Houston Ship Channel Feasibility
Houston-Galveston Navigation Channels, Texas

Real Estate Appendix

28 October 2019

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1 General

This Real Estate Plan (REP) is the real estate work product of the U.S. Army Corps of Engineers, Galveston District, Real Estate Division and supports the project plan formulation for the Houston Ship Channel Expansion and Channel Improvement Report. It identifies and describes the lands, easements, rights-of-way, relocations (i.e., P.L. 91-646 relocations and utility/facility relocations), borrow material, and dredged or excavated material disposal areas (LERRD), required for the construction, operation and maintenance of the proposed Project. Further, the REP describes the estimated LERRD value, together with the estimated administrative and incidental costs attributable to providing LERRD, and the acquisition process. This REP is tentative in nature for planning purposes only and is intended to match the level of detail available in the main feasibility investigation report. Therefore, the final real property lines, estimates of value and rights required for project construction, operation and maintenance are subject to change, even after approval of this report.

2 Non-Federal Sponsor

The NFS is the Port Houston Authority (PHA). PHA is providing the majority of the environmental analyses and engineering products as Work-In-Kind (WIK) products.

3 Purpose

The purpose of this study is to evaluate Federal interest in alternative plans (including the no-action plan) for reducing transportation costs and addressing navigation safety issues on the HSC and assess the effects of the alternatives on the natural system and human environment, including the economic development effects of existing inefficiencies.

Existing inefficiencies include congestion along the waterway. The high volume of barge and deep-draft vessel traffic exacerbates congestion and results in increased delays and possible accidents. For a given volume of traffic, channel deepening and/or widening can result in fewer trips and reduce congestion. Additionally, channel deepening and/or widening could alleviate some congestion and safety problems by enhancing the maneuverability and control of deep-draft vessels. Additional turning basins, moorings, and/or anchorages can also help reduce inefficiencies by alleviating congestion and reducing total vessel transit times. Safety issues on the HSC have already been established under the Houston Ship Channel Project Deficiency Report (Flare at the Intersection of the Houston Ship Channel and Bayport Ship Channel), Houston-Galveston Navigation Channels, Texas – Galveston District, March 2016 (HSCPDR). The HSCPDR, approved May 9, 2016, recommended an interim corrective action through a channel modification to make the project function in a safe, viable, and reliable manner. The ultimate fix was to be included in this study.

The need for this study arises from inefficiencies currently experienced by commercial vessels navigating the HSC system. In general, the entire HSC will be evaluated for up-to-date current and projected vessel size and traffic. The HSC, Galveston Harbor and Channels, Galveston Entrance Channel, and the Texas City Ship Channel are integrally

connected to the overall navigation system of the Galveston Bay area. However, this feasibility study will focus entirely on the HSC.

Beginning at the most seaward end of the HSC, terminating at Bolivar Roads at the Galveston Entrance Channel, the study will examine possible anchorage, and meeting and passing lanes in the Bay Reach, as well as study the side channels, Bayport Ship Channel (BSC) and Barbours Cut Channel (BCC). Additionally, the study will look at the upper reach of the HSC between Boggy Bayou and the Main Turning Basin. Beneficial Use (BU) of dredged material and/or upland confined placement areas (PAs) will also be considered under this feasibility study. See Exhibit A for an overview of the study segments or reaches in the study scope. The Galveston Entrance Channel, Galveston Channel, Texas City Ship Channel, and Cedar Bayou Channel dimensions are provided; however, these channels are not within the scope of the study.

4 Project Authority

The study is being performed under the standing authority of Section 216 of the Flood Control Act (FCA) of 1970 Public Law (P.L.) 91-611, as amended:

> *The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operations of projects the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due [to] significantly changed physical or economic conditions, and to report thereon to Congress with recommendations on the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest.*

5 Study Area

The HSC provides access to various private and public docks and berthing areas associated with the Port of Houston. It is the longest major navigation channel of a larger system of navigation channels of the Galveston Bay Area and spans Harris, Chambers, and Galveston Counties, Texas. The HSC project consists of an existing 50-mile long navigation channel, four tributary channels and one shallow-draft tributary channel. Several other minor tributary channels also intersect the HSC, including South Boaters Cut, North Boaters Cut, and Five Mile Cut.

Although the Texas City Channel, Galveston Harbor and Channel, and the Cedar Bayou Channel Projects are located in the same bay system, they are not part of the HSC ECIP Feasibility Study. The Galveston Entrance Channel provides access from the Gulf of Mexico to the HSC and Galveston Harbor. Just beyond Galveston Harbor, the HSC and the Texas City Ship Channel intersect at Bolivar Roads. Additionally, on the northern end of the Atkinson Island Marsh, the HSC intersects with the Cedar Bayou (shallow draft) Federal channel. These channels are integrally connected to the overall navigation system of the Galveston Bay area; however, each has their own independent sponsor.

Beginning at the seaward end of the project, the HSC begins at Bolivar Roads at mile 0, extending north through the Galveston Bay, the San Jacinto River, and Buffalo Bayou to the Main Turning Basin at Houston, Texas. From there an approximately 6-mile long shallow-draft channel, referred to as the (Buffalo Bayou) Light Draft Channel, extends upstream of the Main Turning Basin and continues past the Main Turning Basin (mile 50.2). Exhibit B depicts the channels and existing placement areas for the HSC system. Table 1 below identifies the owner/ easement provided to the Government and status of each PA.

Table 1: Placement Area Ownership, Easements, and Status

PA	Owner(s) / Easement to Government	Status
ODMDS 1	State of Texas / Navigation Servitude	Active
Bolivar Marsh BU	State of Texas / Navigation Servitude	Active
Evia Island BU	State of Texas / Navigation Servitude	Inactive
Mid Bay PA	State of Texas / Navigation Servitude	Active
PA 14 PA	PHA / Navigation Servitude **	Active
PA 15 PA	PHA / Navigation Servitude **	Active
PA 14/15 Connection	State of Texas / Navigation Servitude	Tentatively Active
Atkinson Island Marsh BU	PHA / Navigation Servitude **	Active
PA 16	PHA / Navigation Servitude **	Active
Spilman Island PA	PHA / 50-Yr Dredge Material Placement Easement*	Active
Alexander Island PA	PHA / 50-Yr Dredge Material Placement Easement*	Active
Peggy Lake PA	PHA / 50-Yr Dredge Material Placement Easement*	Active
Goat Island BU	PHA / Navigation Servitude	Inactive
Lost Lake PA	PHA / Perpetual Dredge Material Placement Easement	Active
Rosa Allen PA	PHA / 50-Yr Dredge Material Placement Easement*	Active
East Clinton PA	PHA / 50-Yr Dredge Material Placement Easement*	Active
West Clinton PA	PHA / 50-Yr Dredge Material Placement Easement*	Active
House Tract PA	PHA / 50-Yr Dredge Material Placement Easement*	Active
Glendale PA	PHA / 50-Yr Dredge Material Placement Easement*	Active
Filterbed PA	PHA / 50-Yr Dredge Material Placement Easement*	Active

**The 50-year easement conveyed from PHA to the Government exceeds the 20-year term identified in this report.*
***Perpetual Easement from Chambers-Liberty Counties Navigation District.*
****PA 14/15 connection was authorized in the previous HSC project, however it is not being utilized due to an oil/gas structure under a 5-year lease. PA will be available after subject lease expires.*

The authorized channel dimensions within the HSC vary. The original authorization for the 45' channel was in Mean Low Tide (MLT). The Galveston District recently converted the HSC to the Mean Lower Low Water (MLLW) datum.

From Bolivar Roads (mile 0) to Boggy Bayou (mile 40) the channel depth is 46'/46.5' MLLW (45' MLT) and width is 530 feet. Between Boggy Bayou and Sims Bayou (mile 47), the channel depth is 41.5' MLLW (40' MLT) and width is 300 feet. From Sims Bayou to the Main Turning Basin (mile 52), the channel depth is 37.5' MLLW (36' MLT) feet and width is 300 feet. Additionally, barge lanes are immediately adjacent to and on either side of the HSC from Bolivar Roads to Morgans Point (mile 26), a distance of approximately 26 miles. Each barge lane measures approximately 125' wide with a

depth of 13' MLLW (12' MLT). Dredged material is typically deposited in a variety of upland confined placement area (PA) sites and BU sites, but some material from the lower bay region has been placed offshore in the Ocean Dredged Material Disposal Site (ODMDS) historically referred to as PA 1.

The HSC system also includes side or tributary channels known as BSC, BCC, Jacinto Port Channel, and Greens Bayou Channel. See Table 2 for a summary of the channel dimensions for the HSC, its tributary channels, and Turning Basins.

Table 2: Dimensions of the HSC, Tributary Channels, and Turning Basins

Houston Ship Channel Section of Waterway	Authorized Dimensions			
	Depth (feet)		Width (feet)	Length (miles)
	MLT	MLLW		
Houston Ship Channel System				
-Bolivar Roads (Mile 0) to Morgans Point (Mile 26.2)[1]	45	46/46.5	530	26.2
-Barge Lanes (adjacent to and on each side from Mile 0 to Mile 26.2)	12	13/13.5	125	26
-Morgans Point (Mile 26.2) to Boggy Bayou (Mile 38.5)	45	46.5	530-600	12.3
-Boggy Bayou (Mile 38.5) to Greens Bayou (Mile 42)	40	41.5	300	3.5
-Greens Bayou (Mile 42) to Sims Bayou (Mile 47.5)	40	41.5	300	5.5
Hunting Bayou Turning Basin	40	41.5	948-1,000[2]	0.3
Clinton Island Turning Basin	40	41.5	965-1,070[2]	0.3
-Sims Bayou (Mile 47.5) to Houston (Main) Turning Basin (Mile 50.2)	36	37.5	300	2.7
Houston (Main) Turning Basin	36	37.5	400-932	0.6
Upper Turning Basin	36	37.5	150-527	0.2
Brady Island Channel	10	11	60	0.9
Brady Island Turning Basin	36	37.5	300-722	0.2
-Barbours Cut Channel[3]	40	41.5	300	1.1
Turning Basin	40	41.5	300-1,600	0.3
-Bayport Ship Channel[3]	40	41.5	300	3.8
Turning Basin	40	41.5	300-1,600	0.3
-South Boat Cut @ Mile 15.3	8	9	300	1.9
-North Boat Cut @ Mile 18.7	8	9	100	2.1
-Five Mile Cut Channel @ Mile 20.9	8	9	125	1.9
-Buffalo Bayou Light Draft Channel				
Upper Turning Basin to Jensen Drive	10	11	60	4.1
Turkey Bend Channel	10	11	60	0.8
Jensen Drive to White Oak Bayou[4]	10	11	60	1.5
-Greens Bayou Channel				
Mile 0.0 to Mile 0.36	40	41.5	175	0.4
Mile 0.36 to Mile 1.65	15	16.5	100	1.3

[1] Per the MLT to MLLW Datum Conversion EDR, the split occurs at Beacon 76.
[2] Includes 300-foot channel width
[3] PHA has approval to deepen channel to 45 feet (MLT)/ 46.5 feet (MLLW)
[4] City of Houston Improved in 1913 & 1914. Jensen Street Bridge to White Oak Bayou (Deauthorized - Sec12 of P.L. 93-251.

Beginning at the seaward end of the project area existing channel feature will be briefly discussed.

5.1 Galveston Harbor Channels

Galveston Harbor and Channels consists of the Galveston Entrance Channel and Galveston Harbor Channel. Though not in the scope of the study, the interconnectivity to the HSC requires description here. The total length of these channels is 18.7 miles. The Entrance Channel is 14.4 miles with a depth of 48' MLLW (47' MLT) and width of 800 feet, but decreases to 46' MLLW (45' MLT) in depth near Bolivar Roads (mile 0). The Galveston Harbor Channel is 4.3 miles with a depth of 46' MLLW (45' MLT) and varying widths from 800 – 1,133 feet. The 46' MLLW (45' MLT) depth ends around Pier 38; however, the last 2,571 feet of the west end of the channel remains at a depth of 46' MLLW (40' MLT). The Galveston Harbor Channel Extension Feasibility Study, currently in progress, is evaluating deepening the last 2,571-feet of channel to match the adjacent 46' MLLW (45' MLT) channel. Dredged material placement for the Galveston Harbor and Channels is placed in the ODMDS (PA 1) in the Gulf of Mexico and/or Pelican Island and San Jacinto upland confined PAs. The Galveston Harbor and Channels are not in the scope of this study.

5.2 Texas City Ship Channel

Texas City Ship Channel is a 6.5-mile channel that is 46' MLLW (45' MLT) deep and 400 feet wide. The channel includes an Industrial Canal that is 41' MLLW (40' MLT) deep and varies between 300-400 feet in width; the Industrial Canal extends for a distance of 1.9 miles southwest of the south end of Texas City Turning Basin. Construction of the locally preferred plan to deepen the channel to 46' MLLW (45' MLT) was completed in 2011. Dredged material from the channel is placed in both upland confined PA and BU sites. The Texas City Ship Channel is not in the scope of this study.

5.3 Barge Lanes

Barge Lanes measuring 125 feet wide by 13' MLLW (12' MLT) feet deep are located immediately adjacent to and on either side of the HSC and extend from Bolivar Roads to Morgan's Point, a distance of approximately 26 miles. The barge lanes were constructed due to heightened concerns of the interaction between faster moving large vessels with slower moving barge tows.

5.4 South Boaters Cut

This 10,000-foot long cut intersects the HSC between Redfish Reef and Mid Bay PA. The 300 feet wide by 9' MLLW (8' MLT) deep cut was constructed to allow smaller vessels to move off the HSC and into the bay.

5.5 North Boaters Cut

This 11,000-foot long cut intersects the HSC between Mid Bay PA and PA 14. The 100 feet wide by 9' MLLW (8' MLT) deep cut was constructed to allow smaller vessels to move off the HSC and into the bay.

5.6 Five Mile Cut

This 125 feet wide by 9’ MLLW (8’ MLT) deep shallow draft channel connects to the HSC just south of the BSC and runs eastward 10,000 feet.

5.7 Bayport Ship Channel (BSC)

Bayport Ship Channel is a tributary of the HSC that connects to the HSC and runs westward toward the west shoreline of Galveston Bay between La Port, Texas and Seabrook, Texas. This channel extends west from the main HSC approximately 4.1 miles to the Bayport Terminal. The federally authorized channel depth is 41.5’ MLLW (40’ MLT) feet, with a width of 300 feet. The PHA recently obtained Section 408 approval and a Department of the Army Permit pursuant to Section 10 of the Rivers and Harbors Act (RHA) of 1899 (33 U.S.C. 403) and Section 404 of the Clean Water Act (CWA)(33 U.S.C. 1344) (“Section 10/404 permit”) to deepen the channel to 46.5’ MLLW (45’ MLT), widen the bay portion of the channel by 100 feet, and widen the constricted portion of the channel within the land cut by 50 feet. Bend easing within this reach was completed, with subsequent Federal assumption of maintenance (AOM) under Section 204(f). The BSC serves the Bayport Container and Cruise Terminals and two liquid bulk terminals at Odfjell and Liquid Bulk Chemicals (LBC). The Bayport Flare is located at the intersection of the BSC and the HSC. A Project Deficiency Report outlining a proposed corrective action to correct a design deficiency to provide interim relief for navigational safety concerns at the flare and the bend in the HSC near BSC was approved in March 2016 and recently completed in 2017.

5.8 Barbours Cut Channel (BCC)

Barbours Cut Channel is located just north of Morgan’s Point and extends to the west from the main HSC approximately 1.6 miles to the Barbours Turning Basin. The BCC is approximately 300 feet wide with an authorized depth of 41.5’ MLLW (40’ MLT). The PHA recently obtained Section 408 approval and a Section 10/404 permit to deepen the channel to 46.5’ MLLW (45’ MLT) and shift a portion of the channel to the north to provide sufficient berthing space for adjacent private facilities. Construction of these improvements was completed in August 2015, with subsequent Federal AOM under Section 204(f). The BCC serves the Barbours Cut Container Terminal.

5.9 Jacintoport Channel

Jacintoport Channel connects to the HSC approximately 10 miles upstream of BCC and east of Boggy Bayou. Currently, the Jacintoport Channel is not a Federal Channel; however, under Section 5001 of WRDA 2007, maintenance has been federally assumed as of 29 April 2016.

5.10 Greens Bayou Channel

Greens Bayou Channel intersects with the HSC approximately 4 miles upstream of Boggy Bayou. The Greens Bayou Channel is a 2.1 mile long combination 41.5’ MLLW (40’ MLT) and 16.5’ MLLW (15’ MLT) shallow-draft tributary.
The study area was divided into the following six segments:

Segment 1 Bay Reach

Segment 2 Bayport Ship Channel
Segment 3 Barbours Cut Channel
Segment 4 Boggy Bayou to Sims Bayou
Segment 5 Sims Bayou to I-610 Bridge
Segment 6 I-610 Bridge to Main Turning Basin

6 Project Area

The study will focus on the entire 50 miles of the HSC, in particular, the upper reach from Boggy Bayou to the Main Turning Basin, as well as the side channels (BSC and BCC), and Galveston Bay. The upper reach of the channel is located within a highly-developed, industrialized urban area of Houston where few tracts of vacant, undeveloped land remain. Any new PAs that may be required by the proposed action will result in potential impacts including residential, business, pipeline, roadway, and railroad relocations. The portions of the study (BSC, BCC, possible anchorage in bay, and placement options) within the bay reach of the HSC will likely involve benthic and oyster impacts and pipeline(s) may need to be relocated.

7 Real Estate Requirements

The Non-Federal Sponsor is responsible for acquiring and furnishing all lands, easements, rights-of-way, relocations (i.e., P.L. 91-646 relocations and utility/facility relocations), borrow material, and dredged or excavated material disposal areas (LERRD) for the project. The real estate requirements for the Project must support construction as well as the continued operation and maintenance of the Project.

The TSP was identified as Alternative 8 and then refined to become the recommended NED plan. PHA desires two-way traffic throughout the Bay from Bolivar Roads to BCC. While the NED plan provides opportunity for meeting and passing between Bolivar Roads and Redfish; the additional increments of widening (Redfish-BSC and BSC-BCC) of the desired Locally Preferred Plan (LPP) would allow two-way traffic of the design vessel up to BCC. The comparisons of NED and LPP plans are shown in the Table 3 below followed by a brief description.

<u>Federalization of Non-Federal Improvements (located in Segments 1, 2, 3 and 4)</u>
Previous improvements made by the Non-Federal sponsor (PHA) to the Jacintoport Channel (Segment 1), BSC (Segment 2), BCC (Segment 3), and Greens Bayou Channel (Segment 4) were recommended for Federalization as part of the TSP. They were previously determined to be in the Federal Interest and are being included into the authorization; these features are assumed part of the Future Without Project (FWOP) and necessary to realize the benefits of the recommended plan.

Descriptions will include all real estate requirements for the channel improvement features, followed by real estate requirements for placement of dredged material as shown in Table 4.

Table 3: NED and LPP Comparisons

	NED PLAN			LPP PLAN		
SEG.	**MEASURE**	**STATION**	**DESCRIPTION**	**MEASURE**	**STATION**	**DESCRIPTION**
1	CW1_Bolivar-Redfish_700	138+369 – 078+844	Widen Houston Ship Channel between Bolivar to Redfish to 700-foot width. Includes bend easings.	CW1_Bolivar-Redfish_700	138+369 – 078+844	Widen Houston Ship Channel between Bolivar to Redfish to 700-foot width. Includes 328-foot bend easings.
		078+844 – 073+934	Bottleneck transition back to existing 530-foot channel.	CW1_Redfish-BSC	073+934 – 028+605	Widen Houston Ship Channel between Redfish to Bayport to 700-foot width. Includes 328-foot bend easings.
	BE1_028+605	026+028 - 031+171	328-foot bend easing along the 530-foot existing channel	CW1_BSC-BCC	028+605 – (-)3.94	Widen Houston Ship Channel between Bayport to Barbours to 700-foot width. Includes 328-foot bend easings.
2	CW2_BSC_455	025+58 – 222+76	Widen Bayport Ship Channel on north side to 455-foot width.	CW2_BSC_455	025+58 – 222+76	Widen Bayport Ship Channel on north side to 455-foot width.
	BE2_BSCFlare	203+66 – 239+78	Widen Bayport Ship Channel south side flare radius to 5,375 feet.			
3	CW3_BCC_455	24+69 – 67+11	Widen Barbours Cut Channel on north side to 455-foot width.	NO CHANGE - SAME AS NED PLAN		
	BETB3_BCCFlare	08+78 – 30+84	Widen Barbours Cut Channel flare on north and south to create 1,800-foot diameter turning basin.			
4	CD4_Whole	684+03 – 974+08	Deepen Houston Ship Channel between Boggy Bayou to Sims Bayou from the existing 41.5-foot depth up to 46.5 feet, stopping at Washburn Tunnel.	NO CHANGE - SAME AS NED PLAN		
	CW4_BB-GB_530	684+03 – 833+05	Widen Houston Ship Channel between Boggy Bayou to Greens Bayou to 530-foot width.			
5	CD5_Whole	1110+78 – 1160+62	Deepen Houston Ship Channel between Sims Bayou to 610 Bridge from 37.5 foot depth to 41.5 feet.	NO CHANGE - SAME AS NED PLAN		
6	CD6_Whole	1266+49=00 +00 – 30+95	Deepen Houston Ship Channel between 610 Bridge and Main Turning Basin.			
	TB6_Brady_900	1189+15.688 – 1203+14.265	900-foot Turning Basin at Brady Island			

As shown in the table above, the differences between NED and LPP are the additional channel widening from 530’ to 700’ identified in Segment 1 Redfish to BSC, BSC to BCC, and the removal of BSC flare expansion feature in Segment 2. The BSC flare

feature has been addressed in the previous Bayport Ship Channel Bend Easing project. The real estate requirements for both the NED and LPP are listed below by project segment.

7.1 NED and LPP Real Estate Requirements for Construction

Segment 1-3
All channel deepening and widening will be constructed under navigational servitude, in which TXGLO owns submerged lands.

Segment 4-6
All channel deepening and widening will be constructed under navigational servitude, in which PHA holds a patent from the State of Texas.

Segment 6
Channel deepening from I-610 Bridge to Main Turning Basin will be constructed under navigational servitude, in which PHA holds a patent from the State of Texas. Turning basin improvements at Brady Island will required the acquisition of .096 acres of land in fee. Additional requirement for this feature is a 1-acre staging/temporary work area easement on Brady Island for the term of one year. Access to staging will utilize public roads to access staging area.

7.2 Real Estate Requirements for Placement of Dredged Material

The DMMPs for the NED Plan and LPP handle the dredge material in Segments 3, 4, 5, and 6 the same. The difference between the plans are in Segments 1 and 2. NED and LPP placement area real estate requirements for new work and O&M material will utilize:

- Existing open water and upland placement areas/BU sites/ODMDS sites
- Expansion of open water placement areas/BU sites
- Creations of open water placement areas/bird islands
- Expansion of existing placement areas
- Creation/Expansion of placement area for one-time use.

New work and O&M placement plan for NED and LPP are shown in table 4 below, followed by a brief description per segment.

Table 4: New Work and O&M Placement Plan for NED and LPP

	NED PLAN			**LPP RECOMMENDED PLAN**		
	New Work		**O&M**	**New Work**		**O&M**
SEG.	**New BU/PAs**	**Existing BU/PAs**		**New BU/PAs**	**Existing BU/PAs**	

1	8-Acre Bird Island Long Bird Island Bird Island Marsh	ODMDS	ODMDS Bird Island Marsh Mid Bay PA15	8-Acre Bird Island Long Bird Island BSC Sedimentation Attenuation Feature Oyster Pad Mitigation Bird Island Marsh	ODMDS M11 M7/8/9	ODMDS Bird Island Marsh MidBay PA 14/PA15 Connection M11 M7/8/9
2	Bird Island Marsh		PA14/15 Connection ODMDS	NO CHANGE - SAME AS NED PLAN		PA14 ODMDS M7/8/9 M11
3	M12		M12 Spilman ODMDS BABUS	NO CHANGE - SAME AS NED PLAN		
4	BW-8 Tract E2 Clinton		Lost Lake BABUS Rosa Allen Rosa Allen Expansion East Clinton	NO CHANGE - SAME AS NED PLAN		
5		Glendale PA	West Clinton	NO CHANGE - SAME AS NED PLAN		
6		Glendale PA Filterbed PA	West Clinton House Tract BABUS	NO CHANGE - SAME AS NED PLAN		

NED/LPP Segment 1-3

All placement areas identified within these segments are located in open water and have been or will be constructed under navigational servitude. Existing PAs that will be utilized and constructed under navigational servitude are listed in table 1.

Segment 2 will include Atkinson Island Expansion. M11 and M12 will be created through expansion Atkinson Island Marshes as new BU sites. M11 will be between M7/8/9 and M10 on the southern end of Atkinson Island and M12 on the north end of Atkinson Island will be constructed under navigational servitude.

8-Acre Bird Island, Long Bird Island, BSC Sedimentation Attenuation Feature, Oyster Pad Mitigation, and Bird Island Marsh are new open water BU/PAs that will be constructed under navigational servitude.

The Bay Aquatic Beneficial Use Site (BABUS) would be constructed in Galveston Bay, south of Atkinson Island, north of Midbay PA, and east of the HSC proposed to provide storage for maintenance material volumes that exceed existing confined PA capacities. This site would be constructed on submerged lands under navigational servitude.

PA 14-15 connection was previously designated as placement of O&M material. The channel-side dike currently has a breach to allow access to an oil/gas structure within the site. The site is not currently available due to the location of the structure and ongoing inquiries from structure owners as to the authority to use this site for the project. If this site is not available during the O&M described in this report, PDT will identify an existing PA for placement or utilize ODMDS.

NED/LPP Segment 4

Beltway 8 is 555.02 acre upland tract owned in fee by PHA and proposed as one-time use placement area, for new work material. Due to the designation of this PA as one time use, PHA will not be eligible for LERRD crediting for BW8 PA.

E2 Clinton is 80 acre tract east of the existing Clinton PA with a proposed one-time use for new work material. Due to the designation of this PA as one time use, PHA will not be eligible for LERRD crediting for E2 Clinton PA.

Rosa Allen extension is a 120 acre tract of the existing Rosa Allen PA currently owned by PHA that would be utilized for O&M material. The conveyance of a perpetual non-standard estate to place dredged material in Rosa Allen extension to the Government is required for this project. PHA will be eligible for LERRD credits for Rosa Allen Extension.

NED/LPP Segment 5-6

Glendale PA is an existing PA located to the north of the HSC in the Sims Bayou to Main Turning Basin Dredging Reach. This upland, confined PA is approximately 176-acres.PHA owns the land in fee and has conveyed a 50-year Dredged Material Placement Easement in 2001 to the Government.

Filterbed PA is an existing PA located to the north of the HSC in the Sims Bayou to Main Turning Basin Dredging Reach. This upland, confined PA is approximately 78 acres. PHA owns the land in fee and has conveyed a 50-year Dredged Material Placement Easement in 2001 to the Government.

East Clinton PA is located to the north of the HSC in the Sims Bayou to Main Turning Basin Dredging Reach. This upland, confined PA is approximately 250 acres. PHA owns the land in fee and has conveyed a 50-year Dredged Material Placement Easement in 2001 to the Government.

West Clinton PA is located to the north of the HSC in the Sims Bayou to Main Turning Basin Dredging Reach. This upland, confined PA is approximately 318-acres. This site is considered feasible for future placement of dredged material. PHA owns the land in fee and has conveyed a 50-year Dredged Material Placement Easement in 2001 to the Government.

PHA will be required to convey a Non-Standard Perpetual Dredged Material Placement Easement for Rosa Allen PA Expansion. Maintenance dredging of the Federal Project

channel is a 100% Federal responsibility and is accomplished through Federal dredging contracts. Perpetual easements conveyed to the Federal Government are needed to assure all project placement areas, which are built for the purpose of supporting the Federal navigation project, are available to the Government as often and for as long as they are needed to support the project. The Government is also responsible for managing the navigation project to assure sufficient placement area capacity exists to meet the needs of the Federal navigation project now and in the future.

Perpetual easements allow the Government to better restrict/control non-federal use, maximum quantities placed by non-federal interests, and remove any potential for interference with federal dredge contractors. Finally, the Government has certain Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) liabilities already as an operator and transporter of materials put into the placement area. Perpetual easements provide the property interest necessary for the Government to issue outgrants to non-federal users that will require testing and approval of non-federal dredged materials prior to placement into the Federal project placement areas, thus protecting the Government from additional CERCLA liability. The district will seek approval of the non-standard estate by separate request to HQ. The granting clause for the non-standard perpetual dredged material placement easement is stated below.

> ***Non Standard Perpetual Dredged Material Placement Easement***
> *A assignable right and easement on, over, and across (the land described in Schedule A) (Tracts Nos. _____,_____, and _____), for the location, construction, operation, maintenance and patrol of a dredged material disposal facility, including the right to borrow and/or deposit fill, spoil and dredged material thereon, the right to move, store and remove equipment and supplies, and the right to perform any other work necessary and incident to said facility, together with the right to trim, cut, fell, and remove therefrom all trees, underbrush, obstructions, and any vegetation, structures, or obstacles within the limits of the easement; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.*

Construction in Segment 6 will include improvements at Brady Island Turning basin. The feature will include the land shaving of .096 acres, which will require the acquisition of .096 acres of land in fee. This work will also require a temporary staging/work area easement adjacent to the proposed Brady Island land shaving feature. The granting clauses for required estates #3 and #15 are stated below:

> ***Standard Estate #3 Fee Excluding Minerals***
> *The fee simple title to the land, subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines; excepting and excluding all (coal) (oil and gas), in and under said land and all appurtenant rights for the exploration, development, production and removal of said (coal) (oil*

and gas), but without the right to enter upon or over the surface of said land for the for the purpose of exploration, development, production and removal therefrom of said (coal) (oil and gas).

Standard Estate #15 Temporary Work Area Easement
A temporary easement and right-of-way in, on, over and across the land described, for a period not to exceed ___ months, beginning with date possession of the land is granted to the United States, for use by the United States, its representatives, agents, and contractors as a (work area), including the right to (borrow and/or deposit fill, spoil and waste material thereon) (move, store and remove equipment and supplies, and erect and remove temporary structures on the land and to perform any other work necessary and incident to the construction of the _____ Project, together with the right to trim, cut, fell and remove there from all trees, underbrush, obstructions, and any other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

8 Navigational Servitude

Navigation Servitude emanated from the Commerce Clause of the Constitution of the United States, Article I; Section 8, Clause 3. The servitude gives the Federal Government the right to use the “Navigable Waters” of the United States without compensation for navigation projects. These are non-transferable rights, and are not considered interest in real property. The Federal Government’s rights under navigation servitude exist irrespective of the ownership of the banks and bed of a stream below the ordinary high water mark and irrespective of western water rights under prior appropriation doctrine.

There will be navigational servitude associated with the HSC ECIP project as it meets the two-step determination of availability process: the project is an aid to commerce and the lands are below the ordinary high water mark. The widening of the existing HSC and creation of the proposed open water placement areas 8-Acre Bird Island, Long Bird Island, BSC Sedimentation Attenuation Feature, Oyster Pad Mitigation and Bird Island Marsh would occur entirely within navigable waters and would be constructed under navigational servitude.

9 Mitigation Features

9.1 Wetlands Mitigation

A total of 72 acres of wetlands would be impacted from construction and operation of either the NED Plan or Recommended Plan due to proposed new upland PA or construction of BU sites. New work placement at Beltway 8 would impact approximately 22.7 acres of forested wetland, and at E2 Clinton, 8.7 acres of mostly emergent wetland. Future O&M placement at the Rosa Allen Expansion would impact 40.7 acres

of mostly forested wetlands when it is built. Due to the high costs of land purchase, construction, maintenance, and monitoring wetlands, permittee creation of wetlands, the preferred of compensatory mitigation may be provided through mitigation banks therefore no additional lands will be required for wetlands mitigation. Additional details regarding wetlands mitigation planning can be found in Appendix P-1.

9.2 Oyster Mitigation

Oyster reefs would be directly impacted by the new work dredging necessary to construct the NED Plan or the LPP. Oyster reef within the NED Plan and the LPP footprint is found primarily in the Bay channel widening measures ("CW1" measures and Bayport Flare Easing) accounting for approximately 70 percent of the NED Plan and all of the increment LPP.

To mitigate for the NED approximately 94.6 acres of reef impacts, approximately 90.2 acres of oyster reef would be created in three locations: 4 acres as part of the 6-acre Long Bird Island, 14.1 acres for part of the 3-Bird Island and 72.1 acres offshore of Dollar Bay with three 20-acre pads located on state owned submerged lands.

To mitigate for the 321 acres of incremental LPP oyster reef impacts, approximately 291 acres of oyster reef would need to be constructed. Fourteen oyster reefs would be constructed located in two locations: offshore of Bacliff and offshore of Dollar Bay Offshore of Bacliff, seven 20-acre reefs and one approximately 26-acre reef would be constructed. Offshore of Dollar Bay, six 20-acre pads would be constructed located on state owned submerged lands.

Two desirable sites were selected in coordination with the resource agencies from among reef sites impacted by Hurricane Ike that have been the focus of TPWD efforts to restore reef in the Bay. These sites in the San Leon and Dollar Reef areas were shown in the oyster reef habitat modeling to provide better restoration quality per acre restored than other proposed sites. These sites will be constructed under navigational servitude, therefore no additional lands are required for the oyster mitigation plan. Coordination with resource agencies on the selection of the mitigation sites also assured that mitigation sites will not be constructed on any submerged lands subject to third party harvesting leases. Additional details regarding oyster mitigation plan can be found in Appendix P-2. The selected sites are shown in Exhibit C.

10 Aids to Navigation

The relocation or addition of ATONs will be required to delineate the limits of the widened channel(s). Coordination with the United States Coast Guard (USCG) has been performed to evaluate the potential impacts to existing ATONs. A total of 86 ATONS will need to be relocated due to project alignment. All ATON relocations will be constructed under navigational servitude. Impacted ATONs in reference to project segment are shown in the table 5 below.

Table 5: Aids to Navigation

Segment	Measure	ATON Qty.
1	CW1_Bolivar-Redfish_700	31
	CW1_Redfish-BSC_700	25
	CW1_Redfish-BSC_700	16
2	CW1_Redfish-BSC_700	6
	CW2_BSCFlare	3
3	CW2_BSCFlare	1
4	CW4_BB-GB_530	4
	TOTAL	86

11 Lands Ownership and Existing Federal Projects

This channel improvement project will overlap the existing HSC project as discussed in the “Purpose” section of this REP. The alignment of the NED and LPP is located mostly on open waters of Galveston Bay and HSC. Portions of the additional submerged lands required over Galveston Bay are owned by TXGLO and will be utilized under navigational servitude. A total of 50 TXGLO submerged tracts were identified as being utilized under navigational servitude. These tracts are located in the CW1 BR-BCC measure. A table of these tracts are shown in Exhibit D. A total of 45 Tracts were identified as NFS owned land via patent by the State of Texas. The PHA currently has a development easement extending approximately 230 feet from the improved channel toe along the north side of the BSC for future development. A table of these tracts are shown in Exhibit E. These submerged lands are located at the BSC and BCC through the upper bayou of this project.

12 Borrow Material

12.1 E2 Clinton

All material needed to construct E2 Clinton will be sourced within the subject PA owned by PHA.

12.2 Rosa Allen Extension

All material needed to construct Rosa Allen Extension will be sourced within the subject PA owned by PHA.

13 Access/Staging

Segment 6 will include turning basin improvements at Brady Island, which will require the land shaving of .096 acres requiring land acquisition in fee. Additional requirement for this feature is a one acre staging/temporary work area easement on Brady Island adjacent to the Brady Island land shaving feature for the term of one year. Access to the staging area will utilize public roads leading into Brady Island.

14 Recreation Features
The proposed Project does not have any recreation features.

15 Project-Induced Flooding
No project-induced flooding will result from the construction of the Project.

16 Baseline Cost Estimate for Real Estate
The baseline cost estimate was determined by analyzing each measure for both NED Plan and LPP, identifying real estate-related impacts and determining associated cost for those impacts. For this estimate, the majority of the proposed work will be in open water constructed on submerged lands exercising navigational servitude in the CW1 BR-BCC measure which is primarily in the Galveston Bay. Submerged lands located at the BSC and BCC through the upper bayou of this project are owned by the NFS via patent by the State of Texas.

The Baseline Cost Estimate for Real Estate reflects the administrative costs for pipeline relocations, project administration costs per segment, land acquisition costs, land costs required for Rosa Allen expansion and LERRD crediting costs for NED and LPP Plan. Details of real estate costs are shown in Exhibit F.

Real Estate BCE for NED and LPP Plan

NED Non-Fed cost: $11,584,000.00
NED Fed cost: $115,250.00
Total Real Estate NED cost: $11,699,250.00

LPP Non-Fed cost: $11,480,375.00
LPP Fed cost: $123,500.00
Total Real Estate LPP cost: $11,726,250.00

17 P.L. 91-646 Relocation Assistance Benefits Anticipated

Land will need to be acquired for the Brady Island land cut, however no P.L. 91-646 relocations are anticipated as a result of the acquisition.

18 Mineral Activity
No mineral activity will be interrupted by the project. The predominant type of mineral activity in the vicinity of the project is oil and gas exploration and production.

19 Assessment of the NFS's Acquisition Capability
An Assessment of the Non-Federal Sponsor's Acquisition Capabilities survey has been sent to the NFS and at the time of this draft, survey responses has not been received. The REP will be updated after the NFS's responses have been submitted and included in Exhibit G.

20 Zoning

No application or enactment of zoning ordinance is proposed in connection with this project.

21 Land Acquisition Schedule

Land acquisition table below reflects the acquisition schedule related to the Brady Island land shaving and temporary staging/work area easement feature in Segment 6. This project has been planned to be constructed in 14 contracts. Brady Island land work is scheduled to begin in contract 14. Land acquisitions for contract 14 will be required prior to the solicitation of contract 14. Table 6 reflects the tasks and durations associated with the project's land acquisitions.

Table 6: Land Acquisition Schedule

Land Acquisition Schedule		
Milestone*	**Predecessor**	**Maximum Duration**
Transmittal of ROW drawings & instruction to proceed with acquisition along with required estate(s)	Immediately after PPA is signed	30 days
Obtain Surveys	Upon transmittal of ROW drawings and instruction to proceed with acquisition	90 days
Obtain Title Evidence	Upon completion of surveys	30 days
Obtain Appraisals & Reviews	Upon obtaining title evidence	90 days
Authorization to Proceed with Offer	Upon obtaining appraisals and reviews	30 days
Conclude Negotiations	Upon obtaining authorization to proceed with offer	60 days
Begin Condemnations**	**Upon conclusion of negotiations**	**30 days**
Conduct Closings	Upon conclusion of negotiations	30 days
Conclude Condemnations**	**Upon beginning condemnations**	**240 days**
Attorney Certifies Availability of LERRD**	**Upon conclusion of condemnations**	**30 days**

*Milestones are based on the project Partnership Agreement (PPA) being signed.
**Task listed in the event condemnation is required.

22 Description of Facility or Utility Relocations

The project, with a main channel depth of -45' MLT, is not subject to deep-draft cost-share requirements as a result of conversion of the reference point of channel depths from -45' MLT to a maximum of -46.5' feet MLLW. Based upon the court's decision in Air Liquide America Corporation v. U.S. Army Corps of Engineers, 359 F.3d 358,366 (5th Cir. 2004), when Congress adopted the Chief's Report for the project, it authorized the construction of a 45-foot deep harbor, not a deep-draft harbor. Since the project was designed with a main channel -45' in depth MLT and would remain at the same

effective depth regarding of the datum change, the maintenance costs remain 100% Federal. Cost sharing and other responsibilities are maintained consistent with the Chief of Engineer's report by which the project was authorized and the agreements for construction of the project, both of which reflect that the project is a shallow-draft project.

In development of the REP, a pipeline assessment was prepared in lieu of an Attorney's Opinion of Compensability (AOC) per PGL-31 January 11, 2019. AOCs for impacted pipelines will be required prior to contract award in PED phase.

The PDT conducted an analysis of pipelines crossing the channel. The data was derived from PHA license data, permit documents, as-built documents, and state and federal databases. PHA has assessed all available data pipelines crossing the HSC and this report focuses efforts on the lines with potential impact. A total of 215 pipelines were identified, with 14 pipelines identified as needing to be removed or relocated as a result of the proposed project. These pipelines are located in the CW1_BR-Redfish and CD4- whole measures.

The non-Federal sponsor is responsible for performing, or assuring the performance of, all pipeline relocations necessary for the project. Costs borne by the non-Federal sponsor to perform or assure the performance of all utility relocations will be creditable against the NFS's required additional 10 percent repayment requirement at the end of the project. A table of all identified pipelines for this project is shown on Exhibit H of the REP.

23 HTRW or Other Environmental Contaminants

The proposed alternative has the potential to impact an existing EPA National Priorities List (NPL) site, known as the Patrick Bayou NPL site. The Patrick Bayou site is undergoing assessment and cleanup under the CERCLA; the site is potentially a continuing source of sediment contaminated with PAHs, PCBs, and metals to the HSC. The channel widening measure from the San Jacinto Monument to Boggy Bayou would widen the existing Federal channel to include a small portion of land at the mouth of Patrick Bayou. Due to the verified contamination in sediment in the bayou, and the continuing discharge from the bayou into the HSC, the proposed alternative may encounter those sediments. Further evaluation is needed in order to assess the risk to the proposed project posed by the Patrick Bayou site. Additionally, widening the channel from Boggy Bayou to Greens Bayou would involve the acquisition of a small portion of land currently owned by the Texas Deepwater Terminal. If this land was to be acquired, the Non-Federal Sponsor must ensure that the land is clean and free of contaminants before inclusion into the federal project. All other measures in this alternative will have no effect in relation to known HTRW.

HTRW sites can be found in near proximity to the proposed project footprint as shown in Exhibit I. These sites are listed in Table 7 below, along with the action recommendation.

Table 7: HTRW Sites near Project Location

Site	Location	REC	Action Recommendation
Patrick Bayou	1.8 mi E of Beltway 8 Bridge, Harris County	NPL site, sediment contaminated with PAHs, metals, and PCBs	Further investigation needed to evaluate potential for contaminated sediments to enter HSC
San Jacinto Waste Pits	Immediately N of I10 bridge @ San Jacinto River, Channelview	NPL site, sediment contaminated with dioxin	Chemical sediment quality sampling within HSC portion of AOC, in accordance with 2009 EPA public notice
Pasadena Refining System	0.25 mi E of Washburn Tunnel, Pasadena	Past RCRA investigations and corrective actions, TSDF, active institutional controls	No action needed. However, further investigation will be needed if widening occurs in this reach of the HSC
South Coast Terminals	0.1 mi E of I610 bridge, Houston	Past state enforcement orders, active VCP remediation ongoing, soil and GW contaminated with VOCs, BTEX, and PAHs	Avoidance of widening measures in this area of HSC
Lone Star Industries	0.1 mi E of Brady Island, Houston	Active VCP investigation ongoing, soil and GW contaminated with VOCs, SVOCs, metals, and TPH	Avoidance of widening measures in this area of HSC
Pasadena Terminal	0.4 mi S of Hunting Bayou, Pasadena	Past state enforcement orders, active institutional controls	No action needed. However, further investigation will be needed if widening occurs in this reach of the HSC
Oxid, LP	0.1 mi E of I610 bridge, Houston	Active VCP remediation ongoing, soil and GW contaminated with solvents and metals	Avoidance of widening measures in this area of HSC
San Jacinto Ordnance Depot	Immediately E of Beltway 8 Bridge, Houston	Unresolved munitions and future use concerns, GW contaminated with mercury	No action needed. However, if the site is considered for dredged material placement, resolution of existing concerns is required.

24 Attitudes of the Landowners

There is no known opposition to the Project by landowners in the Project area.

25 Timber Rights

Timber impacts to this project do not apply.

26 Risk Notification

A copy of the letter notifying the NFS of the risk in acquiring lands prior to the signing of the Project Partnership Agreement (PPA) is shown in Exhibit J.

27 Additional Real Estate Issues

Risk identified during the development of this report has been the process of determining pipelines impacted by the proposed project. The PDT has utilized multiple facility owner's pipeline records and local databases to determine pipeline impacts. However, the District's experience with navigation projects in the PED phase have shown challenges with confirming actual pipeline depths and ownerships. To mitigate this risk the District will begin early coordination with PHA to ensure channel right-of-way will be clear of all pipelines/obstructions prior to contract award.

PA 14-15 connection is designated for placement of O&M material. The channel-side dike currently has a breach to allow access to an oil/gas structure within the site. The site is active, however not currently available due to the location of an oil/gas structure. To mitigate this risk, PDT will identify an existing PA for placement or utilize ODMDS.