor design deficiencies but would not add shoulders to the existing bridge or reduce the vertical grade. Without these safety improvements, the TSM alternative would not satisfy this criterion and would not meet the need and purpose for the project.

The No Build Alternative would not correct the design deficiencies associated with the existing facility and would not upgrade the facility to current design standards. Therefore, the No Build Alternative would not satisfy this criterion and would not meet the need and purpose for the project.

Criterion: Upgrades facility to current design standards where appropriate, allowing for a minimal number of design exceptions when justified due to design or environmental constraints

Each of the build alternatives and the TSM alternative would be designed to meet the NHS design standards (23 CFR §625.4) and the standards in TxDOT's Roadway Design Manual and Bridge Design Manual, including applicable reference documents. The Blue, Green, Red, Orange, West and Tunnel Alternatives would each satisfy this criterion. The TSM Alternative would not make the upgrades necessary to improve safety for the traveling public, namely adding shoulders to the existing bridge and reducing the vertical slope; therefore, the TSM Alternative would not satisfy this criterion and would not meet the need and purpose for the project.

The No Build Alternative would not upgrade the existing facility to current design standards; therefore the No Build Alternative would not satisfy this criterion and would not meet the need and purpose for the project.

Criterion: Serves as a reliable, long-term hurricane evacuation route

Under the State of Texas Hurricane Response Plan (Texas Department of Public Safety 2010), a supplement to the State of Texas Emergency Management Plan, TxDOT is assigned the responsibility to identify the most appropriate highways meeting evacuation requirements; to implement short- and long-term solutions to reduce congestion on highway evacuation routes; and to prioritize infrastructure projects that address obstructions on evacuation routes.

The Green, Red, Orange and West Alternatives would each meet TxDOT's standards for an appropriate hurricane evacuation route for the Corpus Christi area. These alternatives would provide adequate capacity to facilitate evacuation and, with improved geometry and a non-fracture-critical design, would also provide the reliable, long-term solution needed to serve this purpose of the proposed project.

Although US 181 including the Harbor Bridge is currently designated a hurricane evacuation route in the State plan, the No Build Alternative and the TSM Alternative would not provide a reliable, long-term solution because these alternatives would not add shoulders to the existing bridge and would not address other design deficiencies related to safety. Without these more substantive corrections, US 181 under the No Build Alternative or the TSM Alternative would not satisfy this hurricane evacuation criterion and would not meet the need and purpose for the proposed project.

In evaluating the Blue Alternative, which has an alignment that veers out into Corpus Christi Bay, TxDOT notes two elements that could be potentially problematic for hurricane evacuation: 1) the bridge structure would be over water for a distance greater than 7,700 feet and, therefore, more exposed in the event of a major hurricane; and 2) the bridge columns placed out in the bay would increase the likelihood that storm-surge debris could render the highway inoperable after a hurricane, hampering recovery efforts and the influx of emergency personnel and supplies.

The Tunnel Alternative similarly includes elements that would be potentially problematic during a hurricane evacuation. Although the tunnel carrying US 181 under the Inner Harbor would be designed to minimize flooding, reducing the likelihood of storm-surge flooding to zero percent is not feasible, and the implications of a flooded hurricane evacuation route include endangerment and loss of human life. In its Technical Guidelines for Hurricane Evacuation Studies the U.S. Army Corps of Engineers (1995) advises that “[i]n choosing roadways for the hurricane evacuation network, care should be taken to designate only those roads that are not expected to flood from rainfall or storm-surge while the evacuation is in progress.” TxDOT and FHWA agree with and adopt this guideline. Another implication of a flooded tunnel includes a delay in the recovery efforts following a hurricane. Flood waters would need to be pumped from the tunnel, adding time to the duration between the end of the storm event and the start of the recovery effort. Pumping of flood waters from the tunnel is assumed to yield results that are unpredictable at best, due to the range of potential functionality of the pumping apparatus, from operating at full capacity, to intermittent operation, to malfunction and inaction.

For reasons stated, TxDOT, as the state agency responsible for identifying the most appropriate hurricane evacuation routes for the Corpus Christi area, would not be able to recommend the Blue Alternative or the Tunnel Alternative to the Texas Department of Public Safety’s (DPS) Division of Emergency Management for inclusion in Texas’ Hurricane Response Plan. TxDOT officials met with officials from DPS on January 23, 2012, and the TxDOT officials relayed their concerns and discussed these recommendations. DPS has not expressed any objection to TxDOT’s recommendations.

In light of the foregoing, the Blue, Tunnel and TSM Alternatives would not serve as reliable, long-term hurricane evacuation routes for the Corpus Christi area and would, for that reason, not meet the need and purpose for the project.

2.3.2 Summary of the Screening Results

Based on the preceding screening analysis, the following build alternatives (see **Figure 2.3-1** in **Appendix A**) meet the need and purpose for the proposed project and are given full consideration as *reasonable alternatives*: Green Alternative, Red Alternative (Recommended), Orange Alternative and West Alternative. The No Build Alternative is also given full consideration as a means of comparing the effects of each of the build alternatives. The Blue Alternative, Tunnel Alternative and TSM Alternative do not meet the need and purpose for the project and are, therefore, not considered reasonable and were eliminated from further consideration in the Draft EIS.

The range of *reasonable alternatives* was established based on the input from and collaboration with Cooperating and Participating agencies and the public, and further modified and refined by TxDOT and FHWA to that presented herein; the joint lead agencies developed the screening analysis using the measures of effectiveness presented in **Section 2.1.3**.

2.4 RANGE OF REASONABLE ALTERNATIVES

This section describes the reasonable build alternatives in greater detail and includes a discussion of the engineering considerations applicable to the design as means to satisfy the purpose of the project as well as the project objectives. The alternatives are depicted in **Figures 2.4-1** through **2.4-5** in **Appendix A**, and proposed typical sections are presented in **Appendix D**. The No Build Alternative is described in **Section 2.2.8**.

2.4.1 Description of the Reasonable Build Alternatives

2.4.1.1 Green Alternative

The Green Alternative (see **Figure 2.4-1** in **Appendix A**) would follow the existing US 181 alignment, having construction limits beginning 500 feet north of Beach Avenue on the north and ending at I-37 on the south, with a reconstructed interchange at the Crosstown Expressway and a transition back to existing I-37 ending just east of the Buddy Lawrence Drive overpass; the transition back to the existing Crosstown Expressway would be at Laredo Street. The location of the new bridge would be slightly offset to the west of the existing bridge to allow US 181 to remain open to traffic while construction proceeded on the new bridge. The new bridge along the Green Alternative would not include a fracture-critical design and is proposed with an approximate low-chord elevation of 207 feet, meaning the bottom of the bridge structure would be 207 feet above MHW. This compares with the existing bridge's low-chord elevation of 138 feet. In the context of the Harbor Bridge's location over the Corpus Christi Ship Channel, the low-chord elevation corresponds to the air-draft clearance for vessels entering and exiting the Inner Harbor at the Port of Corpus Christi; a vessel's air-draft clearance is the measure from the water surface elevation to its highest-most point, usually the top of the mast or a radio antennae.

The Green Alternative would have three 12-foot main lanes in each direction with a median barrier and 12-foot inside and 10-foot outside shoulders. This alternative proposes to include a 10-foot bicycle and pedestrian shared use path separated from the main lanes by a two-foot concrete barrier. The proposed bicycle and pedestrian shared use path would extend from east of N. Staples Street on the south to Gulf Spray Avenue on the north. Two-lane, one-way frontage roads in each direction would also be included north of the Inner Harbor between Beach Avenue and Breakwater Avenue. The typical right of way width for this alternative would vary between 228 and 459 feet depending on the section of the alignment; the bridge and approach section would be the narrowest section, while the section of US 181 including frontage roads would typically be the widest.

The Green Alternative would also include a reconstructed interchange at the Crosstown Expressway and I-37, including reconstruction of the four existing direct connector ramps (I-37 westbound to Crosstown Expressway southbound, I-37 eastbound to Crosstown Expressway southbound, Crosstown Expressway northbound to I-37 westbound and Crosstown Expressway northbound to I-37 eastbound).

The preliminary construction cost estimate for the Green Alternative is \$558 million. Costs for right of way acquisition, utility relocation and mitigation are not included in this figure and would be additive.

2.4.1.2 Red Alternative

The Red Alternative (see **Figure 2.4-2** in **Appendix A**) would be on a new location alignment west of existing US 181 and the Harbor Bridge. The new bridge would be 1,000 feet to the west of the existing bridge. This alternative would include a reconstructed interchange at I-37 and the Crosstown Expressway. The construction limits for the Red Alternative would be 500 feet north of Beach Avenue on the north and Crosstown Expressway at Laredo Street on the south, with a transition back to existing I-37 at Buddy Lawrence Drive on the west and Shoreline Boulevard on the east. The new bridge along the Red Alternative would not be fracture-critical and is proposed with an approximate low-chord elevation of 216 feet.

The Red Alternative would have three 12-foot lanes in each direction with a median barrier and 12-foot inside and 10-foot outside shoulders. This alternative proposes to include a 10-foot bicycle and pedestrian shared use path on the main span of the bridge and the bridge approaches, separated from main lane traffic by a two-foot concrete barrier. The proposed bicycle and pedestrian shared use path would extend from Winnebago Street on the south to Beach Avenue on the north. Two-lane, one-way frontage roads in each direction would also be included north of the Inner Harbor between Beach Avenue and Coastal Avenue. The typical right of way width for this alternative would vary between approximately 200 feet for the bridge section over the Inner Harbor and 430 feet for the main lane sections of US 181 with frontage roads.

The existing Harbor Bridge and the US 181 embankment on both the north and south approaches to the bridge would be removed as part of this proposed alternative. The existing US 181 south of the Inner Harbor would be converted to an at-grade boulevard section, improving and widening N. Broadway Street to access the existing surface streets downtown. The Tancahua Street and Carancahua Street bridges over I-37 would be reconstructed in their existing locations. North of the Inner Harbor, proposed US 181 would return to the existing alignment at Burleson Street with a northbound exit to be provided at Beach Avenue.

The Red Alternative would reconstruct the I-37/Crosstown Expressway interchange, including four direct-connector ramps (US 181 southbound to I-37 westbound, I-37 eastbound to US 181 northbound, Crosstown Expressway northbound to I-37 westbound and I-37 eastbound to Crosstown Expressway southbound).

The preliminary construction cost estimate for the Red Alternative is \$637 million. Costs for right of way acquisition, utility relocation and mitigation are not included in this figure and would be additive.

The Red Alternative was identified in the Draft EIS as the Preferred Alternative; it has subsequently been reclassified as the Recommended Alternative. Subsequent to the Public Hearing, and pursuant to 23 USC §139(f)(4)(d), the Joint Lead Agencies have developed the Recommended Alternative to a higher level of detail in order to facilitate the development of mitigation measures and to comply with other

federal agency requirements, such as the U.S. Department of the Army requirements under Section 404 of the Clean Water Act and the U.S. Coast Guard requirements under the General Bridge Act. The Joint Lead Agencies have determined, in accordance with 23 USC §139(f)(4)(D), that the development of the Recommended Alternative to a higher level of detail will not prevent them from making an impartial decision as to whether to accept another alternative. The changes in design of the Red Alternative are minor and are described in further detail in **Section 2.4.1.5**.

2.4.1.3 Orange Alternative

The Orange Alternative (see **Figure 2.4-3 in Appendix A**) would be on a new location alignment west of existing US 181 and the Harbor Bridge. The location of the new bridge would be offset approximately 100 feet to the west of the existing bridge to allow the existing bridge to remain open to traffic while construction proceeded on the new bridge. The new bridge along the Orange Alternative would not include a fracture-critical design and is proposed with an approximate low-chord elevation of 210 feet.

The Orange Alternative would have three 12-foot lanes in each direction with a median barrier and 12-foot inside and 10-foot outside shoulders. This alternative proposes to include a 10-foot bicycle and pedestrian shared use path separated from main lane traffic by a two-foot concrete barrier. The proposed bicycle and pedestrian shared use path would extend from Winnebago Street on the south to Beach Avenue on the north. Two-lane, one-way frontage roads in each direction would also be included north of the Inner Harbor between Beach Avenue and Elm Street. The typical right of way width for this alternative would vary between approximately 200 feet for the bridge section over the harbor and 430 feet for the main lane sections of US 181 with frontage roads.

This alternative would include a reconstructed interchange at I-37 and the Crosstown Expressway. The construction limits for the Orange Alternative would be 400 feet north of Beach Avenue on the north and Crosstown Expressway at Laredo Street on the south, with a transition back to existing I-37 at Buddy Lawrence Drive on the west and Shoreline Boulevard on the east. The reconstruction of the I-37/Crosstown Expressway interchange with the Orange Alternative would include four direct-connector ramps (US 181 southbound to I-37 westbound, I-37 eastbound to US 181 northbound, Crosstown Expressway northbound to I-37 westbound and I-37 eastbound to Crosstown Expressway southbound).

The existing Harbor Bridge and the US 181 embankment on both the north and south approaches to the bridge would be removed as part of this proposed alternative. The existing US 181 would be converted to an at-grade boulevard section, similar to the Red Alternative, improving and widening N. Broadway Street to access the existing surface streets downtown. The Tancahua Street and Carancahua Street bridges over I-37 would be reconstructed in their existing locations. North of the Inner Harbor, proposed US 181 would return to the existing alignment at Burleson Street with a northbound exit to be provided at Beach Avenue.

The preliminary construction cost estimate for the Orange Alternative is \$630 million. Costs for right of way acquisition, utility relocation and mitigation are not included in this figure and would be additive.

2.4.1.4 West Alternative

The West Alternative (see **Figure 2.4-4** in **Appendix A**) would be on a new location alignment west of the existing US 181 and the Harbor Bridge. The new bridge would be approximately a mile and a quarter to the west of the existing bridge. This alternative would include a new interchange at I-37 near Nueces Bay Boulevard and a reconstructed interchange at I-37 and the Crosstown Expressway, including reconstruction of two of the existing direct connector ramps (I-37 eastbound to Crosstown Expressway southbound and Crosstown Expressway northbound to I-37 westbound; the other two existing direct connector ramps would be removed). The construction limits for the West Alternative would be approximately 800 feet north of Beach Avenue on the north and I-37 on the south, with a transition back to existing I-37 approximately 450 feet past Up River Road on the west and N. Staples Street on the east; the transition back to the existing Crosstown Expressway would extend to approximately 600 feet south of Comanche Street. The new bridge along the West Alternative would not include a fracture-critical design and is proposed with an approximate low-chord elevation of 206 feet.

The path of the West Alternative runs parallel to and east of Nueces Bay Boulevard from I-37 to the Inner Harbor. North of the harbor, the eastward path of existing US 181 crosses the U.S. Army Corps of Engineers primary dredged spoils placement area for the ongoing maintenance dredging of the ship channel, a distance of approximately one and a third miles. The proposed West Alternative would return to the existing US 181 alignment approximately one quarter mile north of Burleson Street with the northbound exit to be provided at Beach Avenue. There would be a southbound US 181 entrance ramp at Beach Avenue and a southbound exit ramp to Burleson Street as well. The existing northbound exit and southbound entrance at Burleson Street would be removed with the West Alternative. In addition, the existing East Causeway Boulevard entrance to northbound US 181 just south of Burleson Street would also be removed.

The West Alternative would have three 12-foot lanes in each direction with a median barrier and 12-foot inside and 10-foot outside shoulders. This alternative proposes to include a 10-foot bicycle and pedestrian shared use path separated from main lane traffic by a two-foot concrete barrier. The proposed bicycle and pedestrian facilities would extend from Peabody Avenue at the I-37 westbound frontage road on the south to Gulfspray Avenue on the north. The typical right of way width for this alternative would be 320 feet to 570 feet.

The existing Harbor Bridge and the US 181 embankment on both the north and south approaches to the bridge would be removed as part of this proposed alternative. The proposed design for existing US 181 south of the Inner Harbor would be the same as that for the Red and Orange Alternatives and reference can be made to **Section 2.4.1.2** above for a description. North of the Inner Harbor, proposed US 181 would return to the existing alignment north of Burleson Street with a northbound exit to be provided at Beach Avenue.

The preliminary construction cost estimate for this alternative is \$679 million. Costs for right of way acquisition, utility relocation and mitigation are not included in this figure and would be additive.

2.4.1.5 Recommended Alternative

The Recommended Alternative is the Red Alternative as described in **Section 2.4.1.2**, and analyzed in detail in the Draft EIS, with minor design changes reflecting the progression of the highway design from the preliminary schematic stage to a more detailed schematic stage. As listed in **Section 2.4.1.2**, the additional detail for the Recommended Alternative relative to the other build alternatives was developed to facilitate mitigation measures and to comply with federal permitting requirements.

The minor design changes made to the Recommended Alternative since the publication of the Draft EIS include refinement of the proposed right of way line resulting from detailed land surveys establishing more precisely the location of existing rights of way as well as ownership of properties adjacent to the Recommended Alternative. This has resulted in a slightly more expanded proposed right of way line relative to that established for the Red Alternative in the Draft EIS. Another change in the design consists of a minor adjustment to the Lake Street alignment as it would cross US 181 north of I-37. The design of the US 181 bridge over the Inner Harbor has also been modified to reflect two separate bridge structures to carry the northbound and southbound lanes rather than one.

2.4.2 Engineering Considerations

2.4.2.1 National and State Highway Design Standards

In developing the engineering design for the proposed build alternatives, project engineers have the requirements of several design manuals as well as other guidance to consider. One of the primary considerations is the requirement to bring the design of the existing facilities (US 181, I-37 and the Crosstown Expressway) into compliance with the current NHS standards, described in 23 CFR §625.4. Project engineers are also required to adhere to the standards in TxDOT's Roadway Design Manual and Bridge Design Manual; a minimal number of design exceptions may be employed where justified and necessary to avoid substantively impacting human and natural environmental resources. These combined standards require the engineers to consider, among other details, providing shoulders on any new bridge structure and the approaches, lessening the steepness of the vertical grade from 5 percent to 4 percent, providing a main lane design speed of 70 miles per hour, adding bicycle and pedestrian facilities into the design where appropriate, and providing adequate acceleration and deceleration distances on the entrance and exit ramps. Engineers also need to consider traffic congestion, measured by the Level of Service (LOS), and how the proposed designs blend with the existing network of local streets and adjacent land uses. With respect to the bridge design itself, although details relating to the type of structure are still in the conceptual stage, the proposed bridge would not have a fracture-critical design as the existing bridge does.

At this stage of the proposed project, engineers have produced preliminary schematic designs for each of the four reasonable build alternatives and a more detailed schematic design for the Recommended Alternative. (Refer back to **Section 2.4.1** for a description of the preliminary engineering design relative

to the current design standards mentioned above). The proposed typical sections for the build alternatives are included in **Appendix D**, showing the number and dimensions of the travel lanes and shoulders, the relation of the bicycle and pedestrian shared use path to the vehicle lanes, and the usual width of the proposed right of way, which varies greatly depending on the point along the alignment. The typical sections for each of the four reasonable build alternatives are identical. An existing typical section is also included in **Appendix D** for reference.

2.4.2.2 *Bicycle and Pedestrian Accommodations*

A design element of the proposed project is to improve conditions for bicyclists and pedestrians and to allow them to have safe, convenient access to the transportation system consistent with the U.S. Department of Transportation's March 2010 policy statement on bicycle and pedestrian accommodation, TxDOT's 2011 "Guidelines Emphasizing Bicycle and Pedestrian Accommodations," and the 2013 proposed rule by the U.S. Access Board on Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way; Shared Use Paths. Bicycle and pedestrian facilities have been incorporated into the proposed design throughout the project area, and take into account the Corpus Christi Metropolitan Planning Organization's (MPO) adopted Bicycle and Pedestrian Plan (2005) as well as input from the local cycling community. A major concept of the bicycle and pedestrian accommodations, as described under each of the proposed build alternatives (see **Section 2.4.1**), is the inclusion of a ten-foot bicycle and pedestrian shared use path—for use by both bicyclists and pedestrians—on the proposed bridge structure and the approach roadways. This proposed bicycle and pedestrian shared use path would be separated from vehicle traffic on the main lanes by a two-foot concrete barrier. Details relating to the bicycle and pedestrian shared use path ingress and egress are subject to ongoing coordination with the City of Corpus Christi and the Corpus Christi MPO and would be finalized during the detailed design stage.

2.4.2.3 *Bridge Height – Navigational Air-Draft Clearance*

In pursuing the objective to *provide the transportation infrastructure to support the economic opportunities in the area*, when designing the proposed build alternatives project engineers are considering the height of the proposed bridge, which will determine the air-draft clearance vessels would need to maintain to call at the Inner Harbor at the Port of Corpus Christi (the Port). The existing Harbor Bridge provides 138 feet of vertical clearance at MHW, which means the maximum air-draft for vessels calling at the Port's Inner Harbor is 138 feet. The existing Harbor Bridge was designed and built in the 1950s and, as a result, it accommodates vessel sizes of the post-World War II era. As the maritime industry has evolved with the expansion of global trade, the growth in size of modern ships and cargo has outgrown the Harbor Bridge's 138-foot vertical restriction. The 138-foot navigational restriction is "impacting operations" at the Port (Cambridge Systematics, Inc. 2010, 3-17), but also the ability of the state to meet the increasing freight traffic demands expected as a result of the expansion of the Panama Canal. The 138-foot restriction also affects vessels with a light air draft greater than 138 feet, requiring them to take on ballast water after unloading in order to reduce air draft and clear the bridge when exiting the Inner Harbor, a costly and time-consuming exercise (Harrington and Cortelyou, Inc. 2010).

This process represents “cost and time lost” and “makes the use of these larger vessels unprofitable” (Harrington & Cortelyou, Inc. 2010, 5).

The Panama Canal expansion, expected to be completed in 2014, will increase the Canal’s annual capacity by 75 percent, and while the demand for freight on the West Coast of the U.S. is likely to continue to be substantial in the future, the expansion of West Coast ports to accommodate increased freight shipments faces constraints, a result of which could be substantially more cargo being brought into Texas ports (Cambridge Systematics, Inc. 2011, 1).

Considering the minimum 201- to 205-foot vertical restriction at the Panama Canal and the importance the expansion of the canal is projected to play in the overall State plan for accommodating the increase in freight traffic along the Gulf Coast, the vertical restriction of the bridges proposed with each of the four build alternatives ranges from 206 feet to 216 feet. The difference among the alternatives with respect to the proposed bridge heights is due to the angle in which the bridge would cross the ship channel. Because the design proposes to provide 205 feet of vertical clearance above the full width of the ship channel, the alternatives that cross at less of a perpendicular angle would need to be constructed at a higher elevation to provide that level of clearance.

2.4.2.4 Level of Service

The measure of the operational condition of a highway as perceived by the driver is characterized as that highway’s LOS. LOS is broken into categories ranging from A to F, with A representing free-flow operations and F representing very congested traffic conditions. In the publication *A Policy on Geometric Design of Highways and Streets*, the American Association of State Highway and Transportation Officials (AASHTO) recommends that urban freeways and their auxiliary facilities should generally be designed for LOS C in urban areas. TxDOT has adopted these standards, stating in their Roadway Design Manual (TxDOT 2010a) that “[f]or acceptable degrees of congestion, urban freeways and their auxiliary facilities should generally be designed for level of service C...in the design year,” and that “[i]n heavily developed urban areas, level of service D may be acceptable.” Both US 181 and I-37 within the project area are considered urban freeways. The project area is not, however, considered heavily developed; therefore LOS C is the design standard for the proposed project.

Analysis of design-year (2035) traffic conditions for the build alternatives has been conducted for the proposed project, and these studies indicate that any of the build alternative scenarios (Green, Red, Orange or West) would operate between LOS A and LOS C in the p.m. peak hour in the year 2035 (URS 2014). The No Build Alternative would operate between LOS D and E (URS 2013b).

2.4.2.5 Connectivity of US 181 to the Local Roadway System

Project engineers are preliminarily designing the build alternatives in pursuit of the objective *to consider their connectivity to the local roadway system and address the effects that connectivity has on adjacent neighborhoods*. **Section 1.5.2** discusses the effect that the original late-1950s and early-1960s construction of US 181 and I-37 had on the downtown Corpus Christi area and the neighborhoods in

that vicinity, namely the change in access to and from the neighborhoods and the central business district. **Sections 4.5** and **7.3.4.1** also discuss the effect of changes in access on local communities. More contemporarily, as the downtown area has expanded to include a new convention center and an arts and entertainment district, the design of the US 181/I-37 interchange and the access to and from the Harbor Bridge has resulted in traffic congestion issues on US 181 and local downtown roadways during major events.

In the attempt to address these connectivity issues, the design of the proposed build alternatives provides an opportunity to enhance vehicular, bicycle and pedestrian travel to and from adjacent neighborhoods and the downtown area relative to the existing local roadway network. Under the Red, Orange, and West Alternatives the opportunity for enhancement is primarily through the proposed placement of US 181 on a new location alignment and the removal of the existing US 181 alignment between roughly Beach Avenue and the US 181/I-37 interchange, to be replaced with a new, at-grade city street between I-37 and the Inner Harbor. This action would eliminate the embankment of US 181 with the intent of removing or minimizing the barrier between the adjacent neighborhoods and the Corpus Christi CBD. Along with adding bicycle and pedestrian facilities to the proposed highway design, eliminating the existing US 181 embankment would then allow for greater mobility for vehicles as well as bicyclists and pedestrians to travel to and from the downtown area and other major destinations as well, including North Beach, the Texas State Aquarium, the USS *Lexington* museum, the Bayfront Science Park, the Congressman Solomon P. Ortiz International Center, and Whataburger Field.

The engineering design of the Green Alternative, which would largely reconstruct US 181 in its existing location, would not preclude the addition of similar connectivity enhancements but would leave the barrier in place downtown. US 181 would be reconstructed at a higher elevation and would therefore allow for perpendicular streets that currently end at the embankment on the east side of US 181 to carry under US 181 to connect to Tancahua Street on the west side of US 181. This would improve east-west mobility in the downtown area without providing improvement to north-south mobility.

2.4.3 Design Comparison Summary

Table 2.4-1 below provides a summary comparison of the design of the reasonable build alternatives and the No Build Alternative. The cost estimate is a preliminary estimate of all construction costs (including demolition), not including the cost for right of way acquisition, property displacements and relocations, utility relocation or any necessary mitigation. The estimated maintenance costs represent expenditures over the 75-year design life of the proposed project.

Alternative	Bridge Height* (feet over MHW)	Alternative Length (miles)	Main Bridge Span Length (feet)	Length of Mainlanes on Structure (miles within project limits)	Estimated New Right of Way Required (acres)	Estimated Construction Cost (millions[^])	Estimated 75 yr Maintenance Cost [^]
Green	207	5.06	1,045	2.93	30.5	\$558	\$19,247,228
Red	216	5.98	1,515	2.76	50.4 [#]	\$637	\$27,903,876
Orange	210	6.00	1,208	2.80	49.8	\$630	\$22,249,427
West	206	7.59	1,500	3.42	69.8	\$679	\$27,627,600
No Build	138	NA	600	NA	0.0	NA	\$279,471,206

Source: US 181 Harbor Bridge EIS Team 2013

*Equates to low-chord elevation necessary to provide 205-foot navigational clearance across the full width of the ship channel in the Inner Harbor.

[^]Estimates are based on 2013 dollars.

[#]This number reflects the Red Alternative as it was assessed at the Draft EIS stage. The minor design changes made result in an estimate of 8.1 acres of new right of way required for the Recommended Alternative for a total of 58.5.

2.5 EVALUATION OF THE DEGREE TO WHICH THE ALTERNATIVES MEET THE NEED AND PURPOSE AND OBJECTIVES

A detailed evaluation of the degree to which each alternative meets the need and purpose and objectives of the proposed project is included in **Section 5.6.2.5** and summarized here. Each of the build alternatives would satisfy the need and purpose, as described in **Section 2.3**, but due to the differences in alignment they would do so to varying degrees. The most notable difference among the alternatives is with respect to hurricane evacuation, where access to the proposed facility from adjacent neighborhoods would not be evenly accommodated. Primary among the differences would be the degree of access from the Hillcrest neighborhood in the Northside community under the West Alternative (see **Section 3.5.3.3** for a description of the community boundaries in the project area). In this instance the three existing entrances to I-37 from the Northside community (Padre Street, Brownlee Boulevard, and N. Port Avenue) would be removed and cannot be accommodated in the proposed design due to geometric design constraints. Residents in the Hillcrest neighborhood would travel to downtown Corpus Christi to access I-37, the primary hurricane evacuation route for the area. The next available entrance would also be outside the neighborhood, over a mile from N. Port Avenue to the west past Buddy Lawrence Drive. In the event that the other major hurricane evacuation route serving Corpus Christi, US 181 northbound, were needed by Hillcrest residents, they would need to travel east to downtown, against the flow of evacuating traffic, to access the route, as entrances to US 181 northbound from within the Northside community also cannot be accommodated with the proposed design of the West Alternative. Currently, drivers in the Northside neighborhoods can access US 181 via I-37 (accessed from the entrance ramp on Antelope Street just east of Brownlee Boulevard). Given the geometric design constraints that would prevent the accommodation of adequate access to the proposed facility from the Northside community, the West Alternative does not satisfy the hurricane evacuation element of the need and purpose for the proposed project as well as the other build alternatives. The Green, Red (Recommended), and Orange Alternatives would remove the Brownlee Boulevard entrance to I-37 while maintaining the entrance at N. Port Avenue and another entrance at N.

Staples Street. In this way, these alternatives would provide adequate access to the primary hurricane evacuation route in the Corpus Christi area, satisfying this element of the need and purpose.

With respect to the project objectives, identified in **Section 1.5**, differences among the alternatives are also evident. Considerable planning effort has been put forth by the City of Corpus Christi with the aim of revitalizing the downtown area while more fully incorporating the Sports, Entertainment, and Arts (SEA) District, and both of the project objectives (see **Section 1.5**) have elements related to supporting the City's community sustainability planning initiatives in this area. **Section 5.6.2.5** includes a detailed evaluation of how well each alternative satisfies the objectives of the proposed project and ultimately concludes that the Green Alternative does not meet the objectives of the proposed project well relative to the other build alternatives. By maintaining the existing US 181 barrier downtown, the Green Alternative only minimally improves accessibility and mobility, and reduces connectivity to the facility from adjacent neighborhoods. Therefore, the degree to which the Green Alternative meets the project objectives is low relative to the other build alternatives.

The Red Alternative (Recommended), by contrast, meets the project objectives very well by removing the US 181 barrier from downtown, which would improve mobility and access into and out of the SEA District and the downtown area and would therefore support the City's ability to implement its long-term community sustainability planning initiatives. The Red Alternative also preserves much of the existing connectivity to the facility from adjacent neighborhoods relative to the other build alternatives. The degree to which the Red Alternative meets the project objectives, therefore, is high.

The Orange and West Alternatives would also remove the US 181 barrier downtown and provide the infrastructure to improve mobility and access into and out of the SEA District and the downtown area; however, these alternatives would not meet the project objectives well in that they would not support the City's community sustainability planning initiatives as well as the Red Alternative (Recommended). The Orange Alternative is aligned through the SEA District and would convert developed and developable properties within the SEA District to transportation right of way which would potentially negate some of the opportunities presented by the removal of the US 181 barrier. The West Alternative, similarly, is aligned in such a way that traffic (and potential business patrons) would be diverted away from the downtown area and the SEA District, potentially offsetting the opportunities that removing the US 181 barrier would present. The West Alternative, furthermore, reduces connectivity to the facility from adjacent neighborhoods, as described under the discussion of hurricane evacuation earlier in this section, which would affect residents during emergency situations but would also affect use of the facility for routine travel. Therefore, the degree to which both the Orange and West Alternatives meet the project objectives is considered low.

2.6 IMPACT COMPARISON SUMMARY BY ALTERNATIVE

Detailed assessments of the social, economic, and environmental impacts of the each of the proposed build alternatives are provided in **Sections 4.0, 5.0, 6.0 and 7.0** of the Draft EIS published in the Federal Register and the Texas Register on January 3, 2014. Each of the alternatives was evaluated to a

comparable level of detail and this section of the Final EIS provides a summary of those impacts, both beneficial and adverse, by alternative. **Table 2.6-1** provides a side by side comparison of the impacts of each of the build alternatives and the No Build Alternative. In this table, the impacts of the alternatives, including the Red Alternative, are identical to those presented in the Draft EIS.

As previously noted, there are differences in the impacts for all the build alternatives relative to the impacts presented in the Draft EIS. These result either from changes in the affected environment, including newly available traffic projections, or from minor design changes in the case of the Recommended Alternative (Red). These differences are presented in **Table 2.6-2**.

The differences between the impacts presented in the Draft EIS and those presented in this Final EIS are primarily related to traffic noise, residential displacements and wetlands and waters of the U. S. Other minor changes in impacts involve sites potentially containing hazardous materials and air quality.

This Final EIS also makes a substantive change in how the impacts to minority populations and low-income populations are characterized for the Green Alternative and the Recommended Alternative (Red). In the Draft EIS, the Orange and West Alternatives were determined from various assessments to result in disproportionately high and adverse effects to minority populations and low-income populations under the environmental justice Executive Order 12898. In this Final EIS, all build alternatives are presented as having disproportionately high and adverse effects on minority populations and low-income populations. The change in this characterization is primarily a result of comments on the Draft EIS received by the Joint Lead Agencies from the EPA and HUD. In consideration of these comments, and using new traffic data from the MPO that were not available at the time of the Draft EIS, updated analyses of traffic noise impacts and air quality impacts were conducted. These analyses reflect the Joint Lead Agencies' attempts to resolve issues of potential controversy among Cooperating agencies. The impacts identified as a result of these new analyses do not represent new significant impacts not previously identified in the Draft EIS; however, because many of the traffic noise impacts cannot be mitigated through practicable noise abatement measures, and because the majority of these noise impacts occur in minority and low-income neighborhoods, the Joint Lead Agencies have determined that the noise impacts of all the build alternatives, including the Green Alternative and the Recommended Alternative (Red), represent disproportionately high and adverse effects. The analysis leading to this determination is presented in **Section 4.7**.

Table 2.6-1 Summary of Impact Comparison by Alternative—Draft EIS					
Resource/Evaluation Category	Alternatives				
	Green	Red	Orange	West	No Build
Consistency and Compatibility with Local Land Use Plans and Policies	<ul style="list-style-type: none"> •Inconsistent with future land use and community sustainability planning •Compatible with existing and future neighborhood land use 	<ul style="list-style-type: none"> •Consistent with future land use and community sustainability planning •Incompatible with existing and future neighborhood land use 	<ul style="list-style-type: none"> •Inconsistent with future land use and community sustainability planning •Incompatible with existing and future neighborhood land use 	<ul style="list-style-type: none"> •Inconsistent with future land use and community sustainability planning •Incompatible with existing and future neighborhood land use 	<ul style="list-style-type: none"> •Inconsistent with future land use and community sustainability planning •Compatible with existing and future neighborhood land use
Public Input	<ul style="list-style-type: none"> •Mixed support and opposition expressed by US 181 Harbor Bridge Technical and Citizens Advisory Committees 	<ul style="list-style-type: none"> •Official endorsement by Corpus Christi MPO, City of Corpus Christi, Port of Corpus Christi Authority •Expressed support by US 181 Harbor Bridge Technical Advisory Committee •Mixed support and opposition expressed by US 181 Harbor Bridge Citizens Advisory Committees 	<ul style="list-style-type: none"> •Mixed support and opposition expressed by US 181 Harbor Bridge Technical and Citizens Advisory Committees 	<ul style="list-style-type: none"> •Opposition expressed by the US 181 Harbor Bridge Technical Advisory Committee and Citizens Advisory Committees 	<ul style="list-style-type: none"> •General opposition expressed by the US 181 Harbor Bridge Technical and Citizens Advisory Committees and participants in community meetings
Residential Displacements	15	39	102	13	0
Business Displacements	57	3	10	2	0
Other Displacements	3	4	3	1	0
Economic Impacts¹	<ul style="list-style-type: none"> • \$670,535,437 increase in household earnings • 7,674 new jobs (for duration of project) 	<ul style="list-style-type: none"> • \$761,544,606 increase in household earnings • 8,762 new jobs (for duration of project) 	<ul style="list-style-type: none"> • \$757,476,431 increase in household earnings • 8,670 new jobs (for duration of project) 	<ul style="list-style-type: none"> • \$816,784,096 increase in household earnings • 9,349 new jobs (for duration of project) 	<ul style="list-style-type: none"> •No change

¹ Calculated based on construction cost of project using U.S. Bureau of Economic Analysis multipliers. The figures presented here represent the total economic impacts (direct + indirect + induced) for the proposed alternatives; direct impacts are detailed in **Section 4.5.6**, while indirect and induced economic impacts are detailed in **Section 6.5.1**.

Table 2.6-1 Summary of Impact Comparison by Alternative—Draft EIS

Resource/Evaluation Category	Alternatives				
	Green	Red	Orange	West	No Build
Community Impacts	<ul style="list-style-type: none"> Leaves physical US 181 barrier in place between the Northside neighborhoods and downtown Elimination of northbound exit to Burleson Street reduces access to North Beach Reduction in access from downtown and South Central community Avoids separation of the Washington-Coles and Hillcrest neighborhoods 	<ul style="list-style-type: none"> Separation of the Washington-Coles and Hillcrest neighborhoods affecting the cohesion of the Northside community Elimination of northbound exit to Burleson Street reduces access to North Beach Winnebago Street closure affects Northside mobility for drivers and non-drivers—comparable access replaced along Lake Street 	<ul style="list-style-type: none"> Separation of the Washington-Coles and Hillcrest neighborhoods affecting the cohesion of the Northside community Substantial number of residential displacements; loss of 15% of households in Washington-Coles neighborhood affecting cohesion Elimination of northbound exit to Burleson Street reduces access to North Beach Winnebago Street closure affects Northside mobility for drivers and non-drivers—comparable access replaced along Lake Street 	<ul style="list-style-type: none"> Elimination of northbound exit to Burleson Street reduces access to North Beach; Substantially reduced accessibility to US 181 and I-37 from the Hillcrest neighborhood, affecting hurricane evacuation and routine use Avoids separation of the Washington-Coles and Hillcrest neighborhoods 	<ul style="list-style-type: none"> No direct impacts
Environmental Justice	<ul style="list-style-type: none"> Impacts would not be disproportionately high and adverse 	<ul style="list-style-type: none"> Impacts would not be disproportionately high and adverse after the consideration of mitigation and offsetting benefits 	<ul style="list-style-type: none"> Large number of residential displacement effects and impacts to community cohesion would be disproportionately high and adverse 	<ul style="list-style-type: none"> Reduced accessibility effects to US 181 and I-37 from the Hillcrest neighborhood would be disproportionately high and adverse 	<ul style="list-style-type: none"> No disproportionately high and adverse impacts
Traffic Noise	<ul style="list-style-type: none"> 574 sensitive receivers impacted 	<ul style="list-style-type: none"> 654 sensitive receivers impacted 	<ul style="list-style-type: none"> 587 sensitive receivers impacted 	<ul style="list-style-type: none"> 471 sensitive receivers impacted 	<ul style="list-style-type: none"> None

Table 2.6-1 Summary of Impact Comparison by Alternative—Draft EIS

Resource/Evaluation Category	Alternatives				
	Green	Red	Orange	West	No Build
Air Quality	<ul style="list-style-type: none"> •Area is in attainment or unclassifiable for EPA’s NAAQS for pollutants considered harmful to public health and the environment •Modeled CO emissions associated with the proposed project would not exceed EPA’s NAAQS for CO •Overall MSAT emissions are expected to decline in the future 	<ul style="list-style-type: none"> •Area is in attainment or unclassifiable for EPA’s NAAQS for pollutants considered harmful to public health and the environment •Modeled CO emissions associated with the proposed project would not exceed EPA’s NAAQS for CO •Overall MSAT emissions are expected to decline in the future 	<ul style="list-style-type: none"> •Area is in attainment or unclassifiable for EPA’s NAAQS for pollutants considered harmful to public health and the environment •Modeled CO emissions associated with the proposed project would not exceed EPA’s NAAQS for CO •Overall MSAT emissions are expected to decline in the future 	<ul style="list-style-type: none"> •Area is in attainment or unclassifiable for EPA’s NAAQS for pollutants considered harmful to public health and the environment •Modeled CO emissions associated with the proposed project would not exceed EPA’s NAAQS for CO •Overall MSAT emissions are expected to decline in the future 	<ul style="list-style-type: none"> •Area is in attainment or unclassifiable for EPA’s NAAQS for pollutants considered harmful to public health and the environment •Modeled CO emissions associated with the proposed project would not exceed EPA’s NAAQS for CO •Overall MSAT emissions are expected to decline in the future
Tidal Wetlands and Waters of the U. S.	•Permanent impacts of 0.13 acre	•Permanent impacts of 0.25 acre	•Permanent impacts of 0.14 acre	•Permanent impacts of 0.46 acre	•None
Marsh Habitat	•0.32 acre	•0.68 acre	•0.32 acre	•6.68 acres	•None
Essential Fish Habitat	•0.0 acre	•0.42 acre	•0.0 acre	•0.59 acre	•None
Coastal Natural Resource Areas	•Impacts to floodplains and tidal waters	•Impacts to floodplains and tidal waters	•Impacts to floodplains and tidal waters	•Impacts to coastal shore areas, coastal wetlands, floodplains and tidal waters	•None
Cultural Resources	<ul style="list-style-type: none"> •Adverse effect to the Harbor Bridge system (comprised of the Harbor Bridge and six concrete bridges that carry US 181 in the project area) •<i>De minimis</i> impact to SAU&G Depot 	•Adverse effect to the Harbor Bridge system	•Adverse effect to the Harbor Bridge system	•Adverse effect to the Harbor Bridge system	•None

Table 2.6-1 Summary of Impact Comparison by Alternative—Draft EIS

Resource/Evaluation Category	Alternatives				
	Green	Red	Orange	West	No Build
Section 4(f) Uses	<ul style="list-style-type: none"> •Adverse effect to the Harbor Bridge System •Permanent incorporation of 92% of Lovenskiold Park •<i>De minimis</i> impact to SAU&G Depot 	<ul style="list-style-type: none"> •Adverse effect to the Harbor Bridge System •Permanent Incorporation of 45% of Lovenskiold Park •Permanent incorporation of 59% of T.C. Ayers Park 	<ul style="list-style-type: none"> •Adverse effect to the Harbor Bridge System •Permanent Incorporation of 43% of Lovenskiold Park •Permanent Incorporation of 34% of T.C. Ayers Park •<i>De minimis</i> impact to Oveal Williams Senior Center 	<ul style="list-style-type: none"> •Adverse effect to the Harbor Bridge System •Permanent incorporation of 2.83 acres (about 8%) of Rincon Channel Wetlands Interpretive Overlook 	<ul style="list-style-type: none"> •None
Hazardous Materials	<ul style="list-style-type: none"> •Would displace gas station with Leaking Petroleum Storage Tank 	<ul style="list-style-type: none"> •Would displace gas station with Leaking Petroleum Storage Tank •Construction within previously identified area with soil and groundwater contamination 	<ul style="list-style-type: none"> •Would displace gas station with Leaking Petroleum Storage Tank •Construction within previously identified area with soil and groundwater contamination 	<ul style="list-style-type: none"> •Would displace gas station with Leaking Petroleum Storage Tank •Would displace two 200,000 gallon aboveground petroleum storage tanks 	<ul style="list-style-type: none"> •None
Visual and Aesthetic Impacts	<ul style="list-style-type: none"> •Least visually intrusive •Most able to convey landmark status (refers to the quality of being a highly recognizable feature, rather than a “historic landmark”) •Most able to contribute to an iconic Corpus Christi skyline 	<ul style="list-style-type: none"> •Visually and aesthetically intrusive in the Northside community •Able to still convey landmark status •Less able to contribute to an iconic Corpus Christi skyline 	<ul style="list-style-type: none"> •Most visually and aesthetically intrusive in the Northside community •Able to convey landmark status •Able to contribute to an iconic Corpus Christi skyline 	<ul style="list-style-type: none"> •Less visually and aesthetically intrusive in the Northside community •Visually and aesthetically intrusive in the Westside community (Oak Park neighborhood) •Least able to convey landmark status •Not able to contribute to an iconic Corpus Christi skyline 	<ul style="list-style-type: none"> •Not visually intrusive •Conveys landmark status •Contributes to iconic Corpus Christi skyline

Table 2.6-1 Summary of Impact Comparison by Alternative—Draft EIS					
Resource/Evaluation Category	Alternatives				
	Green	Red	Orange	West	No Build
Construction Phase Effects	<ul style="list-style-type: none"> •Greater user effects (travel delays, alteration of traffic patterns for a longer duration) due to the construction overlap with the existing US 181 alignment 	<ul style="list-style-type: none"> •User effects (travel delays, alteration of traffic patterns) 	<ul style="list-style-type: none"> •User effects (travel delays, alteration of traffic patterns) 	<ul style="list-style-type: none"> •User effects (travel delays, alteration of traffic patterns) •Affects U.S. Army Corps of Engineers ability to fulfill their obligation in the event emergency dredging operations were called for to maintain the ship channel during construction •Potential adverse water quality effects from disturbance of dredged sediments in Upland Confined Placement Area 	<ul style="list-style-type: none"> •None

Source: US 181 Harbor Bridge EIS Team 2013

Table 2.6-2 Summary of Changes in Impact Comparison by Alternative—Final EIS					
Resource/Evaluation Category	Alternatives				
	Green	Recommended	Orange	West	No Build
Residential Displacements	<ul style="list-style-type: none"> •No change 	<ul style="list-style-type: none"> •21 	<ul style="list-style-type: none"> •42 	<ul style="list-style-type: none"> •No change 	<ul style="list-style-type: none"> •No change
Community Impacts	<ul style="list-style-type: none"> •No change 	<ul style="list-style-type: none"> •No change 	<ul style="list-style-type: none"> •Substantial number of residential displacements; loss of 6% of households in Washington-Coles neighborhood affecting cohesion 	<ul style="list-style-type: none"> •No change 	<ul style="list-style-type: none"> •No change

Table 2.6-2 Summary of Changes in Impact Comparison by Alternative—Final EIS					
Resource/Evaluation Category	Alternatives				
	Green	Recommended	Orange	West	No Build
Environmental Justice	•Traffic noise impacts, residential displacement effects would be disproportionately high and adverse	•Traffic noise impacts, residential displacement effects, impacts to community cohesion would be disproportionately high and adverse	•Traffic noise impacts would be disproportionately high and adverse	•Traffic noise impacts, residential displacement effects would be disproportionately high and adverse	•No change
Traffic Noise	•522 sensitive receivers impacted	• 538 sensitive receivers impacted	• 480 sensitive receivers impacted	•424 sensitive receivers impacted	•No change
Air Quality	•No change	•No change	•No change	•No change	•No change
Tidal Wetlands and Waters of the U.S.	•Permanent impacts of 0.43 acre	•Permanent impacts of 1.47 acres	•Permanent impacts of 0.6 acre	•Permanent impacts of 1.34 acres	•No change
Marsh Habitat	•0.43 acre	•0.73 acre	•0.5 acre	• 1.03 acres	•No change
Essential Fish Habitat	•No change	•0.55 acre	•0.10 acre	•4.46 acres	•None
Section 4(f) Uses	•No change	•Permanent incorporation of 61% of T.C. Ayers Park	•No change	•No change	•No change
Hazardous Materials	•Total volume of contaminated soil and groundwater would be 890 cu. yds./103,123 gal.	• Total volume of contaminated soil and groundwater would be 6,671 cu. yds./436,289 gal. •Would require remediation of leaking petroleum storage tanks from site of former Washington Elementary School	• Total volume of contaminated soil and groundwater would be 6,420 cu. yds./388,694 gal. •Would require remediation of leaking petroleum storage tanks from site of former Washington Elementary School	• Total volume of contaminated soil and groundwater would be 838 cu. yds./95,190 gal.	•None

Source: US 181 Harbor Bridge EIS Team 2014

2.7 SUMMARY OF THE LEAST OVERALL HARM ANALYSIS

The preceding **Section 2.6** provides a comparison of the impacts of the alternatives considered for the proposed project. Because each of the proposed build alternatives would result in the use of one or more properties protected by FHWA's Section 4(f) regulations, additional factors were considered in evaluating which alternative to identify as the recommended alternative. The full evaluation of these factors is described in the Final Section 4(f) Evaluation in **Section 5.0** and is summarized here. The balancing of these factors leads to the conclusion that the Red Alternative would cause the least overall harm.

The factors to consider in the evaluation of the least overall harm alternative are defined in FHWA's Section 4(f) regulations at 23 CFR §774.3(c) and listed in **Section 5.6**. The first four factors relate to the net harm that each alternative would cause to Section 4(f) property, while the remaining three factors take into account any substantial problems the alternatives may have with issues other than Section 4(f). **Section 5.6** provides a detailed evaluation of each of these seven factors, the results of which are summarized here and in **Table 2.7-1**.

Least Overall Harm Criteria	Build Alternatives			
	Green	Recommended (Red)	Orange	West
Ability to Mitigate Adverse Impacts to 4(f) Properties	Medium	Medium	Medium	High
Severity of Harm to 4(f) Properties after Mitigation	Medium	Medium	Medium	Medium
Relative Significance of 4(f) Properties	Medium	Medium	Medium	High
Views of Officials with Jurisdiction	City of Corpus Christi - In agreement with the determination of project impacts and favorable toward proposed mitigation measures	City of Corpus Christi - In agreement with the determination of project impacts and favorable toward proposed mitigation measures	City of Corpus Christi - In agreement with the determination of project impacts and favorable toward proposed mitigation measures	City of Corpus Christi - In agreement with project impacts and less favorable toward proposed mitigation measures
	THC - concurred with effect determination and mitigation	THC - concurred with effect determination and mitigation	THC - concurred with effect determination and mitigation	THC - concurred with effect determination and mitigation
Degree to which the Alternative Meets Need and Purpose and Objectives	Medium	High	Medium	Low

Least Overall Harm Criteria	Build Alternatives			
	Green	Recommended (Red)	Orange	West
Magnitude of Impacts to Non-4(f) Resources After Mitigation	Medium	Low	High [^]	High
Cost Comparison	\$558 million	\$637 million	\$630 million	\$679 million

Source: US 181 Harbor Bridge EIS Team 2014

NOTE: high = TxDOT has the ability to reasonably mitigate the potential effects from the use of the Section 4(f) property; medium = some of the effects from the use could be offset by mitigation while others could not; low = TxDOT does not have the ability to reasonably mitigate the effects.

[^]The evaluation in **Section 5.6.2.6** presents the Orange Alternative as the alternative with the highest degree of adverse impacts to non-Section 4(f) resources after mitigation.

2.7.1 Factors Related to Section 4(f)

2.7.1.1 Ability to Mitigate Adverse Section 4(f) Impacts

Based on TxDOT's coordination with the officials with jurisdiction over the Section 4(f) properties (the City of Corpus Christi and the Texas Historical Commission [THC]), the West Alternative has a high potential for the adverse impacts to Section 4(f) properties to be mitigated, while the Section 4(f) impacts of the Green, Recommended (Red) and Orange Alternatives have a medium potential to be mitigated. This is primarily based on the fact that the mitigation for the use of Lovenskiold Park by the Green, Red and Orange Alternatives would be in the form of monetary compensation, which the City of Corpus Christi has indicated would be applied to the enhancement of an existing park property elsewhere (Ben Garza Park) rather than the development of a replacement property for public recreational use. The end result would be that although enhancement of recreational function would be achieved there would be a net loss of park property available to the community with these alternatives. The Red and Orange Alternatives would mitigate the adverse impacts to T.C. Ayers Park by acquiring and developing a replacement property to be designated and operated as a public park. Additional mitigation to offset the impacts of the Red and Orange Alternatives would include enhancements to the community swimming pool, expansion of the walking trail adjacent to the pool, and the development of bicycle and pedestrian connections between the various existing and to be created park properties in the Northside community.

The impacts to the Rincon Channel Wetlands Interpretive Overlook resulting from the use of the property by the West Alternative have high potential to be mitigated. TxDOT would compensate for the loss of a portion of the refuge by working with the City to acquire additional acreage to add to the refuge and by developing habitat restoration to replace the lost function.

The use of the NRHP-eligible Harbor Bridge system would be mitigated, and TxDOT has coordinated the proposed mitigation with the THC; the mitigation would be the same for and is applicable to all the proposed build alternatives.

2.7.1.2 Severity of Harm After Mitigation

The severity of harm to Section 4(f) properties after mitigation would be medium for all build alternatives. Because the use of Lovenskiold Park by the Green Alternative would result in the entire park being permanently incorporated into the transportation right of way, and the mitigation for the loss of the park would be applied to the nearby Ben Garza Park, there would be a medium degree of remaining harm to Lovenskiold Park. For the Recommended and Orange Alternatives, the use of Lovenskiold Park would involve permanent incorporation of approximately 43 percent of the land; 55 percent of the park would remain and development of recreational amenities at Ben Garza Park would offset the loss of function at the existing park. The mitigation for the adverse impacts to T.C. Ayers Park would consist of replacement of public park property nearby with amenities that would result in expanded recreational opportunities for the community. Based on coordination with the City of Corpus Christi and the affected neighborhoods in September 2013, this mitigation would be considered an overall benefit to the community, and, as a result, the severity of harm to Section 4(f) properties after mitigation with the Recommended and Orange Alternatives would be medium. Approximately 2.83 acres of the Rincon Channel Wetlands Interpretive Overlook (about 8 percent) would be permanently incorporated into the right of way of the West Alternative, resulting in a medium degree of harm. The loss of acreage would be replaced and habitat restoration would be developed, but the elevated portion of the highway would encroach upon the open space element of the refuge that exists today, potentially affecting users' enjoyment of the refuge.

2.7.1.3 Relative Significance of the Property

With respect to the relative significance of the Section 4(f) properties, a general assessment of how each official administers their jurisdiction over their respective property was used to order the properties by relative significance; **Section 5.6.2.3** covers this analysis in detail. Ultimately, a determination was made that the Harbor Bridge system is the most significant Section 4(f) property affected by the proposed project, and implementation of any of the build alternatives would result in an equal use of this property. The NRHP-eligible San Antonio, Uvalde & Gulf Railroad Depot (SAU&G Depot), the Rincon Channel Wetlands Interpretive Overlook, and the Oveal Williams Senior Center are also relatively significant, among the remaining Section 4(f) properties. T.C. Ayers Park and Lovenskiold Park, while considered significant recreational resources according to the City of Corpus Christi, reflect a lesser degree of significance based on the low funding priority assigned to these properties by the City. The analysis in **Section 5.6.2.3** ultimately concludes that the West Alternative would use Section 4(f) properties with the most relative significance, while the Green, Red, and Orange Alternatives would use properties with a relatively lesser degree of significance.

2.7.1.4 Views of Officials with Jurisdiction

As noted previously in this section, TxDOT has coordinated routinely with the officials with jurisdiction over the Section 4(f) properties, and coordination included a review of the Draft Section 4(f) Evaluation by the City and the THC. With respect to the impacts and proposed mitigation to the properties under their jurisdiction, the City of Corpus Christi has worked with TxDOT to finalize measures to minimize harm to their public parks and refuge lands. If a distinction can be made in this regard, it would be with

respect to the Rincon Channel Wetlands Interpretive Overlook, which is overseen by the Department of Engineering within the City, as opposed to the Parks and Recreation Department. Since the land on which the Overlook sits is encumbered by a conservation easement made possible by a federal Coastal Management Program grant, the City has expressed concern regarding the efficacy of any potential conversion of the easement to transportation right of way.

2.7.2 Factors Not Related to Section 4(f)

2.7.2.1 Degree to Which Alternatives Meet Need and Purpose and Objectives

A detailed evaluation of the degree to which each alternative meets the need and purpose and objectives of the proposed project is included in **Section 5.6.2.5** and summarized in **Section 2.5**. The assessment shows that the Recommended Alternative (Red) would perform best, while the Green, Orange, and West Alternatives would all have deficiencies in regards to the need and purpose or project objectives.

2.7.2.2 Magnitude of Adverse Impacts After Mitigation

Section 5.6.2.6 covers the comparison of the impacts and benefits of the build alternatives (see **Section 2.6** as well) and concludes that after considering mitigation the magnitude of the impacts would be lowest with the Recommended Alternative (Red), followed by the Green, the West, and finally the Orange Alternative.

2.7.2.3 Comparison of Cost

Table 2.4-1 includes the estimated construction cost, including construction engineering, mobilization and contingency costs, of each build alternative and shows that the West Alternative would have the highest estimated cost (\$679 million) of any of the alternatives. The Recommended (Red) and Orange Alternatives would be similar in cost, at \$637 million and \$630 million estimated, respectively. The Green Alternative would have the lowest estimated construction cost (\$558 million) of any of the build alternatives. These cost estimates are exclusive of right of way acquisition costs, property displacement and relocation costs, utility adjustments and any necessary mitigation costs. Ultimately, and due to the preliminary nature of these estimates, the differences among the alternatives in terms of cost would not be considered substantial.

2.8 IDENTIFICATION OF THE RECOMMENDED ALTERNATIVE

Table 2.8-1 provides a summary of the evaluation of all the factors considered in the comparison of reasonable alternatives for the proposed project, and **Figure 2.8-1** in **Appendix A** illustrates the detailed qualitative and quantitative screening process for the identification of the Recommended Alternative. Each of the four build alternatives meets the need and purpose for the proposed project. As discussed above, because there is no feasible and prudent avoidance alternative to the use of Section 4(f) property, FHWA may approve only the alternative that causes the least overall harm based on the factors set forth in 23 CFR §774.3(c), including, among other items, consideration of the degree of harm to Section 4(f) properties as well as the degree to which each alternative meets the need and purpose

and objectives of the proposed project. The evaluation summarized in this chapter leads to the identification of the Red Alternative as the Recommended Alternative.

The Recommended Alternative (described in **Section 2.4.1.5**) meets the need and purpose of the proposed project by providing a solution for the long-term highway operability of the US 181 crossing of the Corpus Christi Ship Channel, a non-fracture critical bridge structure with a 75 year design life. The Recommended Alternative also meets the need for improving safety for the travelling public, including during hurricane evacuations by correcting design deficiencies and upgrading the facility to current design standards.

The Recommended Alternative best meets the objectives of the proposed project of providing the transportation infrastructure to support economic opportunity in the area and addressing connectivity to the local roadway system and its effect on adjacent neighborhoods. The Recommended Alternative would best meet these objectives because it would remove the US 181 barrier from downtown and improve mobility and access into and out of the SEA District and the downtown area. The Recommended Alternative would also best support the City of Corpus Christi's ability to implement its long-term community sustainability planning initiatives relative to the other alternatives. (See the detailed evaluation in **Section 5.6.2.5** and the summary in **Section 2.5**). The Recommended Alternative also preserves much of the existing connectivity to the facility from adjacent neighborhoods relative to the other build alternatives, including accommodating bicycle and pedestrian modes of travel to and from the adjacent communities.

In addition, the Recommended Alternative was determined after mitigation to cause the least overall harm through the seven-factor evaluation presented in **Section 5.6** and summarized in **Section 2.7**. The Recommended Alternative also maximizes the engineering considerations and accommodates the navigational transportation needs of the Port of Corpus Christi. Also, the Recommended Alternative was the only alternative to receive official endorsement by the Corpus Christi MPO, the City of Corpus Christi, and the Port of Corpus Christi Authority.

Alternatives	Meets Purpose and Need (Yes/No)	Meets Purpose and Need and Objectives (High/Medium/Low)	Least Overall Harm (Rank 1-5)	Maximizes Engineering Considerations (High/Medium/Low)	Recommended Alternative (Yes/No)
Green	Yes	Medium	2	Low	No
Red	Yes	High	1	High	Yes
Orange	Yes	Medium	3	Medium	No
West	Yes	Low	4	Low	No
No Build	No	NA	5	NA	No

Source: US 181 Harbor Bridge EIS Team 2013

Cooperating and Participating agencies and the public were provided an opportunity to review and comment on the Draft EIS and the identification of the Recommended Alternative—noted as the Preferred Alternative in the Draft EIS. A public hearing was held on February 18 2014, and a summary of the proceedings is included in **Section 8.0**.

2.9 SUMMARY OF CHANGES TO THE RECOMMENDED ALTERNATIVE

As noted in **Section 2.4.1.5**, minor design changes have been made to the Recommended Alternative since the publication of the Draft EIS, including refinement of the proposed right of way line, adjustment to the alignment of Lake Street across proposed US 181 north of I-37, and a separation of the bridges crossing the Inner Harbor to two structures to carry the northbound and southbound lanes rather than the single structure presumed in the Draft EIS. These design changes have resulted in several differences in the impacts presented for the Red Alternative in the Draft EIS. None of the impacts rise to the level of new significant impacts, and the Red Alternative is still the Joint Lead Agencies' Recommended Alternative in this Final EIS.

Table 2.9-1 presents a summary of the different impacts between the Draft EIS version of the Red Alternative and the Recommended Alternative as presented in this Final EIS.

Table 2.9-1 Differences in Impacts between the Red Alternative (Draft EIS version) and the Recommended Alternative		
Impact Type	Red (Draft EIS)	Recommended
Estimated New Right of Way (acres)	50.4	58.5
Residential Displacements	39	21
Traffic Noise Impacts to Sensitive Receivers	654	538
Section 4(f)—acreage permanently incorporated into the proposed right of way	5.45	5.67
Permanent Impacts to Tidal Wetlands and Waters of the U.S.	0.25	1.47
Marsh Habitat	0.68	0.73
Essential Fish Habitat*	0.42	0.55

Source: US 181 Harbor Bridge EIS Team 2014