EXECUTIVE SUMMARY

ES.1 INTRODUCTION

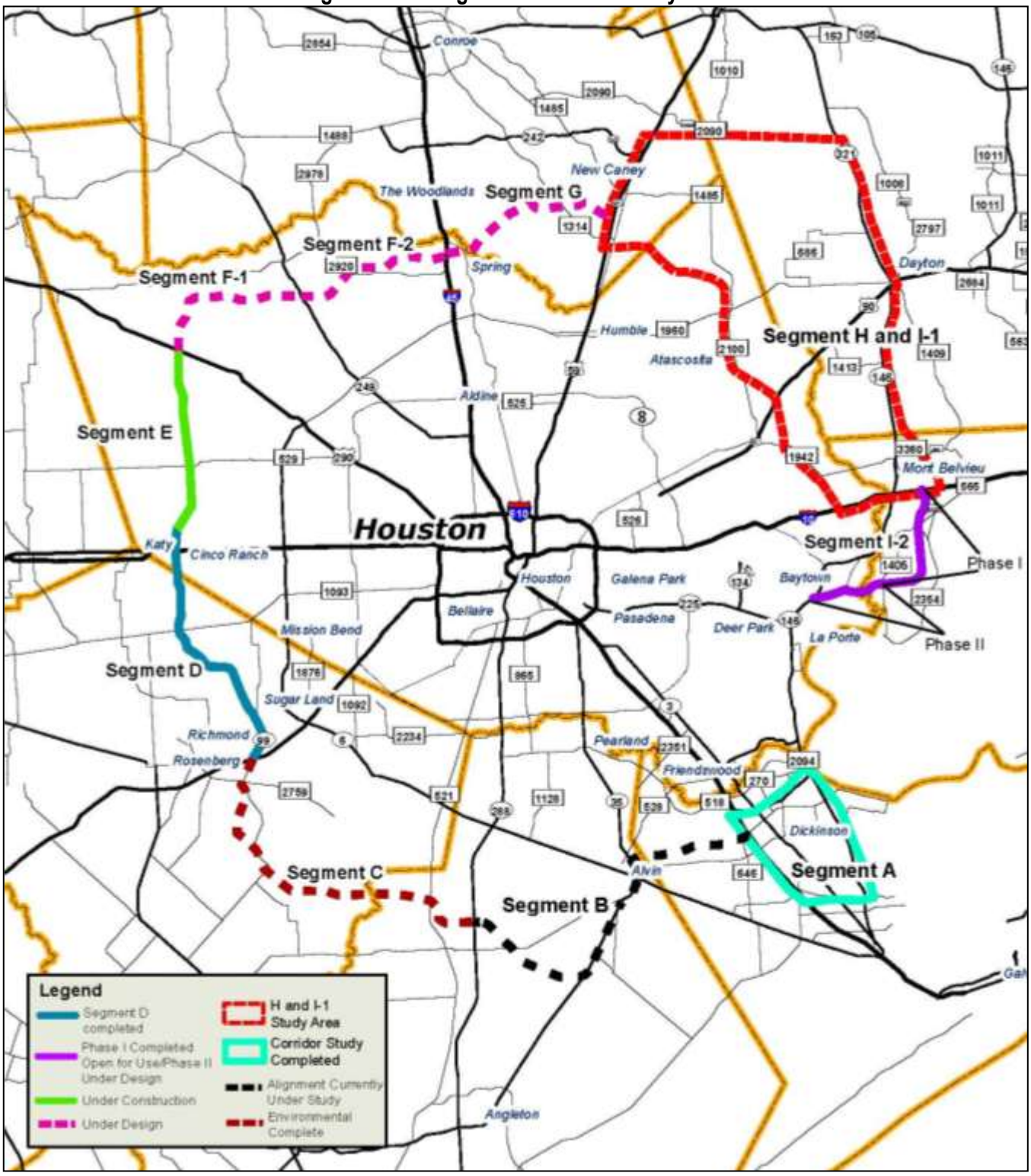
The Grand Parkway Segments H and I-1 are part of a planned 180+ mile (mi) circumferential loop around the greater Houston metropolitan area as shown in **Figure ES-1.** The Grand Parkway is divided into 11 segments, each of which has logical termini and can function separately to facilitate planning, design, and construction. Each segment connects at least two existing major transportation corridors to ensure independent utility as well as independent significance as required by the Federal Highway Administration (FHWA) regulations (23 Code of Federal Regulations [CFR] 771.111(f)). The United States Congress confirmed this segment-by-segment development approach to be in compliance with federal law in the "Department of Transportation and Related Agencies Appropriations Bill of 1993."

A Grand Parkway Overview document was prepared by the Texas Department of Transportation (TxDOT) in 1992 to provide an overall assessment of the entire Grand Parkway outer loop facility. To date, Segment D, from United States Highway (US) 59/Interstate Highway (I) 69 to I-10 West (W), opened to traffic in 1994 and Phase I of Segment I-2, I-10 (E) to Farm-to-Market Road (FM) 1405, was opened to traffic in March 2008. The environmental review of Phase II of Segment I-2, FM 1405 to State Highway (SH) 146, is completed and currently under design. Segments E, F-1, F-2, and G have been let to construction. Segment C received a Record of Decision (ROD) on March 29, 2013. Segments B and Segments H and I-1 (this study) are in the route study and environmental documentation phase. Corridor studies began in September 2008 for Segment A and were completed in 2010.

ES.1.1 Project Description

The Grand Parkway Segments H and I-1 are two separate segments, but for the purposes of the Environmental Impact Statement (EIS) they were evaluated collectively from US 59/I-69 North (N) to I-10 East (E). Due to similarities of the study areas for Segments H and I-1, FHWA and TxDOT recommended that one document be prepared for both segments. The Segments H and I-1 study area is located on the northeast side of the greater Houston metropolitan area **(Figure ES-1)**. The study area is generally bound by FM 2090 on the north, I-10 (E) on the south, US 59/I-69 (N) and FM 2100 on the west and SH 146 on the east, in Montgomery, Harris, Liberty, and Chambers counties.

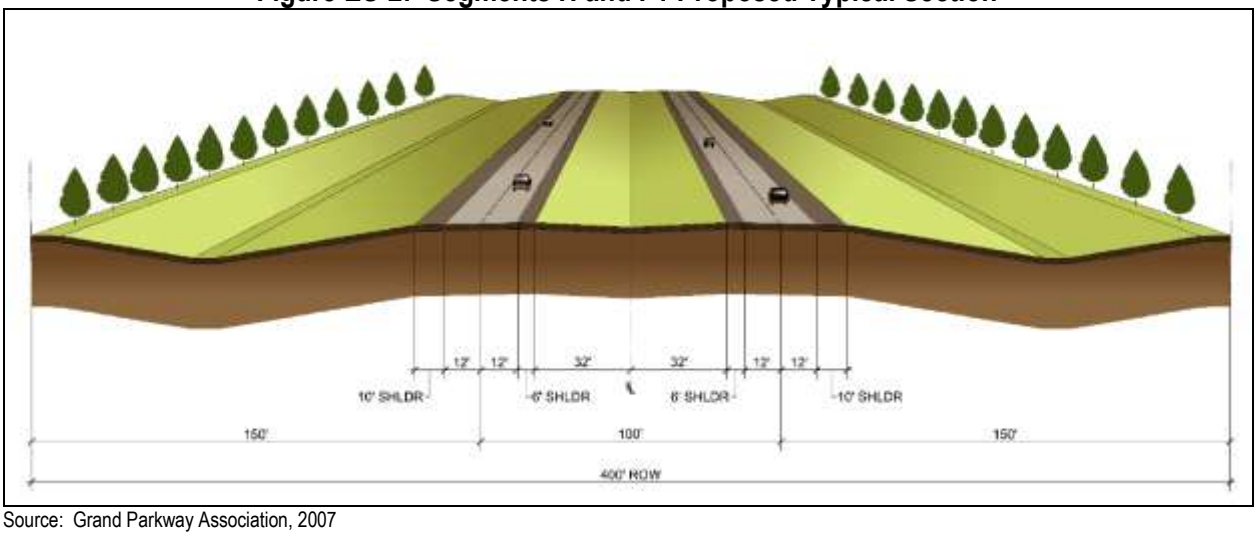
Figure ES-1: Segments H and I-1 Study Area



Source: Study Team, 2012

Segment H begins at US 59/I-69 North (N) near New Caney and continues south to US 90. Segment I-1 begins where Segment H ends at US 90 and continues south to I-10 (E) near Mont Belvieu. Both segments are proposed as a 4-mainlane at-grade controlled-access tollway with proposed grade separations at major intersections within a 400-foot (ft) right-of-way (ROW) width. See **Figure ES-2** below for a proposed typical section of Segments H and I-1.

Figure ES-2: Segments H and I-1 Proposed Typical Section



Source: Grand Parkway Association, 2007

ES.1.2 Document Organization and FEIS Approach

The Final EIS (FEIS) prepared for Segments H and I-1, is organized into a two-volume set. Volume I provides a detailed assessment of Segments H and I-1 relative to the study area. It presents issues, permits needed, and federal actions specific to Segments H and I-1, including the purpose and need, alternatives considered, affected environment, environmental consequences, avoidance, minimization, and mitigation measures, indirect and cumulative impacts, and agency and public coordination. It also contains the exhibits referenced throughout each chapter of Volume I. Volume II contains the appendices referenced throughout Volume I.

ES.1.3 Project Development Process

TxDOT and FHWA filed a Notice of Intent (NOI) for Segments H and I-1 in January of 2006. Two series of public scoping meetings were held on February 28 and March 1, 2006, and on May 8 and 9, 2007. Two public hearings were held on August 9 and August 11, 2011 to present a summary of findings from the Draft EIS (DEIS).

The project development process implemented for Segments H and I-1 consisted of studies to determine the purpose and need, alternatives development and analysis, affected environment (existing conditions), environmental consequences, and indirect and cumulative effects. Throughout the study process, numerous resource agency and elected official meetings were held to solicit input on the project development process. The Preferred Alternative developed during preliminary environmental studies along with input from the resource agencies, elected officials, and the public during the DEIS stage, is detailed in this FEIS.

Representatives of the U.S. Army Corps of Engineers (USACE), Texas Parks and Wildlife Department (TPWD), and U.S. Fish and Wildlife Service (USFWS) were particularly concerned with the identification and avoidance of wetlands; Lake Houston Wilderness Park; floodplains; rare, threatened, endangered or protected species; and special habitat areas. Tools such as a Geographic Information System (GIS) were used to map and identify the potential areas of concern. Sensitive resources were avoided to the maximum extent practicable during the project development process.

ES.2 PROJECT PURPOSE AND NEED

The Segments H and I-1 needs to be addressed are discontinuous system linkage, decreased mobility, compromised safety, and the lack of infrastructure to support population growth. Transportation improvements are needed in the Segments H and I-1 study area because of a lack of efficient connections to major radial roadways, suburban communities, local ports, and industries. Improvements are also needed because the existing and future transportation demand of the study area exceeds the capacity of the local roadways and many of the study area's roadways have high crash rates. Projected population growth within the study area is expected to place an even greater strain on the existing transportation infrastructure. The local needs of the Segments H and I-1 study area are further detailed in the following sections.

ES.2.1 Discontinuous System Linkage

The interstate and regional highways are predominantly oriented in either an east-west or a north-south direction, providing an opportunity to provide linkage via circumferential transportation infrastructure. I-10, US 90, and US 59/I-69 are three radial highways connecting Houston to its suburbs and beyond. No additional alternative connecting major radial facilities exists in the Segments H and I-1 study area. Currently, commuters utilize FM 1485, FM 1960, FM 2100, and SH 146 to make such connections.

Secondary roads include FM 3360, FM 1942, FM 1413, and FM 1314. The central portion of the study area, as shown in **Figure ES-1**, is especially deficient in transportation infrastructure to support circumferential and north-south mobility.

ES.2.2 Decreased Mobility

The transportation demand exceeds the current and future capacity of the study area's existing transportation facilities. Further, the City of Houston and its surrounding areas are an important conduit to receive traffic from the Texas Gulf Coast and distribute it to points beyond.

A Traffic Needs Analysis of the existing roadway network in the study area for Segments H and I-1 of the Grand Parkway was conducted to evaluate the need for improvements in mobility and access for vehicular traffic. The base year for analysis is 2011. After meeting with FHWA, TxDOT, and the local Metropolitan Planning Organization (MPO), which is the Houston-Galveston Area Council (H-GAC), 2039 was selected as the horizon year (design year), with 2019 as the interim year (construction completion date for Phase I). The estimated time of completion for the Grand Parkway ultimate configuration is 2025. The H-GAC Travel Demand Model (TDM) utilized for analysis was based on the 2035 Regional Transportation Plan (RTP) which was adopted in August 2007 and updated in January of 2011. The 2035 traffic model used for analysis was provided by H-GAC in 2012. H-GAC has demographic forecasts through 2050 and, therefore, provided a year 2039 dataset which comprises 2039 travel demand on the 2035 RTP roadway network. The 2035 RTP roadway network includes all segments of the Grand Parkway. However, in evaluating the No-Build Alternative, Segments H and I-1 were deleted from the roadway network.

ES.2.3 Compromised Safety

The proposed project would improve safety within the study area for the traveling public by helping to reduce stop-and-go conditions, reduce crash rates, and congestion during emergency evacuations and peak travel times. During Hurricane Rita in 2005, hurricane evacuation was impeded by the lack of circumferential highways in this region. Traffic trying to evacuate to the north had limited choices on available facilities. SH 146 was backed up from Dayton south to Mont Belvieu due to limited capacity and connectivity with US 59/I-69 (N). The Grand Parkway Segments H and I-1 provides additional evacuation capacity and a direct route to US 59/I-69 (N), as well as connectivity to I-45 via connection to Segment G.

ES.2.4 Lack of Infrastructure to Support Population Growth

The existing transportation system does not provide the necessary infrastructure to support the potential for population growth through efficient circumferential connections and access. Based on the H-GAC 2035 (2012) forecasts, population growth for the Segments H and I-1 study area is projected to increase by approximately 62 percent through the year 2039. This predicted increase in population along with the predicted increases in traffic and congestion would lead to an even greater travel demand for the study area.

ES.3 ALTERNATIVES ANALYSIS

ES.3.1 Corridor Study

The following multi-step process was used to determine the Preferred Alternative within the study area:

- The study area was defined and stakeholders were identified. A Project Coordination Plan was prepared listing stakeholders and the coordination process.
- Constraints mapping was prepared for the study area to identify sensitive resources including wetlands, parks, historic and archeological sites, existing and proposed development, potential environmental justice populations, neighborhoods, floodplains, streams and waterways, potential habitat for threatened and endangered species, churches, schools, and cemeteries.
- The universe of alternatives was identified. The universe of alternatives consisted of study team generated alternatives, Corridor Analysis Tool (CAT) alternatives, and publicly available and previously published alternatives.
- A fatal flaw analysis was conducted for the universe of alternatives resulting in a set of preliminary alternatives. The fatal flaw analysis eliminated any previously published alternatives that bisected Lake Houston Wilderness Park or impacted potential threatened and endangered species habitat. The study area was divided into three sections (A, B, and C) where the alternatives shared common points of intersection. The preliminary alternatives consisted of five alternatives in Section A (northern section), eight alternatives in Section B (middle section), and seven alternatives in Section C (southern section).
- Preliminary alternatives were evaluated and identified a set of reasonable alternatives. The set of reasonable alternatives consisted of 10 Build Alternatives, Alternatives 2 through 11, and a No-Build Alternative, Alternative 1, for a total of 11 reasonable alternatives.
- The reasonable alternatives were analyzed by desktop GIS evaluation and limited field verification and Recommended Alternative 10 was selected and shown at the public hearing.
- Following the public hearing, Recommended Alternative 10 was revised to create the Preferred Alternative 10R.

Throughout the process, input was solicited from the public, agencies, and elected officials and integrated into the various steps in the process. Evaluation criteria for the preliminary alternatives and the reasonable alternatives included environmental, traffic, engineering and public and agency input.

ES.3.2 Alternative Transportation Modes Considered

The following ranges of alternative transportation modes were considered in addition to the reasonable alternatives in order to fully evaluate the purpose and need of the proposed project:

- **Transportation System Management (TSM) Measures –** Examples of TSM measures include, but are not limited to, emergency management, incident management, road weather management, special events management, managed lanes, work zone management, demand management, congestion pricing, active transportation and demand management, and integrated corridor management (TRB 2012). TSM measures implemented at critical locations can improve traffic operations and safety of existing infrastructure through multimodal and intermodal systems and services (TRB 2012). While the TSM Alternative, including the TSM improvements in the 2035 RTP, is expected to ease congestion and travel time for local trips, this alternative does not adequately address critical issues identified in the project purpose and need statement such as inadequate system linkage, decreased regional mobility, compromised safety, and a lack of infrastructure to support population growth.
- **Travel Demand Management Alternatives (TDM) -** TDM measures are strategies and programs that encourage commuters to use alternatives to driving alone, especially during periods of heaviest congestion. TDM measures identified in the 2035 RTP Update for the Grand Parkway Segments H and I-1 study area include the Liberty County Park and Ride Facility to be located southwest of Dayton along US 90, and the Atascosita Park and Ride Facility to be located on FM 1960 west of Lake Houston Parkway. These measures would not be sufficient to effectively accommodate the projected increase in traffic demand through 2039. The TDM components would not address critical issues identified in the project purpose and need statement such as inadequate system linkage, decreased mobility, compromised safety, and a lack of infrastructure to support population growth.
- **Smart Street Alternatives -** Smart Street enhancements in the 2035 RTP Update focus on a range of operational management techniques to reduce delay including traffic light synchronization, deployment of roundabouts, medians, consolidation of duplicate driveways, and partial grade separation of traffic lanes at some intersections. Although the implementation of Smart Streets would improve traffic operations along these study area roadways, the enhancements would not address the study area linkage needs and would not provide the additional circumferential capacity to handle the projected traffic demand.
- **Modal Alternatives -** Modal transportation improvements include bus transit, rail transit, bicycle, pedestrian and high occupancy vehicle (HOV) lanes. The 2035 RTP Update incorporates the 2035 Metropolitan Transit Authority of Harris County (METRO) Long Range Plan, which include the 2025 METRO Solutions Plan and future mobility needs identified in regional planning efforts. This category of alternatives was eliminated from further consideration because of failure to meet the project purpose and need. Modal alternatives would not provide an alternate hurricane/emergency evacuation route to meet the

compromised safety component of the purpose and need. Bicycle and pedestrian treatments are not treated as a stand-alone alternative transportation mode but can be incorporated into the design phase.

- **Preferred Alternative -** Segments H and I-1 of the Grand Parkway are planned by TxDOT and the Grand Parkway Association (GPA) as a controlled-access toll facility to be constructed on new location, consistent with the 2035 RTP Update. The Preferred Alternative includes all committed improvements identified in the No-Build Alternative such as added capacity projects, TSM, TDM, and Smart Streets. The proposed project is specifically targeted at relieving local and regional congestion, improving mobility and system linkage, and improving safety on congested roadways within the region, including an improved emergency evacuation route. The Preferred Alternative is the only alternative that meets the purpose and need of the project. The Grand Parkway Segments H and I-1 are specifically included on the 2035 RTP as a four-lane tolled facility. Due to funding limitations, a free or non-tolled Preferred Alternative was not considered as part of this study.

ES.3.3 No-Build Alternative

The No-Build Alternative would not construct a new location toll facility; however, it includes all committed projects included in the 2035 RTP Update, with the exception of Segments H and I-1 of the Grand Parkway. The RTP improvements include added capacity projects (such as new roadways and roadway widening) as well as committed TSM, TDM, Smart Streets, and modal improvements such as transit. The improvements are already a part of the ongoing plan for upgrades to the existing roadway system. Although the No-Build Alternative would not satisfy the purpose and need of the proposed action, it was retained as a basis for comparison with the alternatives carried forward for detailed study. The No-Build Alternative was designated Alternative 1 as a part of the set of reasonable alternatives studied in the DEIS.

ES.3.4 Preferred Alternative

The Preferred Alternative 10R is the best alternative that fulfills the purpose and need of the proposed project. Ten reasonable alternatives were developed to analyze the physical, biological, and human environments that may be affected by the construction and operation of each alternative, shown in **Table ES-1**. Following the public hearing and a meeting with affected property owners, Recommended Alternative 10 was realigned to avoid impacts disclosed during the hearing, and renamed 10R.

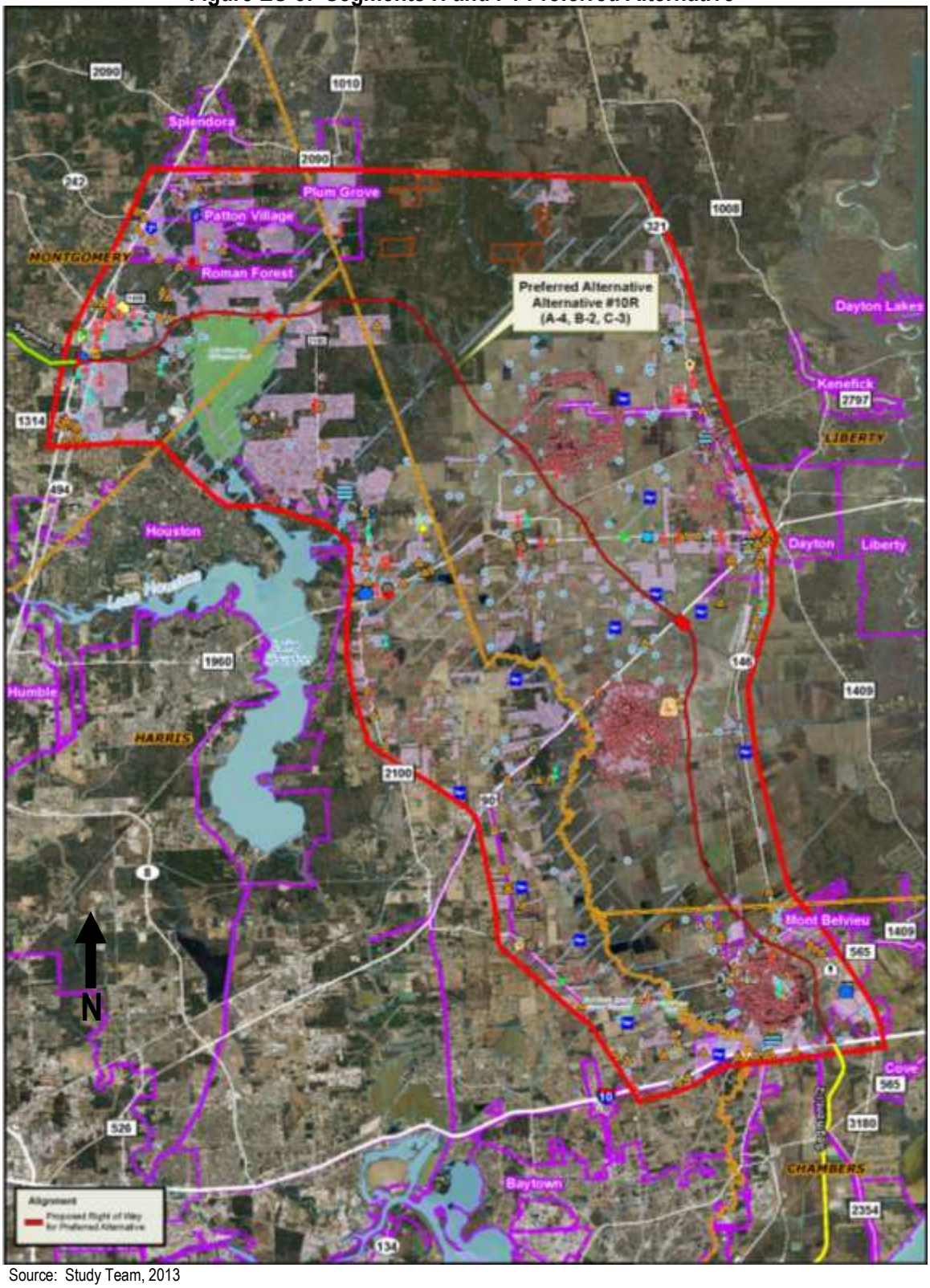
Table ES-1: Reasonable Alternatives

Alternative	Description	Length (miles)
1	No-Build	0
2	A-2, B-1, C-2	38.2
3	A-2, B-1, C-3	39.4
4	A-2, B-2, C-2	35.4
5	A-2, B-2, C-3	36.6
6	A-2, B-5, C-6	35.4
7	A-4, B-1, C-2	39.7
8	A-4, B-1, C-3	41.0
9	A-4, B-2, C-2	36.9
10	A-4, B-2, C-3	37.4
10R*	**A-4, B-2, C-3**	**37.4**
11	A-4, B-5, C-6	37.0

* Preferred Alternative
Source: Study Team, 2012

The Preferred Alternative combines sections A-4, B-2, and C-3 and is approximately 37.4 mi in length, and begins at Community Drive on US 59/I-69 (N), approximately 1.5 mi south of FM 1485. It then bridges over Loop 494 and the Union Pacific Railroad (UPRR) line and continues in a northeasterly direction for approximately 3 mi crossing Caney Creek. The alignment proceeds, turning east near Peach Creek where it overlaps with FM 1485 north of Lake Houston Wilderness Park for approximately 3.5 mi and also crosses the East Fork San Jacinto River. The Preferred Alternative continues east of FM 1485 for roughly 2.5 mi before turning southeast for approximately 13 mi crossing over the UPRR line, FM 1960, and US 90 approximately 3 mi east of Dayton. Approximately 3 mi south of US 90, it turns in a southwesterly direction crossing FM 1413 and traversing south while staying west of the UPRR line. It then turns east bridging over the railroad and crosses SH 146 and FM 565 west of Mont Belvieu, and eventually terminates at I-10 (E) near the I-2 segment of Grand Parkway. Approximately 3 mi of the Preferred Alternative follows existing FM 1485 with the remaining 34.4 mi on new location. The Preferred Alternative includes the reconstruction of FM 1485 from a two-lane roadway, to a pair of one-way non-tolled frontage roads with two travel lanes in each direction on either side of the Grand Parkway Segments H and I-1 toll facility. Both segments of the Grand Parkway are proposed as a toll facility, however the existing portion of FM 1485 would become part of the non-tolled frontage road system and would not be tolled. The Preferred Alternative would require approximately 1,933 acres (ac) of ROW.

Figure ES-3: Segments H and I-1 Preferred Alternative



Source: Study Team, 2013

ES.3.5 Traffic and Transportation Analysis

The study area is bound by US 59/I-69 (N) and I-10 (E) and these radial roadways are only circuitously connected by minor arterials and collector roadways within the study area, such as FM 1485, FM 2100, FM 3360, FM 1413, Loop 494, and SH 146. To accomplish circumferential movements to and from the study area, travelers must use the radial roadways, such as US 59/I-69 (N), US 90, and I-10 (E) to reach the minor arterial and collector roadways. The existing transportation system within the study area does not provide efficient connections to the suburban communities of Kingwood, New Caney, and Huffman, or to the cities of Dayton and Mont Belvieu.

Freight traffic is transported via trucks from I-10 (E) and the Port of Houston through the study area to the major industrial complexes, as well as to US 59/I-69 (N) for national distribution. Trucks currently use the existing two-lane local roadways in the study area which present traffic operation and safety issues. Major industrial complexes within the Segments H and I-1 study area include a Chevron refinery plant located along I-10 (E), the Dow Industrial Chemical Plant, an Exxon refinery plant, Wal-Mart Distribution Center north of Dayton, and numerous gas storage facilities associated with two salt dome formations in Mont Belvieu and west of Dayton.

A summary of transportation benefits for the proposed Segments H and I-1 are listed as follows:

- The Grand Parkway would result in time savings for travel along study area interstates, arterials and collector roads. Daily vehicle hours traveled (VHT) along interstates is projected to reduce by 7 percent (1,265 hours) in 2039. Overall, these results show that the proposed Segments H and I-1 would improve mobility for the traffic study area and reduce congestion on the roadway network.
- Overall, the H-GAC 2035 travel demand model analysis results, extended to year 2039 (**Section 2.3**) demonstrate that the construction of the Preferred Alternative would result in reduced traffic volumes within the traffic study area roadway network ranging from 5 percent to 12 percent when compared to the No-Build Alternative. The No-Build Alternative includes all projects in the 2035 RTP Update excluding the Grand Parkway.
- Diverting traffic from collector roadways to a limited-access facility such as Grand Parkway Segments H and I-1 would be expected to reduce the study area roadway crash rates.

ES.4 ENVIRONMENTAL IMPACTS OF THE PREFERRED ALTERNATIVE

The FEIS document analyzes the Preferred Alternative (10R) for environmental impacts following the public hearing. The potential environmental impacts associated with the construction and operation of the Preferred Alternative have been evaluated and are summarized in **Table ES-2**. The information is divided

into the following technical disciplines: Land Use; Natural Resources; Cultural Resources; Noise; Socioeconomic/EJ; Water Wells, and Hazardous Materials.

Table ES-2: Environmental Impact Summary of the Preferred Alternative

		Environmental Impact	Alternative 10R Preferred Alternative
		Total Project Length (miles)	37
		Total Project ROW (acres)	1,933
Land Use		Commercial (acres)	7
		Agricultural (acres)	1,072
		Residential (acres)	130
		Schools (number)	2
		Churches (acres)	3
		Industrial (acres)	22
		Preliminary Platted (acres)	0
		Undeveloped Platted (acres)	0
		Managed Lands (acres)	11
		Other Undeveloped (acres)	687
		Visual and Potential Access Impacts (yes/no)	Yes
Natural Resources	Wetlands	Forested Wetlands (acres)	27
		Non-Forested Wetlands (acres)	16
		Agricultural wetlands (acres)	285
	Streams	Impaired Streams Impacted (number)	0
		Ecologically Significant Streams Crossed (number)	3
		Threatened and Endangered Species (number)	0
		Species of Concern (number)	0
		Wildlife Habitat (acres)	665
		Floodway (acres)	43
		100-Year Floodplain (acres)	158
		Prime Farmland (acres)	960
		Century Farms (number)	0
Cultural Resources		Recorded Archaeological Sites (number)	0
		Archeological High Probability Areas (acres)	1,696
		Historic Resources (number)	1
		Cemeteries (number)	0
Noise		Potential Noise Impacts (number)	38
Socioeconomic/EJ		Residential Displacements (number)	77
		Commercial Displacements (number)	19
		Churches Displaced (number)	1
		Changes in Community Cohesion (yes/no)	No
		Environmental Justice Issues (yes/no)	No
Water Wells		Public (number)	7
		Private (number)	0
HazMat		Regulated Sites (number)	9
		Oil Wells (number)	11
		Other Sites of Concern (number)	9

Source: Study Team, 2013

ES.4.1 Hydrology and Drainage

The Preferred Alternative would not impact hydrology and drainage.

ES.4.2 Waterbody Modifications

The Preferred Alternative would not impact waterbody modifications.

ES.4.3 Wild and Scenic Rivers

The Preferred Alternative would not impact wild and scenic rivers.

ES.4.4 Coastal Barriers

The Preferred Alternative would not impact coastal barriers.

ES.4.5 Coastal Zone Management

The Preferred Alternative would not impact coastal zone management.

ES.4.6 Essential Fish Habitat

The Preferred Alternative would not impact essential fish habitat.

ES.4.7 Threatened and Endangered Species

The Preferred Alternative would have no effect on any federally listed threatened or endangered species, nor would it adversely impact any state-listed species.

ES.4.8 Land Use

The Preferred Alternative would require 1,933 acres (ac) of proposed ROW. As a result of the predominance of agricultural land in the area, the Preferred Alternative would result in the reduction of agricultural and undeveloped land. Most of the land converted to highway ROW would be agricultural (1,072 ac) or undeveloped platted and other undeveloped (687 ac). The No-Build Alternative would have no impacts to land use associated with the proposed project.

ES.4.9 Soils and Farmland Impacts

The Preferred Alternative would impact 960 ac of prime farmland soils. The Preferred Alternative would be placed along property lines where possible to minimize the impacts to farms. The No-Build Alternative would not result in soils and/or prime farmland soils impacts associated with the construction or operation of the proposed project.

ES.4.10 Social Impacts

ES.4.10.1 Community Cohesion

The Preferred Alternative would be placed along existing transportation corridors, such as Community Drive and FM 1485, in the urban portion of the study area to avoid impacts to community cohesion. The No-Build Alternative would have no community cohesion impacts.

ES.4.10.2 Environmental Justice (EJ)

No environmental justice impacts would result from the proposed Grand Parkway Segments H and I-1 project. One residential displacement is anticipated within census blocks containing significant minority populations. However, none of the displacements are located within a block group with a median household income below that of the Department of Human Health Services 2013 poverty guideline of $23,550. No specific environmental justice issues have been raised throughout TxDOT or Grand Parkway Association's communication with adjacent property owners, adjacent municipalities, and other public agencies with interests along the proposed project's corridor.

The majority of trips originating or destined for Segments H and I-1 are not from areas with identified high proportions of EJ populations. Users would benefit from the proposed Grand Parkway project as a result of improved system linkage and mobility, enhanced safety and additional infrastructure to support population growth in the area. There do not appear to be any disproportionately high and adverse impacts on minority or low-income populations associated with the proposed project. The No-Build Alternative would have no impacts to environmental justice communities.

ES.4.10.3 Displacements

Small concentrations of potential residential and commercial displacements would occur in two areas. Section A-4, in the northern portion of the study area, could cause potential commercial and residential relocations along FM 1485. Section B-2 would potentially cause a small cluster of residential displacements on County Road (CR) 6022 between FM 1960 and US 90 in the central portion of the project area. The Preferred Alternative would displace 77 residences, 19 commercial businesses, and 1 church. No project-related residential or commercial displacements would occur as a result of the No-Build Alternative.

ES.4.11 Economic Impacts

Economic impacts related to the development of Segments H and I-1 include short-term construction-related employment, an increase in other forms of employment, a reduction in travel costs, and additional local and regional income generation from sources such as transportation-related taxes. Economic impacts estimated for the Preferred Alternative do not fluctuate substantially in magnitude and vary only in direct proportion to the level of proposed highway construction expenditures. The No-Build Alternative would have no economic impacts.

ES.4.12 Pedestrian and Bicyclist Impacts

"Proposed Shared-Use Path/Trails" as identified on H-GAC's Regional Bikeway Map (2007) would not be affected by the Preferred Alternative. These include a shared-use path/trail along FM 2100 that would begin near the intersection of FM 2100 with Huffman-Cleveland Road on the western edge of the study area, approximately 3 mi west of the Preferred Alternative, and head south.

The Grand Parkway Segments H and I-1 project, as proposed, would accommodate existing and future crossings for both pedestrians and bicyclists at intersections, bridges, and over/underpasses affecting or providing direct access to designated pedestrian or bicycle facilities. In the event that a bicycle or pedestrian facility is in place prior to the proposed project, the facility would be reconstructed to maintain continuity and function. The proposed project would minimize adverse effects to bicyclists and pedestrians by providing crosswalks walk signals, and appropriate signage at grade separated intersections (entrance ramp access points). The No-Build Alternative would result in higher traffic volumes on local roadways which would create safety issues for pedestrians and bicyclists.

ES.4.13 Visual and Aesthetic Impacts

The Preferred Alternative of Segments H and I-1 would be constructed predominately at-grade with vegetated roadsides, ROW, and medians. The amount of elevated roadway structure would be limited to areas where the proposed roadway would cross another roadway or a rail line. As currently proposed, the roadway lighting system would be restricted to those areas where entrance/exit ramps are located and would consist of low impact, downward directional lighting. The No-Build Alternative would not directly alter any visual resources; however, increased traffic congestion associated with the No-Build Alternative and the current development pressures in the region could lead to short-term and long-term impacts on the visual quality of the area road network and all viewers and users of roads in the network.

ES.4.14 Air Quality Impacts

The proposed project is consistent with the H-GAC's financially constrained 2035 RTP Update as revised and fiscal year (FY) 2013-2016 Transportation Improvement Program (TIP). The proposed project is located within Montgomery, Harris, Liberty, and Chambers counties, which are designated as nonattainment for ozone within the H-GAC's Transportation Management Area (TMA); therefore, the transportation conformity rule does apply. According to TxDOT's 2006 *Air Quality Guidelines*, a traffic air quality analysis is not required if the design year average daily traffic (ADT) is less than 140,000 vehicles per day (vpd). The 140,000 ADT threshold is based on a TxDOT modeling study which demonstrated that it is highly unlikely that the carbon monoxide (CO) standard would ever be exceeded on any project with traffic numbers below this level. According to the H-GAC Travel Demand Model (2012), the design year traffic (2039) is estimated to be approximately 31,443 vpd between US 59/I-69 and US 90 and 22,441 between US 90 and I-10; therefore, a traffic air quality analysis is not required.

Design year ADT volumes are less than 140,000 vpd for the Preferred Alternative; therefore, a qualitative mobile source air toxics (MSAT) analysis was performed. MSAT as a result of a proposed Grand Parkway are not expected to increase overall MSAT in the Houston area in the future years investigated. Under the No-Build Alternative, MSAT are expected to decline at nearly the same rate as the Preferred Alternative with no direct effect to air quality in the Houston area.

ES.4.15 Noise Analysis

As development and growth are projected to increase in the study area, it is expected that ambient noise levels would increase within areas of concentrated development associated with this projected growth. Noise levels were modeled for residential and commercial receivers adjacent to the Preferred Alternative. The Preferred Alternative would result in traffic noise impacts.

ES.4.16 Water Quality Impacts

The Preferred Alternative, 10R, crosses three ecologically substantial stream segments. Effects to surface water runoff and groundwater from the Preferred Alternative would be minimal. Quality and quantity of storm water runoff would be altered by the alternative in two ways: 1) direct effects from construction; and 2) effects from long-term operation of the roadway. Groundwater pollution prevention measures may be required for the public wells included in the Storm Water Pollution Prevention Plan (SWPPP) for which capture zones, defined by the Texas Commission on Environmental Quality (TCEQ), are overlapped by

alternatives; this includes seven public wells and three private wells. The Preferred Alternative would result in transverse floodplain encroachment crossings at each of the six streams within the Segments H and I-1 project area. No stream relocations are anticipated by the Preferred Alternative or the No-Build Alternative. The Preferred Alternative would impact 23 water resource crossings. The watersheds within the Segments H and I-1 project area are comprised of residential and commercial development and undeveloped acreage, such as farmlands and wooded areas. The Preferred Alternative would increase the amount of impervious areas within the watersheds, resulting in increased surface runoff. The increased surface runoff would not be considered substantial due to the required drainage (mitigation) facilities that would be incorporated into the project design. The Preferred Alternative has the potential to impact overland sheet flow patterns due to the construction of the roadway and associated structures. Therefore, sheet flow patterns would be considered during the design phase of the project. The No-Build Alternative would have no impacts to water quality.

ES.4.17 Wetlands Impacts

Site access has been obtained for 49 percent of the Preferred Alternative alignment. Potential wetland impacts were quantified by combining the results of the field delineation with review of color infrared aerial photographs, National Wetlands Inventory (NWI) maps, and published soil survey maps to determine the location of potential wetlands within the Preferred Alternative alignment. The Preferred Alternative would impact approximately 283 ac of adjacent agricultural wetlands, 16 ac of non-forested wetlands, and 39 ac of forested wetlands. The No-Build Alternative would have no impacts to wetlands.

ES.4.18 Permits

A Clean Water Act (CWA) Section 404 permit would be required by the USACE for the Preferred Alternative. Water quality certification from the TCEQ would also be necessary per Section 401 of the CWA prior to filling wetlands. No navigable Waters of the United States (U.S.) exist in the project area; therefore, the need for a Section 9 permit from the U. S. Coast Guard (USCG) or a Section 10 permit from the USACE is not anticipated.

Construction would impact greater than five acres; therefore, a Texas Pollutant Discharge Elimination System (TPDES) storm water discharge permit is required. The TPDES permit requires an NOI and completion of a SWPPP in order to avoid adverse impacts potentially resulting from storm water runoff discharges. There would be no anticipated permits under the No-Build Alternative.

ES.4.19 Vegetative Community Impacts

The Preferred Alternative, 10R, would directly impact approximately 1,025.27 ac of agricultural vegetation, 635 ac of forest, 24 ac of riparian zone, and 15 ac of non-forested wetland, for a total vegetative community impact of 1699 ac. The No-Build Alternative would not impact vegetative communities.

ES.4.20 Wildlife

The primary significant impacts to wildlife species inhabiting the project area are loss of habitat and habitat fragmentation. The Preferred Alternative would impact approximately 690 acres of wildlife habitat. The wildlife habitat is comprised of bottomland hardwood forests, upland pine/hardwood forests, Gulf Coast prairie rangelands, and cultivated cropland habitats. The No-Build Alternative would not impact wildlife.

ES.4.21 Floodplains

Avoidance of floodways and floodplains during the development of the Preferred Alternative was carefully balanced with avoidance of other sensitive resources in the project areas. The Preferred Alternative would encroach on the following streams and their associated regulatory floodways and floodplains: Peach Creek, Caney Creek, East Fork San Jacinto, Luce Bayou, East Fork Cedar Bayou, and Cedar Bayou.

The Preferred Alternative would potentially impact approximately 43 ac of floodway and 158 ac of 100-year floodplain. The proposed project would have little to no impact to regulatory floodways as these would be bridged. Further avoidance and minimization of floodplain encroachments would be considered during preliminary and final design of the selected Preferred Alternative. Under the Preferred Alternative, rainfall runoff rates would be expected to increase slightly due to an increase in impervious pavement surface area; however, the increased runoff would be mitigated and not alter or affect the natural and beneficial floodplain functions, values, or characteristics. The proposed project would not increase the water surface elevation of the base flood more than 1-ft at any point. The No-Build Alternative would not impact floodways or floodplains.

ES.4.22 Non-Archeological Historic Resources

There is one site with two National Register of Historic Places (NRHP) recommended eligible resources within the project Area of Potential Effect (APE). Resources 030a and 030b are located on the south side of FM 1485, outside the proposed project ROW but within the APE. There would be no direct effect to Resources 030a and 030b as a result of this project. They would be separated from the proposed project location by existing FM 1485, which would become a frontage road. There would be no direct effect to this

resource due to the construction of the project. In addition, there would be no indirect effect to the resource. The resource's original orientation towards the FM 1485 would not change and therefore, its original setting and association would not change. The No-Build Alternative would not impact non-archeological historic resources.

ES.4.23 Section 4(f)

A *de minimis* Section 4(f) evaluation was prepared to address the potential impacts from the proposed project, as well as efforts to avoid, minimize, and mitigate impacts to the Lake Houston Wilderness Park. The proposed construction of the Preferred Alternative would potentially impact 10.84 ac of the park; however, it would not adversely affect the features, attributes, or activities that qualify the Lake Houston Wilderness Park as a recreation area, and subsequently a Section 4(f) resource. The Preferred Alternative would improve access to the Lake Houston Wilderness Park by enhancing the existing access points, which complies with the City of Houston's Lake Houston Park Master Plan dated March 24, 2009. The improved park entrance design would be determined at a later date during the design phase of the project, with coordination with TxDOT, TPWD, and the City of Houston. No other parks or recreation areas publicly owned parklands, wildlife or waterfowl refuges, recreational areas, or known historic sites would be directly impacted by the Preferred Alternative. The No-Build Alternative would not impact publicly owned parklands, wildlife or waterfowl refuges, recreational areas, or known historic sites. The No-Build Alternative, however, would not provide the opportunity to enhance access to the Lake Houston Wilderness Park.

ES.4.24 Hazardous Material Impacts

The No-Build Alternative would not result in hazardous materials impacts associated with the construction or operation of the proposed project. The Preferred Alternative would have minimal risks for hazardous materials impacts. Impacts would most likely occur on or near existing hazardous materials sites. There were 18 total sites identified within or near the Preferred Alternative. However, only nine of the 18 sites fall within the proposed ROW of the Preferred Alternative. These sites create a higher potential for encountering hazardous contamination during construction. All nine of the sites may affect the Preferred Alternative, and should be further reviewed prior to ROW acquisition.

The Railroad Commission of Texas (RRC) records (2012) indicate that there are 24 well sites located within or adjacent to the ROW for the Preferred Alternative. The Preferred Alternative, 10R, would have 10 impacted wells.

Asbestos and lead-based paint investigations for all structures impacted by the Preferred Alternative would be addressed during the ROW acquisition process prior to construction.

The Build Alternatives cross/impact approximately 64 petroleum pipeline segments. During further project development, owners and/or operators of these pipelines would be contacted. During ROW negotiation, determinations would be required to make necessary adjustments and/or relocations of these pipelines. If proper precautions are taken, impacts related to petroleum lines within the project area should be minimal.

There would be no anticipated impacts from hazardous materials or pipelines with the No-Build Alternative.

ES.4.25 Railroads

The Preferred Alternative would cross four rail lines in the project corridor owned by UPRR. In each case, the individual track would not be impacted by the proposed project, due to an elevated roadway structure anticipated at the crossing locations. TxDOT would coordinate with UPRR for access, design, and construction phasing during the design/build phase of the project. Therefore, no long term adverse impact to any railroad line or operation is anticipated from the Preferred Alternative or the No-Build Alternative.

ES.4.26 Energy

The Preferred Alternative would have greater energy consumption as compared to the No-Build Alternative. Approximately 4.7 percent more British thermal Units (Btu) per day are predicted to be consumed under the reasonable alternatives than under the No-Build Alternative. Approximately 14,000 more gallons of fuel would be consumed under the Preferred Alternative due to the increase in VMT/day.

The No-Build Alternative would not result in energy impacts associated with the construction or operation of the proposed project. The No-Build Alternative would not have the short-term energy impacts from construction, but it also would not benefit from operation energy efficiencies gained through an improved transportation facility over many decades.

ES.4.27 Construction Impacts

Construction impacts may include temporary degradation of air and water quality, increase in the noise levels, impedance to mainstream traffic operation, safety concerns resulting from changes in traffic flow patterns, aesthetic issues due to stockpiling and disposal of construction materials, as well as mitigation in project specific locations. Construction activities would temporarily affect residents and businesses along

the project corridor as well as travelers in the vicinity.

Air Quality: Construction activities associated with the facility could have a short-term impact on local air quality during periods of site preparation. Particulate matter, also known as fugitive dust, has the greatest impact during construction activities. Any effects of fugitive dust would be temporary and would vary in scale depending on local weather conditions, the degree of construction activity, and the nature of the construction activity. During construction, the contractor would be required to adhere strictly to dust control measures to minimize this effect.

Noise: Heavy equipment operations and certain construction activities, such as pile driving and the vibratory compaction of embankments, would result in temporary noise increases within the area.

Water Quality: Effects to water quality resulting from erosion and sedimentation, as well as from pollutants such as chemicals, fuels, lubricants, raw sewage, and other harmful waste, would be strictly controlled.

Maintenance and Control of Traffic: Maintenance of the current flow of traffic on the existing roadway network would be planned and scheduled to minimize adverse impacts to the traveling public.

Health and Safety: All reasonable safety considerations and safeguards necessary would be taken to protect the life and health of employees on the job, the safety of the public, and the protection of property in connection with roadway construction.

There are no construction impacts with the No-Build Alternative.

ES.4.28 Relationship of Local Short-Term Uses Versus Long-Term Productivity

Construction of the proposed Segments H and I-1 Preferred Alternative would cause limited short-term adverse effects on the environment. The short-term uses of the environment associated with the Preferred Alternative include construction-related noise, air quality impacts, water quality impacts, and visual impacts. In comparison to these short-term impacts, the most evident long-term benefit of the Preferred Alternative is the improved local and regional system linkage, decreased congestion, safety, and improved emergency evacuation. In addition, several long-term economic benefits would result from the construction of the proposed project. There are no impacts with the No-Build Alternative.

ES.4.29 Irreversible and Irretrievable Commitments of Resources

Construction of the proposed Segments H and I-1 Preferred Alternative 10R would involve an irreversible and irretrievable commitment of resources. These include a range of physical, human, natural, and economic resources. The commitment of land for the proposed ROW would be 1,933 acres. This land includes residential and business properties, farmland, natural and forested landscapes. Land occupied by the proposed Segments H and I-1 would be considered an irreversible commitment during the period that the land is used for a highway facility. However, if a greater need arises for use of the land, or if the highway facility is no longer needed, the land could be converted to another use.

The natural resources required for construction includes aggregate, cement, asphalt, sand, and iron ore for steel products. Once used for construction, these resources cannot be replaced as natural resources. They are not in short supply, and their use would not have an adverse effect upon the continued availability of these resources. Construction would also require an expenditure of fossil fuel. Although this is an irretrievable resource, the amount expended toward construction could be offset by the benefits to improved mobility in the region that could improve fuel efficiency. The commitment of these resources is based on the concept that residents in the immediate area, state, and region would benefit by the improved quality of the transportation system. These benefits would consist of improved mobility and safety, system linkage resulting in savings in time, and providing infrastructure to support population growth that are anticipated to outweigh the commitment of these resources. There would be no impact with the No-Build Alternative.

ES.4.30 Indirect and Cumulative Impacts

The induced growth was mapped through information gathered from meetings with local elected officials, participating agencies and an expert panel survey. The potential indirect effects due to the proposed Segments H and I-1 may include the following:

- Development and land use changes due to improved access;
- Impacts due to tolling;
- Runoff increases due to changes in land use and increased development on land surrounding the proposed facility;
- Increased sedimentation of wetlands and streams and decreased water quality due to future development of land adjacent to the new facility;
- Increased use of parks and recreational areas due to more convenient access provided by the new facility; and

- Stimulation of the local economy from the circulation of construction spending; improved access to employment opportunities, markets, goods, or services such as health and education; an increased work force related to construction; and development stemming from the new facility.

For the Preferred Alternative, four major resources/issues were identified that warranted a detailed discussion that includes: land use; air quality (Mobile Source Air Toxics); surface water; and environmental justice due to tolling. There would be no impacts with the No-Build Alternative.

ES.4.31 Mitigation

When impacts are unavoidable, steps would be taken to minimize impacts and mitigate for impacts, as required under the National Environmental Policy Act (NEPA), FHWA, and TxDOT guidelines. Every effort has been made in the selection of alternatives and the identification of the Preferred Alternative to avoid or minimize adverse effects to the human and natural environments. Where impacts to resources require coordination and permitting, required processes would be followed with the appropriate agency with resource jurisdiction.

ES.4.32 Summary of Environmental Consequences

Impacts to the social, economic, natural, and cultural environment would result from construction of the Preferred Alternative and are evaluated in detail in this document. **Table ES-2** summarizes the potential impacts of the Preferred Alternative. The Preferred Alternative was developed within the Segments H and I-1 study area through avoidance and minimization of impacts to a number of resources, while addressing the project's purpose and need and providing feasible engineering alternatives. The Preferred Alternative 10R best satisfies the purpose and need while balancing the project's benefits and overall impacts. The No-Build Alternative would have fewer impacts as compared to the Preferred Alternative, 10R; however, the No-Build Alternative would not meet the purpose and need of the proposed project.

ES.5 AGENCY AND PUBLIC COORDINATION

FHWA, TxDOT, and GPA have engaged governmental agencies, resource agencies, and the public in an extensive coordination effort to inform others of progress in the planning process and solicit input from them. The Segments H and I-1 project has been open to comments by any person and to all views on the proposed project, alternatives development, environmental impacts, and any other matter concerning the proposed project. FHWA, TxDOT, and the GPA have considered all comments to date and would continue to consider all comments through the project development process.