

## 1 **EXECUTIVE SUMMARY**

2 The Texas Department of Transportation (TxDOT), as the lead agency, is proposing improvements to  
3 create additional roadway capacity to manage congestion, enhance safety, and improve mobility and  
4 operational efficiency on Interstate Highway 45 (I-45) from U.S. Highway 59 (US 59)/I-69 to Beltway 8  
5 North, including improvements along US 59/I-69 between I-45 and Spur 527 in Harris County, Texas. The  
6 proposed North Houston Highway Improvement Project (NHHIP) includes roadway improvements to add  
7 four managed express (MaX) lanes on I-45 from Downtown Houston to Beltway 8 North, reroute I-45 to  
8 be parallel with I-10 on the north side of Downtown Houston and parallel to US 59/I-69 on the east side  
9 of Downtown Houston, realign sections of I-10 and US 59/I-69 in the Downtown area to eliminate the  
10 current roadway reverse curves that limit capacity (a reverse curve is a section of the horizontal alignment  
11 of a highway in which a curve to the left or right is followed immediately by a curve in the opposite  
12 direction), and depress US 59/I-69 between I-10 and Spur 527 south of Downtown to remove the  
13 problematic weaving sections. The proposed project also includes reconstruction of mainlanes and  
14 frontage roads, the addition of bicycle/pedestrian realms along the 44 Downtown streets that cross the  
15 freeways, including a 15–17 foot wide pedestrian realm that will create a buffer between the  
16 bicycle/pedestrian traffic and the vehicular traffic, add sidewalks along frontage roads, and add pass-  
17 through lanes on I-10 that will separate traffic desiring to go to Downtown from traffic destined to go  
18 through Downtown.

19 To facilitate in the design and analysis of alternatives, the project area was divided into three segments  
20 and, in general, the segment limits are (from north to south): Segment 1: Beltway 8 North to I-610,  
21 Segment 2: I-610 to I-10, and Segment 3: Downtown Loop System (I-45, I-10, and US 59/I-69). Multiple  
22 alternatives were generated for each study segment, from which three Reasonable Alternatives per  
23 segment were selected for detailed evaluations and documented in the Draft Environmental Impact  
24 Statement (EIS). All of the alternatives would require the acquisition of new right-of-way (ROW) to  
25 accommodate the proposed project. There were 31 alternatives in the “Universe of Alternatives”; 21 were  
26 “Preliminary Alternatives,” and three “Reasonable Alternatives” were evaluated.

27 This Final EIS builds on the documentation in the Draft EIS. Technical reports were updated to focus on  
28 the Preferred Alternative and posted online for public comment. Those technical reports are included as  
29 attachments to this Final EIS. The current recommended designs are discussed in detail in Section 2 of this  
30 Final EIS.

31 Since the release of the NHHIP Draft EIS in 2017, TxDOT has continued public engagement through  
32 community meetings and by posting updated technical reports for public comments.

33 Feedback received during that robust public engagement period resulted in project design changes as well  
34 as new information on the project’s environmental concerns, impacts, and mitigation. This input resulted  
35 in changes to the EIS.

36 Following a minimum of 30 days after notice of availability of the Final EIS is published in the Federal  
37 Register, TxDOT will issue a Record of Decision (ROD). The ROD will identify the selected alternative;  
38 present the basis for the decision; identify the alternatives considered; specify the environmentally

1 preferable alternative; and provide information on the adopted means to avoid, minimize, and  
 2 compensate for environmental impacts. The release of the Final EIS and subsequent signature of the ROD  
 3 are milestones in the National Environmental Policy Act process for the EIS.

4 Achieving environmental clearance (the ROD) is a necessary step for the project to begin detailed project  
 5 design and utility work. Although the ROD is the final step in the EIS process and will result in a selected  
 6 alternative, future changes and refinements to the project can still occur.

7 In the event a build alternative is selected by TxDOT in the ROD, TxDOT will proceed with the proposed  
 8 mitigation measures outlined in the Final EIS to minimize and compensate for noise, air quality, travel  
 9 patterns, and socioeconomic impacts to communities. TxDOT also anticipates continued refinements and  
 10 improvements to the project as the project design continues to develop and additional input is received  
 11 from the public and other stakeholders.

12 The environmental review, consultation, and other actions required by applicable federal environmental  
 13 laws for this project are being, or have been, carried out by TxDOT pursuant to 23 U.S. Code (U.S.C.) 327,  
 14 and a Memorandum of Understanding (MOU) dated December 9, 2019 and executed by Federal Highway  
 15 Administration (FHWA) and TxDOT.

## 16 **ES 1 Project Background**

17 From 2002–2005, the Metropolitan Transit Authority of Harris County (METRO), TxDOT, and the Houston-  
 18 Galveston Area Council (H-GAC) conducted a series of planning studies to identify and address  
 19 transportation needs in the North-Hardy Corridor. The conclusions of the studies were that even with  
 20 improved transit and extension of the Hardy Toll Road to Downtown Houston, additional capacity would  
 21 be needed on I-45. The proposed project addressed in this Final EIS includes adding four managed lanes  
 22 to the I-45/Hardy Toll Road corridor. See Section 1.1.1 in the Final EIS for more information about the  
 23 prior planning studies.

## 24 **ES 2 Project Need and Purpose**

25 TxDOT, with input from the public, agencies, and other stakeholders, defined needs (problems) and  
 26 purposes (solutions) for highway transportation improvements in the NHHIP area from Downtown  
 27 Houston northward to Beltway 8 North, as summarized in Table ES-1.

28 **Table ES-1: Summary of Need and Purpose for Proposed Action**

Need	Purpose
<b><i>Congestion</i></b>	
The roadway facility does not provide adequate capacity for existing and future traffic demands, resulting in congestion, longer travel times, and reduced mobility.	Manage I-45 traffic congestion in the NHHIP area through added capacity, options for high-occupancy vehicle (HOV) lanes, and improved operations.

Need	Purpose
The average daily traffic volumes on I-45 in the areas from US 59/I-69 to I-10 and I-610 to Beltway 8 North are projected to increase by approximately 40 percent between 2015 and 2040. The average daily traffic volume on I-45 between I-10 and I-610 is projected to increase by approximately 15 percent during the same period. Congestion on I-45 currently ranges from “moderate” to “serious” conditions. Without improvements, I-45 will have “serious” to “severe” congestion by 2040, as measured by traffic volume and capacity.	Improve mobility on I-45 between US 59/I-69 and Beltway 8 North by accommodating projected population growth and latent demand in the project area.
The reversible HOV lane on I-45 serves traffic in only one direction during the peak periods and is unused for large portions of the day. During peak hours, the HOV lane congestion is classified as “tolerable.” Forecasts for commuter service indicate that even with parallel high-capacity transit in the corridor, managed lanes would be needed to support commuter traffic and express bus service.	Provide expanded transit and carpool opportunities with two-way, all-day service on MaX lanes, and access to METRO Park & Ride facilities.
<b>Design Standards/Safety</b>	
Portions of I-45 do not meet current roadway design standards, creating a traffic safety concern.	Bring I-45 up to current design standards with shoulders and auxiliary lanes to improve safety and operations.
Roadway design deficiencies also include inadequate storm water drainage in some locations. Intense rainfall causes high water levels at the I-45/I-10 underpass and on the outside lanes and frontage roads between Parker Road and Gulf Bank Road. I-45 would not operate effectively as an evacuation route with high water closures, especially during hurricane evacuations when high rainfall events are likely.	Eliminate areas of flooding on the I-45 mainlanes.
All sections of I-45 show a considerably higher crash rate than the statewide average crash rate.	Provide an improved facility with additional capacity and current design standards to reduce the crash rate.
<b>Emergency Evacuation</b>	
I-45 is a designated evacuation route in case of major storm, hurricane, or chemical spill. At its present capacity, evacuation effectiveness would be limited in the event of a hurricane or other regional emergency.	Expand capacity for emergency evacuations by providing proper design and flexible operations.

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## 2 **ES 3 Summary of Alternatives Considered**

3 The alternatives evaluation process is documented in detail in Section 2 of the Final EIS.

### 4 **ES 3.1 BUILD ALTERNATIVES**

5 Beginning in 2011, TxDOT began the process of developing and evaluating a full range of reasonable  
6 project alternatives. Alternatives and the evaluation criteria used in each stage of the analysis were  
7 presented to the public and agencies at meetings in November 2011, October 2012, November 2013, April  
8 2015, and September 2016. One Proposed Recommended Alternative per project segment was identified

1 in the Draft EIS (April 2017). During preparation of the Draft EIS, TxDOT continued conducting public,  
2 agency, and other stakeholder coordination. In response to comments received and further engineering  
3 evaluation, the Proposed Recommended Alternatives were revised and presented in May 2017 at the  
4 Public Hearing and additional public meetings.

5 Based on comments received during the Draft EIS comment period and from continuing stakeholder input  
6 and coordination, the project design was revised between May 2017 and June 2018. The revised  
7 alternatives for each project segment are identified as Preferred Alternatives, and when combined, is the  
8 Preferred Alternative for the proposed NHHIP. Section 2.2.6 details the design changes proposed since  
9 publication of the Draft EIS. Preliminary sizes and locations of storm water detention basins were  
10 identified after the Draft EIS and included as part of the Preferred Alternative. The Final EIS and associated  
11 technical reports document the analysis of the potential impacts of the Preferred Alternative, described  
12 more specifically in section ES 5 below.

### 13 **ES 3.2 NO BUILD ALTERNATIVE**

14 The No Build Alternative represents the proposed NHHIP not being constructed. No roadway  
15 improvements would be constructed to provide additional capacity to reduce congestion and improve  
16 mobility, and the current design deficiencies, including drainage issues in some areas, would not be  
17 corrected. Although the No Build Alternative does not meet the need and purpose, this alternative was  
18 carried forward through the environmental impact analysis as a basis for assessing the impacts of no  
19 action.

## 20 **ES 4 Summary of Environmental Impacts**

21 This summary includes an overview of the resources and issues evaluated by the Study Team and the  
22 environmental impacts of the Preferred Alternative. Information about the analysis of existing conditions;  
23 impacts of the proposed project; and environmental permits, issues, and commitments is included in the  
24 Final EIS, with reference to the Draft EIS where appropriate, plus associated technical reports that are  
25 included as appendices to the Final EIS.

### 26 **ES 4.1 BUILD ALTERNATIVES**

27 Table ES-2 summarizes by segment the impacts of the Preferred Alternative for some of the resources and  
28 issues discussed in this section.

#### 29 **ES 4.1.1 LAND USE**

30 The NHHIP crosses through urban and developing areas. The project area includes residential,  
31 commercial, industrial, public use/institutional, parks/open space, vacant, and undevelopable land uses.  
32 New ROW would be required for all alternatives. All land uses that would be directly impacted by the  
33 NHHIP would be permanently converted to transportation use. See Section 3.1 in the Final EIS for  
34 discussions of existing conditions and direct impacts to land use. See Section 5 in the Final EIS for the  
35 analysis of potential project-related induced development.

### 1 **ES 4.1.2 COMMUNITY RESOURCES**

2 In a community impacts assessment, potential impacts of a proposed action to community resources are  
3 evaluated. The evaluation includes but is not limited to displacements of residences and businesses, loss  
4 of community facilities, isolation and reconnection of neighborhoods, changes in mobility and access, and  
5 noise and visual impacts. Adverse and beneficial impacts are considered. Impacts to neighborhoods and  
6 community facilities, residences and businesses, and environmental justice populations are discussed in  
7 Section 3.2 in the Final EIS. All alternatives would require new ROW which would displace homes, schools,  
8 places of worship, businesses, billboards, and other uses. See Section 3.2.3 in the Final EIS for the  
9 displacements analysis.

10 Executive Order (EO) 12898 Federal Actions to Address Environmental Justice in Minority Populations and  
11 Low-Income Populations requires federal agencies to “make achieving environmental justice part of its  
12 mission by identifying and addressing, as appropriate, disproportionately high and adverse human health  
13 or environmental effects of its programs, policies, and activities on minority populations and low-income  
14 populations” (Office of the President 1994). EO 12898 also directs agencies to develop a strategy for  
15 implementing environmental justice. While minority and low-income individuals and community facilities  
16 in the project area would be adversely impacted by the proposed project, no Reasonable Alternatives  
17 would avoid adverse impacts. Impacts to environmental justice (EJ) populations and sensitive populations  
18 are discussed in Sections 3.2.4 and 3.2.5, respectively, in the Final EIS.

### 19 **ES 4.1.3 ECONOMIC CONDITIONS**

20 All alternatives could require new ROW and could result in loss of property and sales tax revenues for  
21 local jurisdictions. Conversion of taxable property to roadway ROW and displacements of businesses that  
22 are significant sources of sales tax revenue would have a negative impact on the local economy. Tax  
23 revenue losses may be temporary if displaced businesses and residents relocate within the same taxing  
24 jurisdiction. Construction of the proposed project would have direct, indirect, and induced effects on local,  
25 regional, and state employment, output, and income. See Section 3.3 in the Final EIS for discussions of  
26 direct impacts to tax revenues and employment, and indirect impacts to employment and income.

### 27 **ES 4.1.4 TRANSPORTATION FACILITIES**

28 Transportation facilities in the project area include bus and light rail services, freight railroads, an airport,  
29 roadways, bicycle/pedestrian facilities, and transit centers. Transportation facilities in the project area are  
30 illustrated on the project schematics and on exhibits in the Community Impacts Assessment Technical  
31 Report. See Section 3.4 in the Final EIS for a discussion of impacts to transportation facilities.

### 32 **ES 4.1.5 AIR QUALITY**

33 This project is located within Harris County, which is part of the Houston-Galveston-Brazoria area that has  
34 been designated by the Environmental Protection Agency (EPA) as a serious and marginal nonattainment  
35 area for the 2008 and 2015 ozone National Ambient Air Quality Standards (NAAQS), respectively;  
36 therefore, transportation conformity rules apply.

1 The proposed action is consistent with the Houston-Galveston Area Council (H-GAC)'s fiscally constrained  
2 2045 Regional Transportation Plan (RTP) and the 2019–2022 Transportation Improvement Program (TIP),  
3 as amended, which were found to conform to the TCEQ State Implementation Plan (SIP) by FHWA and the  
4 Federal Transit Administration on August 2, 2019. TxDOT received a project-level conformity  
5 determination from FHWA on June 25, 2020.

6 A traffic air quality analysis (TAQA) was completed to assess whether the project would adversely affect  
7 local air quality by contributing to carbon monoxide (CO) levels that exceed the 1-hour or 8-hour CO  
8 NAAQS. Using the steady-state Gaussian dispersion model CALINE3, the analysis factored in worst-case  
9 assumptions along areas of the project with the highest design hour volume of vehicles and narrowest  
10 ROW for each segment. The analysis results for each segment of the project indicate that CO  
11 concentrations are not expected to exceed the national standard and would remain relatively consistent  
12 from the estimated time of completion (ETC) to the design year.

13 A quantitative mobile source air toxics (MSAT) analysis for the nine priority MSAT was conducted for the  
14 affected transportation network of the NHHIP project. This analysis calculated a reduction of over 72  
15 percent for both the build and no build scenarios for total MSAT emissions from 2018 to 2040, even as  
16 vehicle miles traveled (VMT) is projected to increase between 45–58 percent. The H-GAC regional  
17 congestion management process and construction emissions are also discussed in this Final EIS. See  
18 Section 3.5 for more details on the air quality analysis.

#### 19 **ES 4.1.6 NOISE**

20 A traffic noise analysis was conducted in accordance with TxDOT's (FHWA-approved) Guidelines for the  
21 Analysis and Abatement of Roadway Traffic Noise. Existing and future traffic noise levels were determined  
22 for a variety of noise-sensitive land uses adjacent to the NHHIP project, including exterior areas of single-  
23 family homes, apartments, churches, schools, and parks. Traffic noise impacts for the Preferred  
24 Alternative are predicted to occur at locations represented by a total of 222 receiver points across the  
25 three project segments. Noise abatement measures were evaluated for each traffic noise impact. Where  
26 reasonable and feasible, noise barriers are proposed for 76 locations, which would benefit 138  
27 representative receivers. The quantitative examination of potential mitigation measures including traffic  
28 noise barriers was conducted and is discussed in Section 3.6 of this Final EIS.

#### 29 **ES 4.1.7 WATER RESOURCES**

30 Within the proposed project area, the City of Houston operates and maintains the public water system  
31 that distributes public drinking water to end users. According to the Texas Water Development Board's  
32 groundwater database, seven registered water wells are located within the ROW for the Preferred  
33 Alternative, all of which use the Gulf Coast Aquifer as source water. Implementation of storm water best  
34 management practices (BMPs) and spill prevention measures would minimize potential impacts to  
35 groundwater quality. Wells located within the Preferred Alternative that would be unavoidably impacted  
36 by the Preferred Alternative would be plugged and abandoned according to the TCEQ regulations to  
37 eliminate the potential for impacts to groundwater resources.

1 A storm water pollution prevention plan (SW3P) would be developed according to TxDOT policies, and  
2 measures would be implemented to prevent or correct erosion that may develop during construction. The  
3 proposed project would comply with the Texas Pollutant Discharge Elimination System Construction  
4 General Permit (CGP). The implementation of storm water BMPs and the construction of detention  
5 facilities would minimize potential impacts to surface water quality. Impacts to surface water quality  
6 because of surface spills would be minimized by the implementation of spill prevention measures  
7 established in the SW3P.

8 No coastal barriers as mapped in the Coastal Barrier Resources System occur for the Preferred Alternative  
9 within Segments 1, 2, or 3; therefore, the proposed project would have no impact on coastal barrier  
10 resources. A portion of the Texas Coastal Management Zone associated with Buffalo Bayou traverses east-  
11 west through Segment 3. Construction activities of the Preferred Alternative requiring permit  
12 authorization from the U.S. Army Corps of Engineers (USACE) would necessitate formal coordination  
13 between TxDOT and the General Land Office regarding consistency with the Texas Coastal Management  
14 Program, thereby minimizing impacts to the coastal zone. TxDOT coordination with the U.S. Coast Guard  
15 (USCG) would also be conducted for permitting related to bridge structures constructed over Buffalo  
16 Bayou. See Section 3.7 in the Final EIS.

#### 17 **ES 4.1.8 FLOODPLAINS**

18 Portions of the proposed project traverse areas designated by the Federal Emergency Management  
19 Agency (FEMA) as special flood hazard areas (regulatory floodways, 100-year floodplains, and 500-year  
20 floodplains). Approximately 70 percent of the project area is outside 100-year floodplains and other flood  
21 hazard areas as currently mapped by FEMA. Portions of the existing and proposed project ROW are within  
22 mapped 100-year floodplains. Studies to update floodplain mapping for Harris County are ongoing and  
23 are using updated precipitation-frequency data. See Section 3.8 in the Final EIS for additional information.  
24 As noted in Section 3.8.2 in the Final EIS, the Atlas 14 precipitation-frequency data is currently required  
25 to be used for project design in Harris County, and TxDOT is using the updated precipitation-frequency  
26 estimates when designing new construction projects.

27 TxDOT would coordinate with the City of Houston Department of Public Works and Engineering, and  
28 Harris County Flood Control District (HCFCD) as needed, relative to regulatory floodplains and floodplain  
29 management during the design and evaluation of the proposed project. A detailed hydrologic and  
30 hydraulic study would be performed for the proposed project during the design phase to determine the  
31 appropriate locations and sizes of bridges, culverts, or other drainage structures that would be required.  
32 Federal, state, and local authorities would have the opportunity to review the hydrologic and hydraulic  
33 study to verify that appropriate measures have been proposed such that the project would not increase  
34 the flood risk to adjacent properties. Bridges, culverts, and cross-drainage structures would be designed  
35 to FHWA and TxDOT standards for design events up to the 100-year storm event. The study would also  
36 confirm that the project would not adversely impact existing floodplain conditions within the vicinity of  
37 the project for extreme events (i.e., storm events in excess of a 100-year storm event). BMPs, such as the  
38 construction of detention facilities, would be incorporated into the final design of the proposed project  
39 to offset increased flows from areas of impervious surface. Construction of the proposed project would

1 be in compliance with county and local floodplain guidelines and policies, including use of updated  
2 precipitation-frequency estimates during project design.

### 3 **ES 4.1.9 WETLANDS AND OTHER WATERS OF THE UNITED STATES**

4 Waters and wetlands occurring within or traversing the existing and proposed new ROWs were assessed  
5 for each individual project segment. Buffalo Bayou and a section of White Oak Bayou within the limits of  
6 the proposed project within Segment 3 are navigable waterways (i.e., waters that are subject to the ebb  
7 and flow of the tide, or are presently used, have been used in the past, or may be susceptible for use to  
8 transport interstate or foreign commerce). A Section 9 permit from the USCG would be anticipated for  
9 bridges or other structures constructed in or over Buffalo Bayou and the portion of White Oak Bayou  
10 subject to tidal influence. A Section 10 permit from the USACE would be anticipated for project  
11 construction activities that would involve the discharge of dredged or fill material within the jurisdictional  
12 limits of Buffalo Bayou and the portion of White Oak Bayou subject to tidal influence.

13 The areal extent of aquatic resources identified within the existing and proposed new ROWs was  
14 calculated based on a combination of data collection in the field (from public ROWs and where right-of-  
15 entry was granted) and interpretation of remotely sensed desktop data (described in detail in Section 3.9  
16 of the Final EIS). Subsequent to publication of the Draft EIS, a survey of Buffalo Bayou, White Oak Bayou,  
17 Little White Oak Bayou, and Halls Bayou was conducted by Registered Professional Land Surveyors to  
18 more accurately define the areas of these water courses occurring within the existing I-45 ROW and the  
19 proposed new ROW of the Preferred Alternative. The Final EIS presents the acreage and linear feet of the  
20 29 water bodies, which include both waters of the United States and wetlands, occurring within the  
21 existing I-45 ROW and the Preferred Alternative ROW. Of the 29 identified water bodies, 25 were  
22 preliminarily assessed as being potentially jurisdictional waters of the United States. Approximately  
23 26 acres of potentially jurisdictional features occur within the existing and proposed ROWs.

24 TxDOT will coordinate with the USACE regarding permit authorization for unavoidable discharges of  
25 dredged or fill material into jurisdictional waters of the United States regulated under Section 404 of the  
26 Clean Water Act (CWA) and/or Section 10 of the Rivers and Harbors Act. TxDOT will also coordinate with  
27 the USCG per the requirements of Section 9 of the Rivers and Harbors Act and the General Bridge Act  
28 regarding bridge permit authorization for the construction of bridge structures over the navigable waters  
29 of Buffalo Bayou and White Oak Bayou. Additionally, per the requirements of 33 U.S.C. Section 408, TxDOT  
30 will coordinate with the USACE and the HCFCD to determine if the occupation or alteration of the White  
31 Oak Bayou federal project, a portion of which occurs within the proposed project area, would be injurious  
32 to the public interest or would impair the usefulness of the federal project. See Section 3.9 of this Final  
33 EIS for more detail.

### 34 **ES 4.1.10 VEGETATION AND WILDLIFE**

35 The proposed project is located in a highly urbanized area of the City of Houston. Review of the Texas  
36 Parks and Wildlife Department's (TPWD's) Ecological Mapping Systems of Texas revealed that  
37 approximately 98 percent of the proposed project area is mapped as urban (including existing  
38 transportation infrastructure), with the remaining 2 percent including urban vegetation, disturbed prairie,

1 or riparian vegetation. Field investigations were conducted to verify existing conditions within the  
2 Preferred Alternative alignment. Although the majority of the alignment occurs within a highly urbanized  
3 area, dominated by pavement, vegetation within the undeveloped portions of the project is primarily  
4 ornamental plantings or routinely mowed and maintained grasses. Construction of the Preferred  
5 Alternative would impact herbaceous, shrub, tree, and other plantings through site preparation activities.  
6 Clearing and grading would remove existing vegetative cover and replace it with mostly impervious cover  
7 associated with travel lanes, entrance and exit ramps, and frontage roads. Any remaining open areas  
8 occurring adjacent to the ROW or medians would be planted with herbaceous vegetation that would be  
9 routinely maintained by mowing.

10 Native wildlife populations in the general region of the proposed project have been largely displaced by  
11 the development and urbanization of Houston, leaving remaining habitat areas highly fragmented.  
12 However, certain wildlife species have adapted to the urbanized conditions; therefore, the developed  
13 urban conditions provide habitat for wildlife species in the proposed project area. Construction impacts  
14 to wildlife would result from the removal of vegetation and structures that provide habitat. Operation of  
15 the proposed project could impact wildlife from vehicle strikes because of the additional travel lanes and  
16 impervious cover. According to National Oceanic and Atmospheric Administration mapping, no Essential  
17 Fish Habitat (EFH) is identified in the proposed project area.

18 The project required coordination with the TPWD in accordance with the 2013 TxDOT-TPWD MOU. TPWD,  
19 as a participating agency, reviewed and commented on the Draft EIS, which served as coordination under  
20 the MOU. Coordination with TPWD was completed on December 1, 2016. No additional coordination with  
21 TPWD would be required for this project unless future design modifications resulted in a reevaluation that  
22 was determined to be a substantial change from previous coordination or if the scope of the reevaluation  
23 relates to an issue on which TPWD commented. See Section 3.10 in the Final EIS for discussions of existing  
24 conditions and potential impacts to vegetation and wildlife.

#### 25 **ES 4.1.11 THREATENED AND ENDANGERED SPECIES**

26 The U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Conservation website lists five  
27 species as potentially occurring within the proposed project area. The three listed bird species were  
28 removed from consideration in this review because the proposed project is not related to wind energy  
29 generation. The Texas prairie dawn-flower and West Indian manatee would not be impacted because of  
30 an absence of suitable habitat. Therefore, no effects to any federally listed species are anticipated as a  
31 result of the proposed project.

32 Potential impacts to state-listed species and species of greatest conservation need (SGCNs) could be  
33 attributed to mobile species interacting with or avoiding construction machinery, the loss of wildlife  
34 habitat, habitat fragmentation, vehicle collisions, and the direct removal/disturbance of plant populations  
35 or individuals. The Preferred Alternative would require the removal of more than 120 acres of non-urban  
36 vegetation that may provide suitable habitat for eight state-listed species. In accordance with the *Best  
37 Management Practices Programmatic Agreement* between TxDOT and TPWD under the 2013 MOU, BMPs  
38 have been defined for implementation by TxDOT in order to minimize impacts to state-listed species and

1 SGCNs. See Section 3.11 in the Final EIS for discussions of existing conditions and potential impacts along  
2 with a table of BMPs for state-listed species and SGCNs.

### 3 **ES 4.1.12 SOILS AND GEOLOGY**

4 Soil erosion that could result from construction activities would be controlled or minimized through the  
5 use of proper construction techniques and the implementation of BMPs. The use of appropriate design  
6 standards and construction methods would minimize adverse impacts associated with surface faults,  
7 topography, and soils such that natural processes would not be affected. See Section 3.12 in the Final EIS  
8 for discussions of existing conditions and potential impacts to soils and geology.

### 9 **ES 4.1.13 ARCHEOLOGICAL RESOURCES**

10 The proposed NHHIP includes state and federal funds managed through TxDOT; therefore, the proposed  
11 project is subject to regulations defined in Section 106 of the National Historic Preservation Act (NHPA) of  
12 1966, as amended. Under Section 106 of the NHPA, and in accordance with the Advisory Council on  
13 Historic Preservation (ACHP) regulations pertaining to the protection of historic properties (36 Code of  
14 Federal Regulations [CFR] 800), federal agencies are required to locate, evaluate, and assess the effects  
15 of their undertaking on historic properties. For transportation projects such as this one, where ground  
16 disturbance occurs on state-owned ROW, compliance with Section 106 of the NHPA and the Antiquities  
17 Code of Texas is implemented under the Programmatic Agreement among FHWA, TxDOT, the Texas State  
18 Historic Preservation Officer, and the ACHP Regarding the Implementation of Transportation  
19 Undertakings (PA-TU). Pursuant to 36 CFR 800.4, TxDOT shall make a “reasonable and good faith effort to  
20 carry out appropriate identification efforts” of historic properties.

21 In 2015–2017, Raba Kistner Environmental, Inc. identified areas within the proposed project ROW that  
22 had a low, moderate, or high probability to contain intact archeological deposits based on proximity to  
23 known resources and levels of previous disturbance. Archeologists from Raba Kistner then conducted an  
24 intensive pedestrian archeological survey within some high-probability areas distributed across 23 parcels  
25 for which right-of-entry permission was granted. In 2018, a follow-up archeological background study  
26 conducted by TxDOT further refined archeological probability areas within the proposed project ROW on  
27 the basis of proximity to water, historic land use, archival research, additional disturbance information,  
28 and updated design details.

29 In April 2018, TxDOT moved forward with survey of three high-probability locations adjacent to Buffalo  
30 Bayou for which access was granted but where hazardous materials concerns required pre-fieldwork  
31 contaminant testing. TxDOT’s soil testing contractor, TRC Solutions, conducted subsurface contaminant  
32 testing in October 2018, identifying areas where chemicals and bacteria of concern were elevated. These  
33 areas were digitally and physically flagged for avoidance during subsequent archeological survey. In  
34 November 2018, in consultation with TxDOT, Cox McLain Environmental Consulting (CMEC) excluded the  
35 need to survey two high-probability locations due to evidence of disturbance. Then, in November and  
36 December 2018, CMEC archeologists conducted survey and limited testing under Texas Antiquities Permit  
37 8613, using mechanical trenching in one high-probability area that intersected sites 41HR982 and  
38 41HR1037. Following survey and testing, TxDOT recommended that the portions of these sites within the

1 NHHIP area of potential effects (APE) were heavily disturbed, provided redundant data when viewed in  
2 the context of adjacent work by others, and could not contribute to either site's eligibility for the National  
3 Register of Historic Places.

4 On February 25, 2019, the Texas Historical Commission (THC)/Texas State Historic Preservation Office  
5 (SHPO) concurred with TxDOT recommendations that no further work or consultation is required for the  
6 surveyed portions of the APE. TxDOT shall ensure that all archeological assessments as well as Section 106  
7 and Antiquities Code of Texas consultation are completed prior to the commencement of construction  
8 within the remaining unsurveyed acres of proposed new ROW/easements. The remaining portions of the  
9 project's APE that require further investigation, including medium-probability areas located near the  
10 northern terminus of the project and two high-probability areas located within and near the Clayton  
11 Homes apartment complex, are shown in Figure 3-4 of this document. On February 25, 2019, the THC  
12 concurred with TxDOT's commitment to complete survey of these areas. See Section 3.14 in the Final EIS  
13 for discussions of existing conditions and potential impacts to archeological resources.

#### 14 **ES 4.1.14 HISTORIC RESOURCES**

15 TxDOT conducted identification, documentation, and evaluation of historic properties for this project per  
16 provisions of the Section 106 Programmatic Agreement (PA), as executed among FHWA, TxDOT, the Texas  
17 SHPO, and the ACHP. These efforts were executed in compliance with Section 106 of the NHPA as codified  
18 at 36 CFR 800.

19 TxDOT used a phased approach to identify, document, and evaluate historic properties in the project area,  
20 with an initial Historic Resources Research Design, four reconnaissance-level Report for Historic Studies  
21 Survey (Report) documents, and two focused intensive-level survey reports prepared between 2015 and  
22 2018. A *Historical Resources Survey Report — Update* (Appendix H to the Final EIS), finalized in September  
23 2019, brought together the findings of the various reports and addressed comments and questions raised  
24 by the Texas SHPO in response to previous reports. The September 2019 Report was submitted to the  
25 Texas SHPO and other consulting parties as part of the Section 106 consultation process. In accordance  
26 with Section 106 and 36 CFR 800, TxDOT conducted public involvement and outreach efforts focused on  
27 historic resources.

28 The Texas SHPO concurred with TxDOT's determinations of effect on September 9, 2019, on the condition  
29 that design prescriptives to avoid or minimize adverse effects are incorporated into the design-build  
30 contract. Section 3.15 of the Final EIS summarizes adverse direct effects, indirect effects, and cumulative  
31 impacts along with design commitments. The September 2019 *Historical Resources Survey Report —*  
32 *Update* (Appendix H to the Final EIS) contains a full discussion of direct, indirect, and cumulative effects  
33 to all identified historic properties in the APE. See also Section 7.15 of the Final EIS.

#### 34 **ES 4.1.15 HAZARDOUS MATERIALS**

35 An evaluation of hazardous materials issues for the proposed NHHIP was based on a review of  
36 environmental regulatory records and observations made during field investigations. A regulatory  
37 database search was performed by Environmental Data Resources Inc. on May 22, 2014. A second  
38 regulatory database search was performed by Banks Environmental Data (Banks) on October 4, 2017, to

1 facilitate review of areas where new ROW would be required for design changes. The 2017 Banks report  
2 identified a total of 833 records within the search radii prescribed by ASTM E 1527-13. Of those records  
3 in the Banks report, 137 sites (primarily Leaking Petroleum Storage Tanks [LPST] and Voluntary Cleanup  
4 Program [VCP] sites) were determined to have the potential to impact the project corridor. This  
5 determination was based on the type of database listing, the information provided in the database report,  
6 and the distance and direction of the listing to the corridor. Additionally, 33 orphan or unlocatable sites  
7 were identified in the database search. For the Preferred Alternative, impacts associated with hazardous  
8 materials would most likely occur during construction and would be related to activities on or near existing  
9 hazardous material sites in the vicinity of the proposed project.

10 Construction of the proposed NHHIP could include the demolition of building structures, some of which  
11 may contain asbestos materials. Asbestos issues would be addressed during the ROW acquisition process  
12 prior to construction. Use and handling of hazardous materials associated with construction machinery  
13 and equipment would pose a minimal risk to the environment, as BMPs and appropriate safety and spill  
14 prevention/containment measures would be implemented. Should construction crews encounter  
15 contaminated soil or groundwater during construction of the proposed project, all activities would cease  
16 until contaminated materials are properly removed from the area and transported to an appropriate  
17 disposal site in compliance with applicable federal, state, and municipal laws. See Section 3.16 in the Final  
18 EIS for discussions of existing conditions and potential of hazardous materials.

#### 19 **ES 4.1.16 VISUAL AND AESTHETIC RESOURCES**

20 The detailed visual impact analysis was conducted after the Draft EIS and is discussed in Section 3.17 of  
21 the Final EIS. The extent of any potential impact is based on compatibility of the impact, viewer sensitivity  
22 of the impact, and the degree of the impact. The analysis concludes that while there may be specific areas  
23 close to the Proposed Facility which may be negatively impacted by a reduction in visual quality, the  
24 majority of viewers would have no impacts. Some viewers would have improved views where elevated  
25 structures have been removed, or where mitigation measures have reduced visual impacts. Areas where  
26 adverse impacts could occur could be mitigated to minimize the visual impact (see Section 7.17 of the  
27 Final EIS). The visual impact summary concluded the following: for landscape unit #1 (Segment 1), the  
28 visual impact would be neutral, existing viewer sensitivity is low, and the project is compatible. For  
29 landscape unit #2 (Segment 2), the visual impact would be neutral, existing viewer sensitivity is low, and  
30 the project is compatible. For landscape unit #3 (Segment 3), the visual impact would be neutral, existing  
31 viewer sensitivity is moderate, and the project is compatible. For some residential and other viewers  
32 outside of Downtown with views of the Downtown skyline, the majority of viewsheds in the Segment 3  
33 area would have improved views or no impacts to views, and visual quality would remain moderate.  
34 Specific areas where adverse impacts could occur (north of Downtown) could be mitigated to minimize  
35 the impact (see Section 3.17.3 of the Final EIS).

36 The project will be developed under TxDOT's Green Ribbon Program, which allocates funds for trees and  
37 plants within roadway ROW. A detailed landscaping plan will be developed as part of the final design  
38 process. TxDOT will coordinate with local groups and agencies to accommodate enhancements to  
39 standard landscaping and recreational use of green space in and around storm water detention areas,

1 where feasible. Wet bottom detention basins will be considered if a partner entity agrees to maintain  
2 them. The detention areas will not be parks as their primary use is for drainage and flood mitigation. See  
3 Section 3.17 of the Final EIS for a detailed discussion.

#### 4 **ES 4.1.17 SECTION 4(F) RESOURCES**

5 Section 4(f) of the Department of Transportation Act of 1966 prohibits the Secretary of Transportation  
6 from approving any program or project that requires the “use” of 1) any publicly owned land from a public  
7 park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance as  
8 determined by federal, state, or local officials having jurisdiction thereof, or 2) any land from an historic  
9 site of national, state, or local significance as so determined by such officials unless there is no feasible  
10 and prudent alternative to the use of such land and the project includes all possible planning to minimize  
11 harm to the resource.

12 TxDOT coordinated with the Texas SHPO as part of the Section 106 process and as the Official with  
13 Jurisdiction for historic sites under Section 4(f). The SHPO concurred with TxDOT’s findings of eligibility  
14 and preliminary effects on September 9, 2019. In a letter dated February 27, 2020, SHPO as the Official  
15 with Jurisdiction had no comment on the Section 4(f) findings. The SHPO concurred with TxDOT’s  
16 determination that the project would have an adverse effect to:

- 17       ▪ Houston Warehouse Historic District
- 18       ▪ Carlisle Plastics North Warehouse
- 19       ▪ Readers Distributors Warehouse
- 20       ▪ Cheek-Neal Coffee Company Building and associated property parcel
- 21       ▪ Rossonian Cleaners

22 There are no feasible and prudent avoidance alternatives to the use of Section 4(f) properties: Warehouse  
23 Historic District, Readers Distributors Warehouse, Carlisle Plastics, Cheek-Neal Coffee Company Building,  
24 and Rossonian Cleaners. The project includes all possible planning to minimize harm to the Section 4(f)  
25 properties. The project complies with other related laws, including Section 6(f) of the Land and Water  
26 Conservation Fund Act and Chapter 26 of the Texas Parks and Wildlife (TPW) Code, when applicable.

27 Public parks and recreational facilities within 500 feet of the proposed project ROW of the Build  
28 Alternatives were evaluated for potential Section 4(f) effects. See Section 3.18 in the Final EIS and  
29 Appendix O *Individual Section 4(f) Evaluation* for details.

30 Due to extensive efforts to avoid direct impacts and uses to park resources, there are no direct impacts  
31 to parks. The Preferred Alternative would not result in a use of or adverse impact to any Section 4(f) park  
32 properties. Although there would be no use and no adverse impact to Sam Houston Park, it bears  
33 mentioning for beneficial impacts. The proposed action would substantially reduce the highway footprint  
34 in the area of Sam Houston Park. With the proposed project, noise levels are predicted to decrease by 3  
35 decibels at approximately the center of the park. In addition, project designers worked to improve and  
36 optimize open space resources throughout the project corridor.

1 **ES 4.1.18 ENERGY REQUIREMENTS; SHORT-TERM USES AND LONG-TERM**  
2 **PRODUCTIVITY; AND IRREVERSIBLE AND IRRETRIEVABLE**  
3 **COMMITMENTS OF RESOURCES**

4 Decreased vehicle delays and more efficient vehicle operating speeds would allow for increased energy  
5 efficiency on the improved roadway. Construction-related energy consumption would be for a limited  
6 time and could be offset by operational energy efficiencies gained through the use of the improved  
7 transportation facility and changing vehicle and fuel technology over many decades.

8 The local, short-term uses of the environment associated with construction of the Preferred Alternative  
9 would be typical of roadway construction and would have limited long-term effects. Construction of the  
10 Preferred Alternative would involve the commitment of natural, physical, human, and fiscal resources.  
11 The decision to commit these resources for construction of the Preferred Alternative would be based on  
12 the concept that residents in the immediate area, region, and state would benefit by the improved quality  
13 of the regional transportation system. The benefits would be anticipated to outweigh the commitment of  
14 resources.

15 Short-term and long-term energy requirements; the relationship between local short-term uses and the  
16 maintenance and enhancement of long-term productivity; and irreversible and irretrievable  
17 commitments of resources are addressed in Sections 3.19, 3.20, and 3.21 of this Final EIS, respectively.

18 **ES 4.1.19 GREENHOUSE GAS AND CLIMATE CHANGE**

19 TxDOT has prepared a Statewide On-Road Greenhouse Gas Emissions Analysis and Climate Change  
20 Assessment technical report. A summary of key issues in this technical report (which details how TxDOT  
21 is responding to a changing climate) is provided in Section 4 of the Final EIS.

22 **ES 4.1.20 INDIRECT IMPACTS**

23 Transportation projects that provide new or improved access to adjacent land could induce development  
24 of undeveloped land or redevelopment of land to more intensive uses. A planning judgment approach,  
25 supported by planning assumptions and land use projections from the H-GAC, City of Houston, Harris  
26 County, and management districts within the project area, was used to identify areas of potential growth,  
27 development trends, and the probability of the proposed project to influence local land use decisions  
28 within the Area of Influence (AOI). Most of the AOI is already developed and developable land within the  
29 AOI is relatively limited.

30 The proposed project is expected to induce redevelopment in two general locations: throughout the  
31 Downtown Management District and within a 0.25-mile buffer along I-45 from I-610 to Beltway 8. The  
32 proposed project may also slow development rates in areas that would experience access changes or  
33 access limitations resulting from the proposed improvements or in areas that would be physically  
34 impacted (e.g., proposed displacements). Such slowdowns may be compounded by redevelopment in  
35 areas flooded during Hurricane Harvey and increasing floodplain regulations. The proposed project would  
36 add capacity to existing facilities and would not induce development to the same degree as a new  
37 roadway. The Downtown area and the surrounding neighborhoods are experiencing various degrees of

1 redevelopment, and growth trends identified in questionnaire responses indicate that redevelopment  
2 would continue independent of the proposed improvements to existing facilities. Additionally, several  
3 roadway projects are planned or under development throughout the Houston area and coincide  
4 temporally with the proposed NHHIP improvements; these projects could influence growth and,  
5 therefore, the proposed NHHIP project may contribute to induced growth impacts as one of many factors  
6 affecting growth in the area. See Section 5 in the Final EIS for the analysis of induced growth impacts.  
7 Encroachment alteration effects are discussed by resource category as appropriate in Section 3 of the  
8 Final EIS.

#### 9 **ES 4.1.21 CUMULATIVE IMPACTS**

10 The Council on Environmental Quality (CEQ) defines cumulative impact as impact “on the environment  
11 which result from the incremental impact of the action when added to other past, present, and reasonably  
12 foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such  
13 other actions. Cumulative impacts can result from individually minor but collectively significant actions  
14 taking place over a period of time” (40 CFR 1508.7). Section 6 of this Final EIS discusses the project’s  
15 potential cumulative impacts.

16 Based on the results of the cumulative impacts risk assessment, supported by the information included in  
17 this Final EIS and associated technical reports, the proposed project may potentially have cumulative  
18 impacts on community resources. The cumulative impacts analysis for community resources (specifically  
19 neighborhoods/public facilities and EJ populations) assessed the health of these resources, described  
20 relevant trends, and identified a specific Resource Study Area boundary and appropriate temporal  
21 boundary for the analysis. The construction of the proposed project was considered in conjunction with  
22 past, present, and reasonably foreseeable future actions to estimate the cumulative impacts on  
23 community resources. The proposed project maintains urban development trends from other past,  
24 present, and reasonably foreseeable future large infrastructure projects that resulted or are expected to  
25 result in both beneficial and adverse impacts to community resources. Mitigation of direct adverse  
26 impacts from the proposed project substantially reduces the project’s incremental contribution to  
27 adverse cumulative impacts on community resources. Urban development trends are not likely to be  
28 substantially changed by this project. See Section 6 and the *Cumulative Impacts Technical Report*.

#### 29 **ES 4.2 NO BUILD ALTERNATIVE**

30 With the No Build Alternative, there would be no impacts related to construction and operation of the  
31 proposed project. The No Build Alternative would not result in the acquisition of new ROW and no existing  
32 land uses would be converted to transportation uses. There would be no direct impacts to the human  
33 environment including neighborhoods, community resources, minority and low-income populations,  
34 existing transportation facilities, archeological or historic resources, and Section 4(f) properties. The No  
35 Build Alternative would not change the existing visual environment. There would be no direct impacts to  
36 hazardous materials sites.

37 The No Build Alternative would not impact current property or sales tax revenues and would not have the  
38 positive regional and statewide economic impact of creating additional jobs and income during

1 construction. The community would also not experience the benefits of decreased traffic congestion,  
2 improved mobility, and improved safety conditions resulting from the proposed project. Decreasing  
3 mobility due to traffic congestion may adversely impact existing and future businesses. Increased  
4 congestion on the existing I-45 and other roadways in and near the proposed project area may result in  
5 additional air emissions. No short-term noise would be generated from construction-related activities;  
6 however, traffic noise levels would be expected to increase with an associated increase in future traffic  
7 volumes on existing roadways.

8 The No Build Alternative would not result in direct impact to the natural environment, including water  
9 resources, floodplains, wetlands and waters of the United States, wildlife, vegetation, and threatened and  
10 endangered species. There would be no anticipated impacts to topography, soils, or geological resources,  
11 and no direct impacts to prime or unique farmland soils.

12 Additional information on the impacts of the No Build Alternative is provided in the Final EIS in Section 2  
13 Alternatives Analysis.

## 14 **ES 5 Preferred Alternative**

15 The need for and purpose of the proposed NHHIP is to improve mobility and safety in the I-45 corridor  
16 from Downtown Houston to Beltway 8 North. The No Build Alternative would neither safely or adequately  
17 accommodate existing and future traffic volumes on I-45 within the study area. Therefore, the No Build  
18 Alternative does not meet the need for and purpose of the proposed project.

19 The Preferred Alternative was selected based on detailed analysis of engineering and traffic evaluation  
20 factors, environmental impacts, and extensive agency coordination and public involvement. Section 2 of  
21 the Final EIS describes the alternatives analysis process conducted since the initiation of the EIS process  
22 in 2011, including several levels of screening (evaluation) of alternatives. The Preferred Alternative for the  
23 proposed project is described below, by study segment. The Preferred Alternative includes changes to the  
24 Recommended Alternative (for each segment) presented and evaluated in the Draft EIS. Section 2 of the  
25 Final EIS discusses the design changes, including the proposed locations of storm water detention areas.  
26 The total project length is approximately 25.3 miles.

### 27 **ES 5.1 SEGMENT 1: I-45 FROM BELTWAY 8 NORTH TO NORTH OF I-610** 28 **(NORTH LOOP)**

29 The Preferred Alternative would widen the existing I-45 primarily on the west side of the roadway to  
30 accommodate four MaX lanes. The proposed typical section would include eight to ten general purpose  
31 lanes (four to five lanes in each direction), four MaX lanes (two lanes in each direction), and four to six  
32 frontage road lanes (two to three lanes in each direction). Between Tidwell Road and I-610, there would  
33 be 12 general purpose lanes (six in each direction) to accommodate ramps and connections to and from  
34 I-610. The general purpose lanes and MaX lanes would be at-grade except at major cross streets, where  
35 they would be elevated over the intersecting streets. Approximately 200 to 225 feet of new ROW would  
36 be required for the roadway widening, mostly to the west of the existing I-45. New ROW would also be  
37 required on the west side of I-45 for proposed storm water detention areas. New ROW would be required

1 to the east of the existing I-45 ROW at intersections with major streets and between Crosstimbers Street  
2 and I-610. Approximately 246 acres of new ROW would be required in Segment 1.

3 **ES 5.2 SEGMENT 2: I-45 FROM NORTH OF I-610 (NORTH LOOP) TO I-10**  
4 **(INCLUDING THE INTERCHANGE WITH I-610)**

5 The Preferred Alternative would widen the existing I-45 to accommodate four MaX lanes. The proposed  
6 typical section would include ten general purpose lanes (five lanes in each direction), four MaX lanes (two  
7 lanes in each direction), and four to six frontage road lanes (two to three lanes in each direction). From  
8 north of Cottage Street to Norma Street, the general purpose lanes and the MaX lanes would be  
9 depressed, while the frontage road lanes would be at-grade. The proposed I-45 and I-610 frontage roads  
10 would be continuous through the I-45/I-610 interchange. New ROW would be required from both the east  
11 and west sides of the existing I-45. The new ROW would include proposed storm water detention areas  
12 on the east side of I-45, south of Patton Street. Approximately 44 acres of new ROW would be required in  
13 Segment 2.

14 The Preferred Alternative provides a structural “cap” over a portion of the depressed lanes of I-45 from  
15 north of Cottage Street to south of N. Main Street. Future use of the structural cap area for another  
16 purpose would require additional development and funding by entities other than TxDOT.

17 **ES 5.3 SEGMENT 3: DOWNTOWN LOOP SYSTEM (I-45, US 59/I-69, AND I-10)**

18 The Preferred Alternative would reconstruct all the existing interchanges in the Downtown Loop System  
19 and reroute I-45 to be parallel to I-10 on the north side of Downtown and parallel to US 59/I-69 on the  
20 east side of Downtown. Access to the west side of Downtown would be provided via “Downtown  
21 Connectors” that would consist of entrance and exit ramps for various Downtown streets. A section of the  
22 Downtown Connectors would be below-grade (depressed) between approximately W. Dallas Street to  
23 Andrews Street. The existing elevated I-45 roadway along the west and south sides of Downtown would  
24 be removed. The portion of I-45 (Pierce Elevated) between Brazos Street and US 59/I-69 could be left in  
25 place for future use and redevelopment by others; however, an alternative use for the structure is not  
26 proposed by TxDOT and is not evaluated in this Final EIS.

27 To improve safety and traffic flow in the north and east portions of Segment 3, portions of both I-10 and  
28 US 59/I-69 would be realigned (straightened) to eliminate the current roadway curvature. I-45 and  
29 US 59/I-69 would be depressed along a portion of the alignment east of Downtown. South of the George  
30 R. Brown Convention Center, the rerouted I-45 would begin to elevate to tie to existing I-45 southeast of  
31 Downtown, while US 59/I-69 would remain depressed as it continues southwest toward Spur 527.  
32 US 59/I-69 would be widened from 8 to 12 general purpose lanes between I-45 and State Highway (SH)  
33 288 and would be reconstructed to ten general purpose lanes from SH 288 to Spur 527.

34 The four proposed I-45 MaX lanes in Segments 1 and 2 would terminate/begin in Segment 3 at Milam  
35 Street/Travis Street, respectively. I-10 express lanes (two lanes in each direction) would be located  
36 generally in the center of the general purpose lanes within the proposed parallel alignment of I-10 and

1 I-45 on the north side of Downtown. The I-10 express lanes would vary between being elevated and at-  
2 grade.

3 New ROW to the east of the existing US 59/I-69 along the east side of Downtown would be required to  
4 accommodate the proposed realigned I-45. A new continuous southbound access road would be provided  
5 adjacent to US 59/I-69 and would tie to existing Hamilton Street on the south side of the Convention  
6 Center. The existing St. Emanuel Street would serve as a northbound access road. The project ROW would  
7 include areas to be developed as storm water detention. Approximately 160 acres of new ROW would be  
8 required, the majority of which would be for the I-10 and US 59/I-69 realignments (straightening) and to  
9 construct the proposed I-45 lanes adjacent to US 59/I-69 along the east side of Downtown.

10 The Preferred Alternative provides a structural “cap” over the proposed depressed lanes of I-45 and  
11 US 59/I-69 from approximately Commerce Street to Lamar Street. There would also be a structural cap  
12 over the depressed lanes of US 59/I-69 between approximately Main Street and Fannin Street, and in the  
13 area of the Caroline Street/Wheeler Street intersection. Future use of the structural cap areas for another  
14 purpose would require additional development and funding by entities other than TxDOT. For the latest  
15 schematics of the Preferred Alternative please visit: <http://www.ih45northandmore.com/>.

16 Table ES-2 summarizes impacts from the Preferred Alternative.

Table ES-2: Summary of Impacts of the Preferred Alternative

<b>Segment 1 Preferred Alternative (Alternative 4 Proposed Recommended); Segment 2 Preferred Alternative (Alternative 10 Proposed Recommended); Segment 3 Preferred Alternative (Alternative 11 Proposed Recommended)</b>
<b>Land Use</b>
<p>Segment 1 — approximately 246 acres of land impacted. The land use type impacted the most is commercial land use (139 acres).</p> <p>Segment 2 — approximately 44 acres of land impacted. The land use type impacted the most is commercial land use (21 acres).</p> <p>Segment 3 — approximately 160 acres of land impacted. The land use types impacted the most are transportation/utility (45 acres) land uses and commercial (35 acres) land uses.</p>
<b>Community Resources</b>
<ul style="list-style-type: none"> <li>▪ Displacement of 5 Places of Worship</li> <li>▪ Displacement of 2 schools/universities</li> <li>▪ Some “business” displacements may include community services such as medical care facilities, non-profit facilities, drug rehabilitation centers, grocery stores</li> <li>▪ Other impacts such as impacts to parking, changes in access to public transportation</li> </ul>
<b>Displacements</b>
<ul style="list-style-type: none"> <li>▪ 160 Single-family residences</li> <li>▪ 433 Multi-family residential units (multi-family units are all located within apartment communities)</li> <li>▪ 486 Public and Low-Income Housing multi-family units</li> <li>▪ 344 Businesses</li> <li>▪ 58 Billboards</li> <li>▪ Mitigation is discussed in Section 7 of the Final EIS</li> </ul>
<b>Environmental Justice</b>
<ul style="list-style-type: none"> <li>▪ The Preferred Alternative would result in impacts to low-income and minority populations. Specific impacts and mitigation measures are detailed in the Final EIS and the <i>Community Impacts Assessment Technical Report</i>. Public involvement activities included proactive outreach to ensure meaningful access to public participation.</li> </ul>
<b>Economic Conditions</b>
<ul style="list-style-type: none"> <li>▪ Estimated employment impact — 344 businesses would be displaced, and employees would be expected to relocate with the business.</li> <li>▪ Based on \$7 Billion in construction spending and using Texas State Comptroller economic multipliers — direct and indirect income is estimated to be \$6.1 Billion; direct and indirect employment is estimated to be 181,387 jobs, and statewide final demand impact is estimated to be \$19.2 Billion.</li> <li>▪ Estimated property tax and sales tax losses totaling from \$152.9 M to \$313.9 M annually due to displacements.</li> </ul>

**Segment 1 Preferred Alternative (Alternative 4 Proposed Recommended); Segment 2 Preferred Alternative (Alternative 10 Proposed Recommended); Segment 3 Preferred Alternative (Alternative 11 Proposed Recommended)**

***Transportation Facilities***

- Segment 1 would not affect access to transit centers, Park & Ride facilities, or Light Rail Transit (LRT) services.
- Segment 2 would not affect existing bus service routes; no Park & Ride facilities are located in Segment 2.
- Segment 3 would not permanently affect bus service; Wheeler Transit Center access is being coordinated with TxDOT.
- Displacement of bus stops could affect people that do not have access to automobiles or that are dependent on public transportation.
- Close coordination between TxDOT and METRO would facilitate proactive communications with transit users for schedules, routes, and service changes, compliance with Americans with Disabilities Act of 1990 (ADA) requirements.
- During construction, the proposed project may require re-routing or redirecting of existing rail lines and infrastructure. Relocation or rerouting of existing rail lines could temporarily disrupt operations and result in delays for rail traffic that is rerouted as well as rail traffic on rail lines to which traffic is rerouted. TxDOT has previously coordinated with Houston Belt & Terminal Railway (HB&T), BNSF Railway, and Union Pacific Railroad (UPRR) representatives, and TxDOT does not anticipate permanently affecting current operations and rail locations.

***Air Quality***

- TAQA results for each segment of the project indicate that CO concentrations are not expected to exceed the national standard and would remain relatively consistent from the ETC to the design year.
- Based on regulations now in effect, overall MSAT emissions will decline significantly over the next several decades. A quantitative MSAT analysis for this project forecasts a combined reduction of over 72 percent for both the build and no build scenarios for total MSAT emissions from 2018 to 2040, while VMT is projected to increase between 45–58 percent.
- Congestion Management Process Strategies are in place in the travel corridor.
- TxDOT received a project-level conformity determination from FHWA on June 25, 2020.

***Noise***

- Traffic noise impacts were identified in each project segment for a variety of noise-sensitive land uses, including exterior areas of single-family homes, apartments, churches, schools, and parks. Traffic noise impacts are predicted to occur at locations represented by 222 receiver points along the project corridor.

Noise abatement measures were evaluated for each traffic noise impact. Where reasonable and feasible, noise barriers are proposed for 76 locations, which would benefit 138 representative receivers.

- Segment 1: 7 barriers proposed to mitigate noise impacts.
- Segment 2: 12 barriers proposed to mitigate noise impacts.
- Segment 3: 57 barriers proposed to mitigate noise impacts.
- The final decision to construct proposed noise barriers will not be made until completion of the proposed NHHIP design, utility evaluation, and polling of adjacent property owners.

**Segment 1 Preferred Alternative (Alternative 4 Proposed Recommended); Segment 2 Preferred Alternative (Alternative 10 Proposed Recommended);  
Segment 3 Preferred Alternative (Alternative 11 Proposed Recommended)**

**Water Resources**

- Potential impacts to groundwater would be primarily related to storm water discharges from both construction and operation of the proposed project.
- Groundwater wells exist within the proposed ROW (7 in Segment 1, none in Segment 2 or 3).
- Construction of the proposed project would cause an increase in the overall area of impervious cover, resulting in minor increases in localized storm water runoff.
- Short-term and long-term BMPs implemented as part of the proposed project would minimize water quality degradation of surface waters and groundwater in the proposed project area.
- TxDOT will coordinate with the TCEQ during the review and evaluation of the proposed project relative to the TCEQ's 303(d) List of impaired water bodies occurring within the proposed project area that could potentially be impacted by construction and operation of the proposed project.

**Floodplains**

- Segment 1: Approximately 211 acres of 100-year floodplains would be within the existing and proposed ROWs of the Preferred Alternative.
- Segment 2: Approximately 118 acres of 100-year floodplains would be within the existing and proposed ROWs of the Preferred Alternative.
- Segment 3: Approximately 169 acres of 100-year floodplains would be within the existing and proposed ROWs of the Preferred Alternative.

**Wetlands and Other Waters of the U.S.**

A Section 9 permit from the USCG would be anticipated for bridges or other structures constructed in or over Buffalo Bayou and the portion of White Oak Bayou subject to tidal influence. A Section 10 permit from the USACE would be anticipated for project construction activities that would involve the discharge of dredged or fill material within the jurisdictional limits of Buffalo Bayou and the portion of White Oak Bayou subject to tidal influence. The Final EIS presents the acreage and linear feet of the 29 water bodies occurring within the existing I-45 ROW and the Preferred Alternative ROW. Of the 29 identified water bodies, 25 were preliminarily assessed as being potentially jurisdictional waters of the United States. Approximately 26 acres of potentially jurisdictional features occur within the existing and proposed ROWs.

Segment 1 Potentially jurisdictional waters of the U.S. (acres and linear feet of streams):

- Existing ROW: 1.06 acres; 2,342 linear ft.
- Proposed ROW: 1.46 acres; 1,637 linear ft.

Segment 2 Potentially jurisdictional waters of the U.S. (acres and linear feet of streams):

- Existing ROW: 4.18 acres; 4,839 linear ft.
- Proposed ROW: 0.34 acres; 698 linear ft.

Segment 3 Potentially jurisdictional waters of the U.S. (acres and linear feet of streams):

- Existing ROW: 11.49 acres; 6,609 linear ft.
- Proposed ROW: 7.44 acres; 3,025 linear ft.

**Threatened and Endangered Species**

No effects to any federally listed species are anticipated as a result of the proposed project. In accordance with the *Best Management Practices Programmatic Agreement* between TxDOT and TPWD under the 2013 MOU, BMPs have been defined for implementation by TxDOT in order to minimize impacts to the state-listed species and SGCNs that could occur in the project area.

**Segment 1 Preferred Alternative (Alternative 4 Proposed Recommended); Segment 2 Preferred Alternative (Alternative 10 Proposed Recommended); Segment 3 Preferred Alternative (Alternative 11 Proposed Recommended)**

***Wildlife and Vegetation***

- Approximately 480 acres of observed vegetation types could be affected by the Preferred Alternative; 98 percent of the project area is transportation infrastructure or urban development.
- Construction of the Preferred Alternative would impact herbaceous, shrub, tree, and other plantings through site preparation activities.
- Construction of the Preferred Alternative would directly impact any animals that reside within the path of the proposed roadway improvements; could displace mobile species; and could impact fewer mobile species. Construction could cause loss of habitat, habitat fragmentation, or pollution from increased impervious cover.

***Soils and Geology***

Soil erosion that could result from construction activities would be controlled or minimized through the use of proper construction techniques and the implementation of BMPs. The use of appropriate design standards and construction methods would minimize adverse impacts associated with surface faults, topography, and soils such that natural processes would not be affected.

***Archeological Resources***

Archeological studies performed to date identified some areas within the proposed project ROW that are classified as high probability and moderate probability areas. Two intensive pedestrian archeological surveys were conducted for some high-probability areas for which right-of-entry permission was granted. On February 25, 2019, the THC/Texas SHPO concurred with TxDOT recommendations that no further work or consultation is required for the surveyed portions of the APE. TxDOT shall ensure that all archeological assessments as well as Section 106 and Antiquities Code of Texas consultation are completed prior to the commencement of construction within the remaining unsurveyed acres of proposed new ROW/easements. The remaining portions of the project's APE that require further investigation, including medium-probability areas located near the northern terminus of the project and two high-probability areas located within and near the Clayton Homes apartment complex, are shown in Figure 3-4. On February 25, 2019, the THC concurred with TxDOT's commitment to complete survey of these areas.

***Historic Resources***

TxDOT used a phased approach to identify, document, and evaluate historic properties in the project area, with an initial Historic Resources Research Design, four reconnaissance-level Report for Historic Studies Survey (Report) documents, and two focused intensive-level survey reports prepared between 2015 and 2018. A *Historical Resources Survey Report — Update* (September 2019) consolidated findings and addressed Texas SHPO concerns. The September 2019 Report was utilized for Section 106 consultation. Per Section 106 and 36 CFR 800, TxDOT conducted public involvement and outreach efforts focused on historic resources. The Texas SHPO concurred with TxDOT's determinations of effect on September 9, 2019, on the condition that design prescriptives to avoid or minimize adverse effects are incorporated into the design-build contract.

- In Segment 1, one historic district and one individual historic property were located in the APE; no direct or indirect adverse effects would occur.
- In Segment 2, two historic districts were in the APE; design revisions were made to avoid impacts to the historic districts and contributing properties; no direct or indirect adverse effects would occur.
- In Segment 3, 5 historic properties and two historic districts would be directly adversely affected. Design refinements were made where possible; design prescriptives to be undertaken by the design-build contractor were incorporated into the SHPO conditional concurrence.

**Segment 1 Preferred Alternative (Alternative 4 Proposed Recommended); Segment 2 Preferred Alternative (Alternative 10 Proposed Recommended); Segment 3 Preferred Alternative (Alternative 11 Proposed Recommended)**

***Hazardous Materials***

- Of the records in the 2017 Banks database search report, 137 sites (primarily LPST and VCP sites) were determined to have the potential to impact the project corridor. An ASTM-conforming Phase I environmental site assessment is recommended prior to ROW acquisition.
- Construction of the proposed NHHIP could include the demolition of building structures, some of which may contain asbestos materials. Asbestos issues would be addressed during the ROW acquisition process prior to construction.
- Use and handling of hazardous materials associated with construction machinery and equipment would pose a minimal risk to the environment, as BMPs and appropriate safety and spill prevention/containment measures would be implemented.

***Visual and Aesthetic Resources***

- The analysis concludes that while there may be specific areas close to the Proposed Facility which may be negatively impacted by a reduction in visual quality, the majority of viewers would have no impacts.
- Some viewers may have improved views where elevated structures have been removed, or where mitigation measures have reduced visual impacts.
- The visual impact summary concluded the following: for landscape unit #1 (Segment 1), the visual impact would be neutral, existing viewer sensitivity is low, and the project is compatible. For landscape unit #2 (Segment 2), the visual impact would be neutral, existing viewer sensitivity is low, and the project is compatible. For landscape unit #3 (Segment 3), the visual impact would be neutral, existing viewer sensitivity is moderate, and the project is compatible.

***Section 4(f) Resources***

TxDOT has coordinated with the SHPO as part of the Section 106 process and as the Official with Jurisdiction for historic sites under Section 4(f). The SHPO concurred with TxDOT's findings of eligibility and preliminary effects on September 9, 2019. In a letter dated February 27, 2020, SHPO as the Official with Jurisdiction had no comment on the Section 4(f) findings. The SHPO concurred with TxDOT's determination that the project would have an adverse effect to:

- Houston Warehouse Historic District
- Carlisle Plastics North Warehouse
- Readers Distributors Warehouse
- Cheek-Neal Coffee Company Building and associated property parcel
- Rossonian Cleaners

There are no feasible and prudent avoidance alternatives to the use of Section 4(f) properties: Houston Warehouse Historic District, Readers Distributors Warehouse, Carlisle Plastics, Cheek-Neal Coffee Company Building, and Rossonian Cleaners. The project includes all possible planning to minimize harm to the Section 4(f) properties. The project complies with other related laws, including Section 6(f) of the Land and Water Conservation Fund Act and Chapter 26 of the TPW Code, when applicable. Section 4(f) parks resources are fully assessed including alternatives analysis in the Section 4(f) Evaluation under separate cover. The Preferred Alternative would not result in a use of or adverse impact to any Section 4(f) park properties.

**Segment 1 Preferred Alternative (Alternative 4 Proposed Recommended); Segment 2 Preferred Alternative (Alternative 10 Proposed Recommended);  
Segment 3 Preferred Alternative (Alternative 11 Proposed Recommended)**

***Indirect Impacts***

The proposed project is expected to induce redevelopment in two general locations: throughout the Downtown Management District and within a 0.25-mile buffer along I-45 from I-610 to Beltway 8. The proposed project may also slow development rates in areas that would experience access changes or access limitations resulting from the proposed improvements or in areas that would be physically impacted (e.g., proposed displacements). The proposed project would add capacity to existing facilities and would not induce development to the same degree as a new roadway. The Downtown area and the surrounding neighborhoods are experiencing various degrees of redevelopment, and growth trends identified in questionnaire responses indicate that redevelopment would continue independent of the proposed improvements to existing facilities.

***Cumulative Impacts***

Considering past, present, and reasonably foreseeable future actions, the construction of the proposed project was considered in conjunction with these other actions to consider cumulative impacts. The proposed project maintains urban development trends from large infrastructure projects that result in both beneficial and adverse impacts to community resources. Mitigation of direct adverse impacts from the proposed project substantially reduces the project's incremental contribution to adverse cumulative impacts on community resources. Urban development trends are not likely to be substantially changed by this project.