

2.0 ALTERNATIVES

2.1 HISTORY AND PROCESS FOR FORMULATING ALTERNATIVES

For the preparation of the CCSCCIP, alternatives were analyzed during the Initial Plan Formulation Phase to identify the alternative that maximized National Economic Development (NED) benefits. Twenty-three alternatives, including combinations, were analyzed during this initial stage. The Feasibility Report, to which this FEIS is attached, provides details of the Alternatives Analysis. Only a brief summary is included below.

The Planning, Environmental, and Regulatory Division of the Galveston District (PER) provided channel depths for analysis. Channel widths were determined by design economic vessels and ship simulations based on information from Aransas-Corpus Christi Pilots and the U.S. Army Engineer Research and Development Center (ERDC). Non-Federal sponsor requests were also evaluated.

An economic evaluation of project modifications to the Corpus Christi and La Quinta channels was conducted by calculating project benefits based on reductions in transportation costs. Benefits were evaluated for the following alternatives: Corpus Christi depths of 48, 50, and 52 feet; deepening the existing Federal portion of the La Quinta Channel; extension of the La Quinta Channel Federal project; and widening the Corpus Christi Bay Channel 400- and 500-foot reaches to 530 feet. In addition to widening of the bay channel, benefits were evaluated for barge shelves in the 400-foot reach. The shelves would extend 200 feet from the toe of the proposed 530-foot-wide channel on either side.

2.2 ALTERNATIVES SCREENING

An initial screening analysis of the plan alternatives was completed in early 2000. The results of the initial screening were presented at the 4 April 2000 Feasibility Scoping Meeting (FSM). The initial screening showed that a Corpus Christi channel depth of 52 feet produced the highest net excess benefits for the deepening plans evaluated for the main channel. The screening analysis suggested that additional studies were necessary to determine whether widening of the bay reach and extension of the La Quinta channel was within Federal interest. An additional recommendation of the FSM was to further investigate deepening of the La Quinta Channel beyond the existing project depth of 45 feet. In regard to channel widening, the non-Federal sponsor and pilots association expressed a strong interest in widening the bay reach due to safety concerns and associated vessel delays and self-imposed vessel meeting restrictions. The recommendation for widening the entire bay reach to 530 feet was based on the USACE Waterways Experiment Station (WES) findings and the safety interest of Aransas-Corpus Christi Pilots. The pilots presently limit vessel meetings to combined beam width up to 251 feet in the 400-foot reach and a combined loaded draft limit of 80 feet.

The USACE conducted the FSM to discuss the twenty-three alternatives with preliminary benefit-cost (BC) ratios providing justification for reducing the alternatives to six. Mitigation was not required to be considered during this initial screening process. Cost factors such as levee construction, dredging, and pipeline relocations were included in the cost analysis. The essence of the initial screening process was to put all the alternatives on an equal basis without the mitigation costs. Costs were

developed for all 23 alternatives, but benefits were determined to be needed only on certain alternatives (48-, 50-, and 52-foot depths in the main channel and 400- and 500-foot widths).

The outcome of this initial screening resulted in six alternatives to be analyzed further. The following briefly describes each alternative:

- Deepen to 52 feet from the Gulf of Mexico to Viola Turning Basin and widen across Corpus Christi Bay (maximum net excess benefits)
- Deepen to 50 feet from the Gulf of Mexico to Viola Turning Basin and widen across Corpus Christi Bay
- Widen only across Corpus Christi Bay (Sponsor Request)
- Deepen La Quinta Channel to 50 feet (Sponsor Request)
- Extend La Quinta Channel
- Provide Barge Lanes across the Upper Bay in Corpus Christi Bay

The initial screening indicated that added depth was not needed on La Quinta Channel and channel extension. Reynolds Metals and Oxychem stated that they did not need additional depth in La Quinta Channel. Despite the 0.6 Benefit Cost Ratio, the widening-only alternative was also evaluated further for additional benefits that could change the ratio.

While not part of the initial screening, alternatives also arose for offshore placement of dredged material, including ocean placement pursuant to Marine Protection Research and Sanctuaries Act and beneficial use pursuant to Section 404 of the Clean Water Act. To ensure maximum use of the dredged materials in a beneficial way, the BUW determined that disposal of materials beneficially was the preferred disposal option (BU Site ZZ; see Section 1.6).

2.2.1 Channel Deepening Benefit Summary

Channel deepening benefits were calculated for Corpus Christi crude petroleum, petroleum products, and grain cargoes. The transportation savings benefits were calculated using a Federal discount rate of 6½ percent and using fiscal year 2000 hourly operating costs. Transportation costs were calculated for 45- to 52-foot channel depth alternatives (see economic appendix for details).

Projected deepening will result in a decrease in the cost per ton for both the shuttles associated with offshore lightering and for vessels associated with direct shipments. Nearly all crude oil shipped from the Mideast is lightered and will continue to be lightered in the future, and nearly all oil shipped from Mexico and Venezuela is currently shipped direct and will continue to be in the future. Lightering and lightening costs are presently costs slightly less than direct shipment cost for movements from Africa and the North Sea. The deepening project will reduce the differential between direct shipping cost and lightering cost and the reduction in this differential will make direct shipment more likely for movements from Africa and the North Sea. The cost differential reduction is expected to result in a slight increase in direct shipment for Africa and North Sea crude oil imports.

Although lightering would not be eliminated, there would be an overall decrease in the number of vessels needed to transport a given volume of petroleum products. The percentage of tonnage by trade route and method of shipment is displayed in the economic appendix.

The purpose of the spill analysis was to identify accident and spill frequencies for the Corpus Christi Ship Channel project area. The affected area primarily includes the offshore entrance, the bay channel, La Quinta, and the Inner Harbor. Lightering occurs in international waters. A literature search was conducted of national spills. Over one-half of the mother vessels associated with Corpus Christi's offshore transfers operate in the international waters offshore from Galveston. The remainder of crude is transferred in the international waters off of Corpus Christi.

2.2.2 Channel Widening Benefits

Benefits were calculated for widening the Corpus Christi Bay Channel 400- and 500-foot reaches to 530 feet. In addition to widening the bay channel, benefits were evaluated for a barge shelf in the 400-foot reach. The barge shelf would extend 200 feet from the toe of the proposed 530-foot channel.

The benefits associated with widening the bay reach to 530 feet were calculated based on the probability of vessel meetings and potential delays. The Aransas-Corpus Christi Pilots vessel meeting criterion is that vessels with combined beam widths of 251 feet or more cannot meet in the 400-foot reach. An additional criterion is that meetings are not permitted between vessels with combined loaded drafts in excess of 80 feet. The pilots noted that the 80-foot combined draft limit was invoked in the early 1990s.

Benefits for widening the bay reach were calculated based on reductions in delays due to the combined beam width restriction. Benefits were not calculated for easement of the underkeel clearance policy, as the pilots indicated there would be no change in the policy to maintain 3 feet of underkeel clearance.

National data reviewed for the Corpus Christi study showed that for the period 1973–93, there were 38,778 spills in the waters monitored by the USCG and falling in the category of “outer continental shelf and inland regimes.” Twenty percent of these spills involved tank ships. The associated volume spilled was 66 million gallons. Two percent of the 66 million gallons was associated with lightering operations. Corpus Christi project data obtained from the USCG for the period 1992-99 was evaluated for the Corpus Christi study. Analysis of the USCG data records showed that pollution incidents, collisions, and allisions most frequently occur in the project area between the Inner Harbor and Viola Turning Basin, where channel widening and barge lanes will reduce the probability of collisions (see economic appendix for details).

2.2.3 Deepening of the Existing La Quinta Federal Project

Examination of the vessel sizes and trade routes associated with tonnage transported through the existing 45-foot channel showed that only a small number of vessels were loaded to drafts in excess of 40 feet. Additional analyses indicated that port depths at shipping and receiving ports were and would continue to remain a constraint. Comparison of the project construction costs for deepening the existing channel to depths over 45 feet with potential reductions in transportation costs associated with

more deeply loaded vessels did not produce a BC ratio above unity, which is typically required for a Federal deep-draft navigation project (refer to Feasibility Report – Economic Criteria).

2.2.4 Extension of the Existing La Quinta Federal Project

Determination of the Federal interest in the extension of the existing limits of the La Quinta Channel was evaluated based on the results of a multiport analysis. The purpose of the analysis was to determine whether the La Quinta Channel extension to a proposed container terminal offered a competitive advantage over existing and anticipated container facilities such as the Port of Houston's Barbours Cut and Bayport projects and the Texas City Shoal Point project. It was determined that it would, that the BC ratio was greater than one, and that it would be in the Federal interest.

2.3 RECOMMENDED ALTERNATIVE

The study area has been divided into five reaches for discussion in this document: the Entrance Channel, Lower Bay, La Quinta Channel, Upper Bay, and Inner Harbor (Figure 2-1). Information for the Gulf Intracoastal Waterway (GIWW) across Corpus Christi Bay is also discussed but is not considered a reach since there are no improvements to it associated with this project. The Entrance Channel includes that area from the Gulf of Mexico through the Aransas Pass jetties to the Inner Basin (Station -38+00 to 310+00). The Lower Bay includes the area from the Inner Basin to La Quinta Junction (Station 12+55 to 54+00). La Quinta is the channel from the La Quinta Junction north (Station 309+51 to 382+00). The Upper Bay includes the area between the La Quinta Junction and Beacon 82 (Station 54+00 to 1050+00). Between Beacon 82 and Viola Turning Basin lies the Inner Harbor reach (Station 1050+00 to 1561+00).

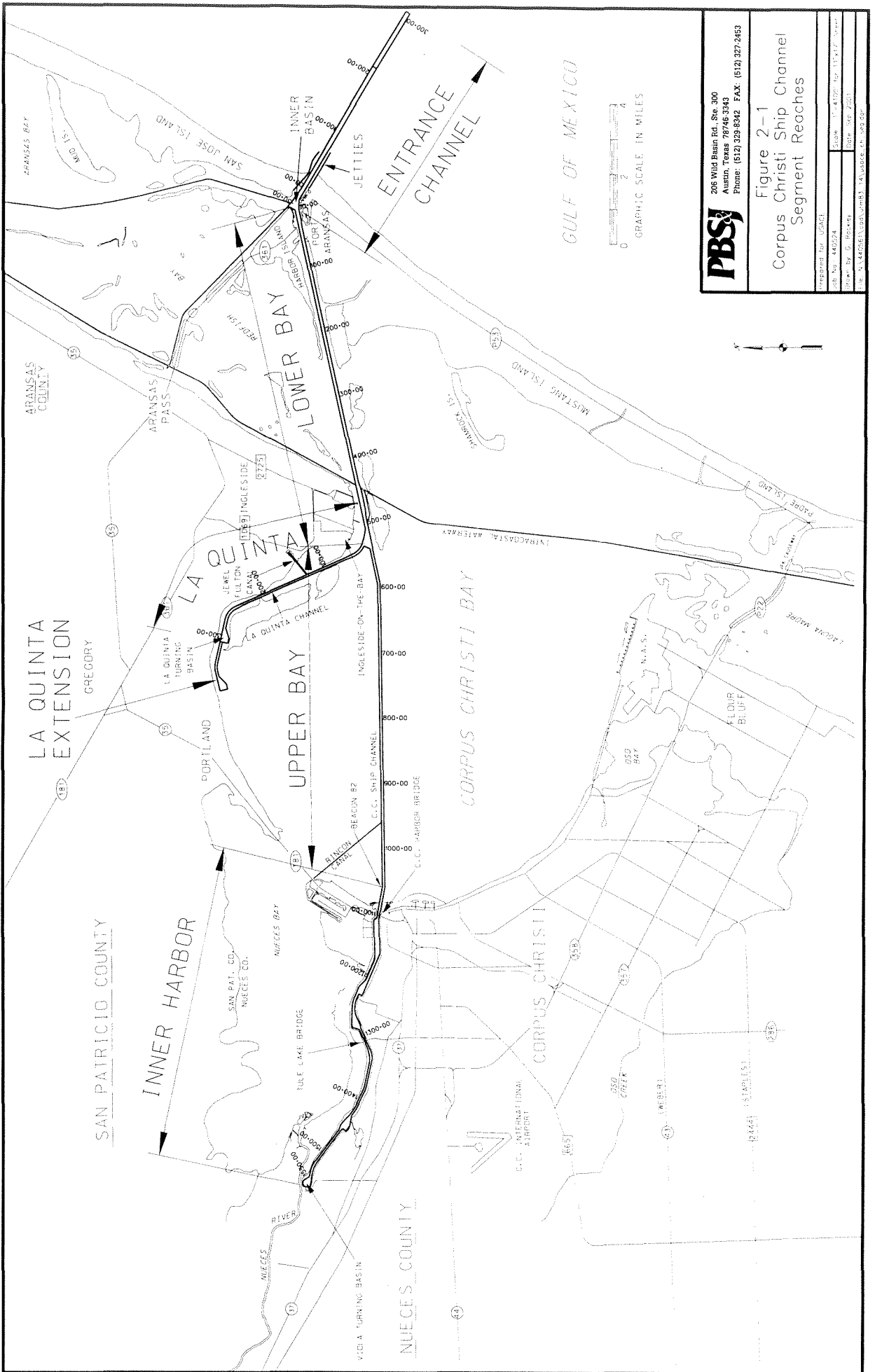
2.3.1 No-Action

In the absence of Federal actions to improve the CCSC, the existing Federal project will continue to be maintained at its current dimensions and the dredged materials will be disposed of in a manner very similar to existing practices. It is also expected that industrial expansion in the area will continue and that shipping will likewise increase. The No-Action Alternative is discussed more fully under the various affected resource categories in Section 4, Environmental Consequences.

2.3.2 Preferred Alternative

The following plan is based on the economic, engineering, and environmental factors and is the USACE-recommended and PCCA-preferred alternative for the CCSCCIP. The preferred alternative includes deepening of the CCSC from Viola Basin to the end of the jetties in the Gulf of Mexico to 52 feet, deepening of the remainder of the channel to 54 feet, widening of the Upper Bay and Lower Bay reaches to 530 feet, construction of barge lanes across the Upper Bay portion of the CCSC, and extension of the La Quinta Channel at 39 feet.

The land locked portion of the Entrance Channel will be deepened to 52 feet plus 2 feet of advanced maintenance. The area of the Entrance Channel in the open waters of the Gulf will be dredged to a 54-foot authorized depth with an additional 2 feet of advanced maintenance to insure safe vessel



205 Wild Basin Rd., Ste. 300
 Austin, Texas 78746-3343
 Phone: (512) 329-8302 FAX: (512) 327-2453

Figure 2-1
 Corpus Christi Ship Channel
 Segment Reaches

Prepared for: USACE	Date: 12/4/2010 for 11/11/12 Report
Job No.: 440294	Sheet No.: 201
Project No.: 068043	Scale: 1" = 1/4" (not shown)
File No.: 440294(11/11/12) (01)	Author: J. L. ...

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passage in a high wave energy environment. The existing channel will be extended an additional 10,000 feet into the Gulf in order to reach a 54-foot natural depth. Minor widening is necessary in a 100-foot-wide area on the northern side of the channel from in the Inner Basin to allow for a better turning radius when entering the Gulf or the Lower Bay portion of the channel.

The Lower Bay will be deepened from 45 feet to 52 feet plus 2 feet of advanced maintenance. The eastern portion of this channel segment is currently wider than the selected 530 feet and no widening will be necessary in this reach. The western half is approximately 500 feet in width and will be widened to 530 feet.

The Upper Bay is currently 400 feet wide and 45 feet in depth. This reach will be deepened to 52 feet with 2 feet advanced maintenance and widened to 530 feet. Barge lanes will be constructed on both sides of the channel and will extend 200 feet from the toe of slope of the main channel and will be dredged to a depth of 12 feet with 2 feet of advanced maintenance.

The Inner Harbor will be deepened to 52 feet plus 2 feet of advanced maintenance. The channel width will range between 300 and 400 feet. Several minor modifications will be made to the turning basins to ensure that they meet USACE navigation requirements. One basin, the Avery Point Basin, will not meet USACE width criteria due to the presence of industry on the shoreline of the channel. In the vicinity of the Tule Lake Lift Bridge, because the bridge may be removed and/or replaced, the channel width in this area will be authorized at 400 feet. This width is consistent with the remainder of the Inner Harbor channel segment. Making the channel width consistent in this area, should the bridge be removed, will allow safer passage through the channel for all ship traffic. Should the bridge remain at the time of project construction, construction will be limited to 200 feet to ensure no impacts to the bridge supports. This 200-foot width is sufficient to allow all expected traffic access beyond the bridge and will not prevent the realization of project benefits.

The La Quinta Channel at the current depth of 39 feet will be extended approximately 7,400 feet beyond its current limit. The channel will measure 300 feet wide at the toe and a second turning basin with a 1,200-foot radius will be constructed. No changes will be made to the existing channel.

New work material will be dredged to deepen the channel from the -56-foot isobath in the Gulf to the Inner Harbor. A complete description of the texture and quality of the new work material and the existing maintenance material can be found in Sections 3.3.1 and 3.3.2 of the FEIS, respectively. Table 2.3-1 provides the quantities, by reach, of the new work and maintenance material expected from the preferred alternative. All dredged material will come from widening, deepening, and subsequent maintenance of the CCSC and the La Quinta Channel.

The project has identified eight existing confined upland sites, one existing offshore (open-water) site, and eight existing bay (open-water) sites for meeting the capacity requirements for the placement of both new work and maintenance dredging materials, as described below. However, the project may utilize all existing upland sites as needed during the life of the project to maintain operational flexibility.

TABLE 2.3-1
QUANTITIES OF NEW WORK AND MAINTENANCE DREDGED MATERIAL (mcy)

Reach	New Work Material	Maintenance Material (50 years)
Entrance Channel	4.337	62.0
Lower Bay	8.754	11.7
Upper Bay	14.419	82.2
Inner Harbor	6.916	24.1
La Quinta Channel	6.257	28.0
Barge Lanes	0.271	NA

The existing offshore PA 1, 510 acres in size, is located approximately 2 miles offshore and 1,000 feet south of the channel centerline. This site was designated by the EPA as the Corpus Christi Ship Channel ODMDS pursuant to Section 102(c) of MPRSA in 1989, but USACE terminology is PA 1. The reader should note that these two are the equivalent names for the same site. It is proposed that this site be used to place approximately 62.0 mcy of maintenance dredging materials (over a 50-year period) from the Entrance Channel portion of the project. Modeling was conducted which determined that PA 1 would be able to accommodate the additional volume of maintenance material, included with the proposed project, without exceeding the mounding requirements of the ODMDS Site Management Plan (Appendix A). Designation of the ODMDS by the EPA does not constitute approval by the EPA for placement of materials at the site. Prior to each placement event, the concurrence by the EPA must be given after determination that the materials meet all environmental criteria and regulatory requirements pursuant to MPRSA (40 CFR 220-228). The EPA and USACE, Galveston District, have established a Regional Implementation Agreement (RIA) for testing and reporting requirements for ocean disposal of dredged materials that outlines dredged material characterization and evaluation requirements.

PA 2 is partially confined on the beach and dune area just north of the San Jose Island jetty, which protects the CCSC Entrance Channel near Port Aransas. Effluent flows from the site, over the beach, and into the Gulf of Mexico.

Suntide PA (IH-PA 8) is a 306-acre UCPA located just west of the terminus of the Inner Harbor reach of the project channel in Corpus Christi. It will be used to contain approximately 1.2 mcy of new work dredged materials, and 1.0 mcy of future maintenance dredged materials for the project.

The Inner Harbor PA 1 (IH-PA 1) is a 350-acre upland confined placement area (UCPA) located just north of the inner harbor area in Corpus Christi. IH-PA 1 is subdivided into two cells (A and B), and will be used to contain approximately 800,000 CY of material from new work dredging and 10.6 mcy from maintenance dredging over a period of 50 years.

The Rincon PA (IH-PA 2) is a 230-acre UCPA located adjacent to and just north of PA 1. It will be used to contain approximately 900,000 CY of new work material and 5.2 mcy of future maintenance material.

South Shore (IH-PA 3) is a UCPA located on the south shore of Nueces Bay at Corpus Christi, just west of IH-PA 1 and north of the CCSC. It is divided into 3 cells, A, B, and C. Cell A is 200 acres in size and Cell B is 183 acres. Cell C is not proposed for use to meet capacity requirements under this project, but will continue to be available should it be needed. Cell A of IH-PA 3 will be used to contain approximately 1.0 mcy of new work material and is not planned for any future maintenance material. Cell B will be used to contain approximately 1.0 mcy of new work material and 1.0 mcy of future maintenance material.

IH-PA 6 is a 360-acre upland confined placement area which is south of the ship channel, as shown on Plate F-42 in the Feasibility Report. IH-PA 6 will be used to contain approximately 1.6 mcy of new work material and 1.1 mcy of future maintenance dredged material. Although this placement area is an existing placement area that has been used for material disposal in the past, it is not specifically provided or used under the present authorized 45-foot project. Consequently, IH-PA 6 will have to be acquired for the improved channel to satisfy storage capacity needs.

PA 6 is a 304-acre UCPA, located on the northern point of Mustang Island, south of and adjacent to the CCSC between Port Aransas and the La Quinta junction. It has been used once in the past as a placement area, but currently is in a state of disrepair. Its utilization will require major renovation of the perimeter levees and drop structure. PA 6 will be used to contain approximately 2.7 mcy of new work material from the channel. The project does not include the use of PA 6 for future maintenance dredging of the channel.

PA 7 and 8 (Pelican Island) form a 360-acre UCPA located to the west of PA 6, south of the CCSC. PA 7 and 8 will not be used for new work material but will continue to be used periodically to receive 11.7 mcy of future maintenance material over the 50-year life of the project.

PA 10 is a 196-acre UCPA located on the south side of the CCSC across from Port Ingleside. It will not be used for the placement of any new work dredged materials, but will be used to contain approximately 2.8 mcy of future maintenance dredged material over the 50-year life of the project.

PA 13 is a 750-acre UCPA located in the northeast corner of Corpus Christi Bay on the west side of the La Quinta Channel, near Port Ingleside. PA 13 will be used to contain approximately 3.7 mcy of new work dredged materials, and 25.2 mcy of future maintenance dredged materials over the 50-year life of the project.

PA 14-A, 14-B, 15-A, 15-B, 16-A, 16-B, 17-A, 17-B, open water placement areas, are considered to have unlimited capacity for placement of dredged materials. They are located on either side of the ship channel across Corpus Christi Bay. These areas will be used for containment of approximately 11.8 mcy of new work dredged materials, and 87.4 mcy of future maintenance dredged materials over the 50-year life of the project.

New work material from the outer half of the Entrance Channel will be used beneficially in BU Site ZZ (Appendix A) and maintenance material will be placed in PA 1. New work material from the inner half of the Entrance Channel will be placed in BU Site MN; from the Lower Bay in BU sites I, R, and S and PA 6; from the La Quinta Channel extension in Sites E and GH and a portion stockpiled in PA 13 for future levee renovation at PA 13; from the Upper Bay in BU Sites R, S, CQ, and PAs 14a – 17b; and from the Inner Harbor in a series of UCPAs. Maintenance material from the jetty channel will be placed in offshore PA 1 and/or in PA 2 for beneficial use (only from a section of the Lower Bay), if it is of the correct grain size; from the Lower Bay at Pelican Island for rookery enhancement, BU Sites S and R, and PA 10; from the La Quinta Channel in PA 13; from the Upper Bay in PAs 10 and 14a-17b; and from the Inner Harbor in a series of UCPAs.

The following PAs are designated for placement of dredged maintenance material from the CCSC authorized 45-foot deepening project. While not scheduled for use at this time, these areas are available for the 52-foot project future, if needed.

Inner Harbor PAs 4 and 5 (IH-PA 4 and IH-PA 5) are privately owned, but are potentially available for use through an agreement with the land owner or by navigation servitude. IH-PA 4 and IH-PA 5 were last used 23 years ago during the CCSC 45-foot deepening project.

PA 4 is a confined site located north of the CCSC on Harbor Island. It has not been used since the 45-foot deepening project for the placement of new work dredged material. It is owned by the PCCA and may be available for use by the proposed project.

PA 5 is an upland unconfined site located on the south side of the CCSC west of Port Aransas. It has not been used since before the CCSC was deepened to 45 feet and may be available for use by the proposed project through navigation servitude.

PA 9 is an unconfined emergent placement area located south of the CCSC and east of the GIWW crossing. It has not been used in the past 23 years. It was last used for placement of new work material during the 45-foot deepening project.

PA 18 is an unconfined open-water placement area that is configured as two narrow, parallel placement corridors oriented perpendicular to the CCSC. PA 18 is available for use, but has not been used recently because of concerns that it could accelerate filling of the small-boat channels near the Corpus Christi City Marina.

Creation of all BU sites will cover roughly 935 acres of unvegetated deep bay bottom and 120 acres of upland. The area of the offshore BU Site MN and the topographic relief feature further offshore at BU Site ZZ depends on the exact placement methods and equipment and height of the berms, but will cover approximately 1,590 acres of Gulf of Mexico bottom. Offshore PA 1 is the only site currently in use offshore. It should be noted that the site where BU Site ZZ is located was not originally designated as a BU site, but as the ODMDS for virgin and maintenance material from the U.S. Navy Homeport project (see Section 5.3.3). The physical location of BU Site ZZ and the ODMDS for the Homeport project coincide. Physical examination of the materials proposed for placement in BU Site ZZ indicated that additional testing would be required to determine suitability for placement at the site pursuant to MPRSA

(i.e., ocean dumping). However, the BUW determined that beneficial use of these materials is the preferred option and disposal of these materials at the site beneficially is evaluated under Section 404 of the Clean Water Act (Appendix A) and under the Fishery Conservation and Management Act.

All BU sites, except BU sites E, MN, and ZZ, will be located in deep, unvegetated bay bottom. BU Site E will be located upland. BU Site MN will be located in 20 to 40 feet of Gulf water, whereas BU Site ZZ will be located in approximately 50 feet of Gulf water. The maintenance PAs are currently being used to receive maintenance material dredged from the CCSC and La Quinta Channel. The BU sites will be constructed during widening and deepening of the CCSC, creation of the barge lanes, and extension of the La Quinta Channel. Maintenance will be ongoing. Only hydraulic pipeline dredges will be used inshore of the jetties. The entrance channel will be dredged with an oceangoing hopper dredge. The completed elevation of most BU sites will be approximately -1 to -2 feet MLT, to promote the growth of seagrasses. Most BU sites include breakwaters to an elevation of +6 feet MLT and most have fringes around the inside of the breakwaters with a design elevation of around +2 feet MLT for *Spartina* growth. Sites I and CQ include interior islands to an elevation between approximately +3 to +10 feet MLT. Site MN and the offshore topographic relief feature at site ZZ will likely have elevations around 6 feet above the Gulf bottom.

The new work material will range from mostly hard clay in the Inner Harbor and La Quinta Extension to mostly soft clay in the Upper Bay and mostly medium-to-dense sand in the Lower Bay to very dense sand in the jetty channel portion of the entrance channel and soft-to-firm clay in the outer portions of the entrance channel. The maintenance material is silt or sandy silt in the Inner Harbor, Upper Bay, and La Quinta Channel; fine or silty sand and silt in the entrance channel; and a mixture of silt or sandy silt, fine or silty sand, and sand in the Lower Bay.

This project was coordinated with State and Federal resource agencies. Their recommendations have been considered and are expected to be implemented. Any unavoidable resource losses have been identified by the RACT/MW and will be mitigated. The BU sites, including the offshore sites, are designed to lead to an overall increase in the productivity and diversity of habitat in the project area.

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