

# **Appendix A**

## **Permit Applications**

**Note: The Section 508 amendment of the Rehabilitation Act of 1973 requires that the information in Federal documents be accessible to individuals with disabilities. The USACE has made every effort to ensure that the information in this appendix is accessible.**

**However, this appendix is not fully compliant with Section 508, and readers with disabilities are encouraged to contact Mr. Jayson Hudson at the USACE at (409) 766-3108 or at [SWG201900067@usace.army.mil](mailto:SWG201900067@usace.army.mil) if they would like access to the information.**

## **Appendix A1**

**Permit Application, January 3, 2019**



## PORTCORPUSCHRISTI

January 3, 2019

Colonel Lars N. Zetterstrom, PE  
Commander, Galveston District  
USACE Galveston District  
P.O. Box 1229  
Galveston, Texas 77553

Attn: Jayson Hudson

**Subject: Port of Corpus Christi Authority Standard Permit Application for the Proposed Deepening of the Corpus Christi Ship Channel from the Gulf of Mexico to Harbor Island in Nueces and Aransas Counties, Texas**

Dear Colonel Zetterstrom:

The Port of Corpus Christi Authority has contracted with AECOM Technical Services, Inc. (AECOM) to perform engineering design and support services related to the proposed deepening and extension of the Corpus Christi Ship Channel in the subject counties. The proposed channel deepening and extension would accommodate the transit of very large crude carriers calling at the Port of Corpus Christi. This letter authorizes Carl Sepulveda of AECOM to act on behalf of the Port of Corpus Christi Authority as our agent in the processing of the Department of the Army permit application, and to furnish, upon request, supplemental information in support of the permit application for the proposed channel deepening.

Enclosed with this letter is an ENG Form 4345 and supporting information, prepared for the deepening and extension of the Corpus Christi Ship Channel and placement of the dredged material generated from the proposed activity.

Please contact Mr. Sepulveda by telephone at 713-278-4620 or by email at [carl.sepulveda@aecom.com](mailto:carl.sepulveda@aecom.com) should you require additional information to process the permit application.

Sincerely,

Sarah L. Garza  
Director of Environmental Planning & Compliance

cc: Sean C. Strawbridge, Chief Executive Officer  
Clark Robertson, Chief Operating Officer  
David L. Krams, PE, Director of Engineering Services  
Daniel J. Koesema, PE, CFM, Chief of Channel Development  
Paul D. Carangelo, REM, Coastal Development Planning Manager  
Beatriz Rivera, PE, Environmental Engineer





17. DIRECTIONS TO THE SITE

From the Port of Corpus Christi (222 Power Street, Corpus Christi, Texas), head west on Power Street to North Water Street. Turn right on North Broadway Street and take the ramp on the left on US-181 N. Merge onto US-181 N, continue onto TX-35 N. Take the TX-35 Business exit toward Farm to Market Road 1069/Aransas Pass. Continue onto TX-35 BUS N/W Wheeler Avenue. Slight right onto W. Wheeler Avenue. W Wheeler turns slightly right and becomes Harrison Blvd. Turn left onto W Goodnight Avenue. Continue onto TX-361 S/Redfish Bay Causeway for 5.2 miles.

18. Nature of Activity (Description of project, include all features)

The Port of Corpus Christi Authority (PCCA) proposes to deepen the Corpus Christi Ship Channel (CCSC) from the Gulf of Mexico to Harbor Island. From the offshore end of the federally authorized Entrance Channel at Station -330+00 to Station -72+50 (25,750 feet), the CCSC would be deepened beyond the currently authorized project depth of -56 feet MLLW to a depth of -77 feet MLLW plus two feet of advanced maintenance and one foot of allowable overdredge to a maximum depth of -80 feet MLLW. From Station -72+50 to Station 54+00 (12,650 feet) the CCSC would be deepened from authorized project depths of -56 feet MLLW and -54 feet MLLW to -75 feet MLLW plus two feet of advanced maintenance and one foot of allowable overdredge to a maximum depth of -78 feet MLLW. The PCCA also proposes to dredge a 29,000-foot entrance channel extension from the authorized Entrance Channel (Station -330+00) to a depth of -77 feet MLLW plus two feet of advanced maintenance and one foot of allowable overdredge to a maximum depth of -80 feet MLLW at Station -620+00 in the Gulf of Mexico. The overall length of the proposed project is approximately 12.8 miles. The Entrance Channel extension and increased channel depth would accommodate transit of fully laden Very Large Crude Carriers (VLCCs) expected to draft approximately 70 feet.

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

The purpose of the project is to allow for more efficient movement of U.S. produced crude oil to meet current and forecasted demand in support of national energy security and national trade objectives, enhance the Port of Corpus Christi's ability to accommodate future growth in crude oil movement, and construct a channel project that the PCCA can operate and maintain to serve industry needs. Currently, crude oil is exported using Aframax and Suezmax vessels. The Suezmax vessels are sometimes light loaded (lightered) due to the depth restrictions in the existing CCSC, and would continue to be light loaded when the current federally-authorized -54-foot MLLW project is completed. Reverse lightering translates into additional vessel trips, cost, manhours, operational risk, and air emissions. To efficiently and cost effectively move crude oil cargo, oil exporters are increasingly using fully loaded vessels, including VLCCs with deeper drafts. To fulfill its mission of leveraging commerce to drive prosperity in support of national priorities, the PCCA must keep pace with the global marketplace.

USE BLOCKS 20-23 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

Dredged material generated from construction of the proposed project and 10 years of maintenance material would be placed partially within existing authorized placement facilities, and partially within several areas in proximity to the proposed project for beneficial use. Dredged material judged to be suitable for beneficial use would be used to create several feeder berms in near-shore areas to nourish eroded beach areas, reestablish sand dune areas on San Jose Island that were breached by Hurricane Harvey, restore perimeter portions of placement areas that have experienced erosion, place material in areas adjacent to the interior CCSC that were breached by Hurricane Harvey, and enhance/armor a perimeter berm along Harbor Island that would absorb erosive forces of waves and ship wakes to protect areas of marsh and submerged aquatic vegetation behind the berm. Dredged material judged to be unsuitable for beneficial use would be placed in authorized placement areas. (See Attachment A Section 1.2.) Proposed placement options are shown on the attached drawings.

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards:

Type Amount in Cubic Yards	Type Amount in Cubic Yards	Type Amount in Cubic Yards
15.1 Million Cubic Yards of Clay	23.7 Million Cubic Yards of Sand	

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

Acres 1764.3 acres of open waters to be dredged for proposed channel & turning basin. See Atch A Section 3.1 for dredge placement details.  
or  
Linear Feet

23. Description of Avoidance, Minimization, and Compensation (see instructions)

See Attachment A Sections 5.0 and 6.0.

24. Is Any Portion of the Work Already Complete?  Yes  No IF YES, DESCRIBE THE COMPLETED WORK

25. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (if more than can be entered here, please attach a supplemental list).

a. Address- See attached page

City - State - Zip -

b. Address-

City - State - Zip -

c. Address-

City - State - Zip -

d. Address-

City - State - Zip -

e. Address-

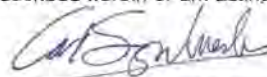
City - State - Zip -

26. List of Other Certificates or Approvals/Denials received from other Federal, State, or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED
TCEQ	401 WQS		In process		
USACE/EPA	MPRSA Section 103		In process		
TGLO	Coastal Consistency		In process		

\* Would include but is not restricted to zoning, building, and flood plain permits

27. Application is hereby made for permit or permits to authorize the work described in this application. I certify that this information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.



Jan. 3, 2019

SIGNATURE OF APPLICANT

DATE

SIGNATURE OF AGENT

DATE

The Application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than \$10,000 or imprisoned not more than five years or both.

# CONSISTENCY WITH THE TEXAS COASTAL MANAGEMENT PROGRAM

THE APPLICANT SHOULD SIGN THIS STATEMENT AND RETURN WITH APPLICATION PACKET TO:

COASTAL PERMIT SERVICE CENTER  
TAMU-GALVESTON  
P.O. BOX 1675  
GALVESTON, TX 77553-1675  
FAX: (409) 741-4010

## FOR USACE USE ONLY:

PERMIT #: \_\_\_\_\_

PROJECT MGR: \_\_\_\_\_

## APPLICANT'S NAME AND ADDRESS (PLEASE PRINT):

Title  First  Last  Suffix

Mailing Address  Home

City  State  Zip Code  Work

Country  Email  Mobile

Fax

The Texas Coastal Management Program (CMP) coordinates state, local, and federal programs for the management of Texas coastal resources. Activities within the CMP boundary must comply with the enforceable policies of the Texas Coastal Management Program and be conducted in a manner consistent with those policies. The boundary definition is contained in the CMP rules (31 TAC §503.1).

• To determine whether your proposed activity lies within the CMP boundary, please contact the Permit Service Center at [permitting.assistance@glo.texas.gov](mailto:permitting.assistance@glo.texas.gov)

## PROJECT DESCRIPTION:

Is the proposed activity at a waterfront site or within coastal, tidal, or navigable waters?  Yes  No

If Yes, name affected coastal, tidal, or navigable waters:

Is the proposed activity water dependent?  Yes  No (31 TAC §501.3(a)(14))

<http://tinyurl.com/CMPdefinitions>

Please briefly describe the project and all possible effects on coastal resources:

The Port of Corpus Christi Authority (PCCA) proposes to deepen the Corpus Christi Ship Channel (CCSC) from the Gulf of Mexico to Harbor Island. From the offshore end of the federally authorized Entrance Channel at Station -330+00 to Station -72+50 (25,750 feet), the CCSC would be deepened beyond the currently authorized project depth of -56 feet MLLW to a depth of -77 feet MLLW plus two feet of advanced maintenance and one foot of allowable overdredge to a maximum depth of -80 feet MLLW. From Station -72+50 to Station 54+00 (12,650 feet) the CCSC would be deepened from authorized project depths of -56 feet MLLW and -54 feet MLLW to -75 feet MLLW plus two feet of advanced maintenance and one foot of allowable overdredge to a maximum depth of -78 feet MLLW. The PCCA also proposes to dredge a 29,000-foot entrance channel extension from the authorized Entrance Channel (Station -330+00) to a depth of -77 feet MLLW plus two feet of advanced maintenance and one foot of allowable overdredge to a maximum depth of -80 feet MLLW at Station -620+00 in the Gulf of Mexico. The overall length of the proposed project is approximately 12.8 miles. The Entrance Channel extension and increased channel depth would accommodate transit of fully laden Very Large Crude Carriers (VLCCs) expected to draft approximately 70 feet.

Indicate area of impact:

acres or  square feet

## ADDITIONAL PERMITS/ AUTHORIZATIONS REQUIRED:

- Coastal Easement - Date application submitted: \_\_\_\_\_
- Coastal Lease - Date application submitted: \_\_\_\_\_
- Stormwater Permit- Date application submitted: \_\_\_\_\_
- Water Quality Certification - Date application submitted:
- Other state/federal/local permits/authorizations required:

The proposed activity must not adversely affect coastal natural resource areas (CNRAs).

**PLEASE CHECK ALL COASTAL NATURAL RESOURCE AREAS THAT MAY BE AFFECTED:**

- |  |  |  |
|--|--|--|
| <input checked="" type="checkbox"/> Coastal Barriers       | <input checked="" type="checkbox"/> Critical Erosion Areas | <input checked="" type="checkbox"/> Submerged Lands              |
| <input checked="" type="checkbox"/> Coastal Historic Areas | <input checked="" type="checkbox"/> Gulf Beaches           | <input checked="" type="checkbox"/> Submerged Aquatic Vegetation |
| <input type="checkbox"/> Coastal Preserves                 | <input type="checkbox"/> Hard Substrate Reefs              | <input type="checkbox"/> Tidal Sand or Mud Flats                 |
| <input checked="" type="checkbox"/> Coastal Shore Areas    | <input type="checkbox"/> Oyster Reefs                      | <input checked="" type="checkbox"/> Waters of Gulf of Mexico     |
| <input type="checkbox"/> Coastal Wetlands                  | <input type="checkbox"/> Special Hazard Areas              | <input checked="" type="checkbox"/> Waters Under Tidal Influence |
| <input checked="" type="checkbox"/> Critical Dune Areas    |  |  |

*The applicant affirms that the proposed activity, its associated facilities, and their probable effects comply with the relevant enforceable policies of the CMP, and that the proposed activity will be conducted in a manner consistent with such policies.*

**PLEASE CHECK ALL APPLICABLE ENFORCEABLE POLICIES:**

<http://tinyurl.com/CMPpolicies>

<input checked="" type="checkbox"/>	§501.15 Policy for Major Actions
<input type="checkbox"/>	§501.16 Policies for Construction of Electric Generating and Transmission Facilities
<input type="checkbox"/>	§501.17 Policies for Construction, Operation, and Maintenance of Oil and Gas Exploration and Production Facilities
<input type="checkbox"/>	§501.18 Policies for Discharges of Wastewater and Disposal of Waste from Oil and Gas Exploration and Production Activities
<input type="checkbox"/>	§501.19 Policies for Construction and Operation of Solid Waste Treatment, Storage, and Disposal Facilities
<input type="checkbox"/>	§501.20 Policies for Prevention, Response and Remediation of Oil Spills
<input type="checkbox"/>	§501.21 Policies for Discharge of Municipal and Industrial Wastewater to Coastal Waters
<input type="checkbox"/>	§501.22 Policies for Nonpoint Source (NPS) Water Pollution
<input checked="" type="checkbox"/>	§501.23 Policies for Development in Critical Areas
<input type="checkbox"/>	§501.24 Policies for Construction of Waterfront Facilities and Other Structures on Submerged Lands
<input checked="" type="checkbox"/>	§501.25 Policies for Dredging and Dredged Material Disposal and Placement
<input checked="" type="checkbox"/>	§501.26 Policies for Construction in the Beach/Dune System
<input type="checkbox"/>	§501.27 Policies for Development in Coastal Hazard Areas
<input checked="" type="checkbox"/>	§501.28 Policies for Development Within Coastal Barrier Resource System Units and Otherwise Protected Areas on Coastal Barriers
<input type="checkbox"/>	§501.29 Policies for Development in State Parks, Wildlife Management Areas or Preserves
<input checked="" type="checkbox"/>	§501.30 Policies for Alteration of Coastal Historic Areas
<input type="checkbox"/>	§501.31 Policies for Transportation Projects
<input type="checkbox"/>	§501.32 Policies for Emission of Air Pollutants
<input type="checkbox"/>	§501.33 Policies for Appropriations of Water
<input type="checkbox"/>	§501.34 Policies for Levee and Flood Control Projects



Please explain how the proposed project is consistent with the applicable enforceable policies identified above. Please use additional sheets if necessary. *For example: If you are constructing a pier with a covered boathouse, then the applicable enforceable policy is: §501.24 Policies for Construction of Waterfront Facilities and Other Structures on Submerged Lands. The project is consistent because it will not interfere with navigation, natural coastal processes, and avoids/minimizes shading.*

§501.15 Policy for Major Actions. Prior to taking a major action, the project and associated entities having jurisdiction over the proposed project shall meet and coordinate their major actions relating to the proposed project and to the greatest extent possible, consider the cumulative and secondary adverse effects. Certification of a federal permit for the discharge of dredge or fill material will be issued by the Texas Commission on Environmental Quality.

§501.23 Policies for Development in Critical Areas. The selected channel alternative will not impact critical areas. Placement alternatives have been selected to minimize impacts to critical area and make use of existing Placement Area (PAs) and beneficial use (BU) as much as possible. No oyster reef or hard substrate reef would be impacted by the placement plan. Critical areas that could be impacted are coastal wetland, submerged aquatic vegetation (SAV), and tidal sand flat. However, the majority of proposed BU will restore and protect these resources compared to the minimal direct impacts.

§501.25 Policies for Dredging and Dredged Material and Placement. The project is consistent because it has been designed to minimize adverse effects to coastal waters, submerged lands, critical areas, coastal shore areas, and Gulf beaches to the greatest extent practicable. Dredging and dredged material disposal and placement would not cause or contribute, after consideration of dilution and dispersion, to violation of any applicable surface water quality standards. Dredging and disposal and placement of material to be dredged will comply with applicable standards for sediment toxicity. Use of new work dredge material to raise dikes, restore shoreline, dunes, beaches and protect SAV is consistent with 501.25(d)(1) and (3) to beneficially using dredged material. Of 11 proposed placement features, 10 involve BU. The use of some of the existing PAs proposed is consistent with many of the impact minimization techniques in 501.25(b) such as locating and confining discharges to minimize smothering of organisms, discharging materials in areas previously disturbed or used for placement, discharging materials at sites where the substrate is composed of material similar to that being discharged, and use of containment levees. Past maintenance material and recent 2018 new work testing from the same segment to establish sediment quality has indicated no contaminant concerns, and material is suitable for offshore placement.

§501.26 Polices for Construction in the Beach/Dune System. This project is consistent because it has been designed to avoid adverse effects to the coastal dunes and the selected placement plan includes BU to restore dunes and beaches on San Jose Island. It also proposes feeder berms in multiple locations allowing for dredged material to build up historically receding shoreline along Mustang and San Jose Islands.

§501.28 Polices for Development Within Coastal Barrier Resource System Unites and Otherwise Protected Areas on Coastal Barriers. This project is in compliance because the development of dune and beach restoration and feeder berms within the Coastal Barrier Resource Area (CBRA) T08, also known as San Jose Island. Placement would be designed to repair and nourish these critical areas, critical dunes, gulf beaches, and washover areas. The feeder berm would occur at sites and times selected to have the least adverse effects practicable with the CBRA unit and would be designed to provide material to rehabilitate dunes.

§501.30 Polices for Alteration of Coastal Historic Areas. This project would comply with the Texas Historic Commission (THC) with the policies when issuing permits under the Texas natural Resources Code. The proposed project would avoid affecting a coastal historic area and would minimize alteration or disturbance of the site unless the site's excavation will promote historical, archaeological, educational, or scientific understanding. The few sites that have been identified in the Gulf portion of the proposed placement would be investigated and appropriate action taken prior to construction.

BY SIGNING THIS STATEMENT, THE APPLICANT IS STATING THAT THE PROPOSED ACTIVITY COMPLIES WITH THE TEXAS COASTAL MANAGEMENT PROGRAM AND WILL BE CONDUCTED IN A MANNER CONSISTENT WITH SUCH PROGRAM



January 4, 2019

Signature of Applicant/Agent

Date

***Any questions regarding the Texas Coastal Management Program should be referred to:***

Allison Buchtien  
Texas General Land Office  
1001 Texas Clipper Road  
PMEC #3027, Room 135  
Galveston, Texas 77554  
Phone: (409) 741-4057  
Fax: (409) 741-4010  
Toll Free: 1-866-894-7664  
[permitting.assistance@glo.texas.gov](mailto:permitting.assistance@glo.texas.gov)

Texas General Land Office  
Coastal Protection Division  
1700 North Congress Avenue, Room 330  
Austin, Texas 78701-1495  
Toll Free: 1-800-998-4GLO  
[federal.consistency@glo.texas.gov](mailto:federal.consistency@glo.texas.gov)

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Attachment A – Project Description

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**PORT OF CORPUS CHRISTI AUTHORITY  
CORPUS CHRISTI SHIP CHANNEL DEEPENING  
NUECES AND ARANSAS COUNTIES, TEXAS**

**Project Description for Corpus Christi Ship Channel Deepening Project**

**Department of the Army Permit Application SWG-XXXX-XXXXX**

**Applicant: Port of Corpus Christi Authority**

**January 2019**

## Description for Corpus Christi Ship Channel Deepening Project

### 1.0 INTRODUCTION AND SUMMARY OF THE NATURE OF ACTIVITY

The Port of Corpus Christi Authority (PCCA) is requesting permit authorization from the U.S. Army Corps of Engineers (USACE) – Galveston District for the PCCA to conduct dredge and fill activities related to the deepening of a portion of the Corpus Christi Ship Channel (CCSC), hereinafter referred to as “the proposed project.” The proposed project requires dredging in navigable waters of the United States to deepen the portion of the CCSC from Harbor Island into the Gulf of Mexico, an overall distance of approximately 12.8 miles (Station 54+00 to Station -620+00) as show on Sheet 2 of 17 of the permit drawings. The proposed project also involves the placement of fill (dredged material) in waters of the United States. Both of the proposed activities are regulated by the USACE.

The CCSC is currently authorized by the USACE to project depths of -54 feet and -56 feet mean lower low water (MLLW) from Station 54+00 to Station -330+00 as part of the Corpus Christi Ship Channel Improvement Project (CCSCIP). The current authorized width of the CCSC is 600 feet inside the jetties and 700 feet in the entrance channel. The proposed project would deepen the channel from Station 54+00 to Station -72+50 to a maximum depth of -78 feet MLLW (-75 feet MLLW plus two feet of advanced maintenance and one foot of allowable overdredge), and from Station -72+50 to Station -330+00, the channel would be deepened to a maximum depth of -80 MLLW (-77 feet MLLW plus two feet of advanced maintenance and one foot of allowable overdredge). The proposed project includes a 29,000-foot extension of the CCSC from Station -330+00 to Station -620+00 to a maximum depth of -80 MLLW (-77 feet MLLW plus two feet of advanced maintenance and one foot of allowable overdredge) to reach the -80-foot MLLW bathymetric contour in the Gulf of Mexico.

The proposed project is needed to accommodate transit of fully laden very large crude carriers (VLCCs) that draft approximately 70 feet. The deepening activities would be completed within the footprint of the authorized CCSC channel width. The proposed project does not include widening the channel; however, some minor incidental widening of the channel slopes is expected in order to meet side slope requirements and to maintain the stability of the channel. The proposed project including dredged material placement, is described below.

The following summarizes where information required by USACE Permit Engineering Form 4345 can be found in this attachment:

- Block 21, Type of Discharge – Section 1.1 discusses the amount and type of discharges anticipated to be generated by the channel improvements of the proposed action. Section 4 below provides details on the alternatives screening process, and Table 4.1 summarizes the new work dredge quantities and other attributes involved in the selection process, and of the proposed action.
- Block 22, Surface Area in Acres of Wetlands or Other Waters Filled – Section 3 describes the extent of the proposed affected waters, and summarizes potential impacts of the proposed action, and Table 3.1 summarizes the acreages of waters (associated with bay bottom impacted) proposed for excavation or fill.
- Block 23, Description of Avoidance, Minimization, and Compensation – Sections 4 and 5 describe the various channel and placement alternatives evaluated in the selection of the proposed action, as well as factors of avoidance and minimization of impacts to aquatic

resources where feasible involved in the selection process. Section 6 describes the mitigation or compensation proposed, as well as a summary of the aquatic impacts of the proposed action.

- Section 7 provides a short conclusion.

## 1.1 **Proposed Project**

To address changing market needs, the PCCA proposes to deepen the portion of the CCSC from Harbor Island (Station 54+00) into the Gulf of Mexico (Station -620+00) beyond the current authorized project depths of -54 feet and -56 feet MLLW to maximum depths of -78 feet and -80 feet MLLW to accommodate transit of fully laden VLCCs with drafts of approximately 70 feet. The overall project length is approximately 12.8 miles. The design depths are based on a detailed review of the dimensions of the VLCCs expected to call at the Port of Corpus Christi's (Port's) existing and proposed crude oil export terminals; the predominant density of crude oil to be exported and associated vessel drafts; environmental effects due to winds, waves and currents; and required under keel clearances, plus two feet of advanced maintenance and one foot of allowable overdredging depth. The proposed project does not include widening the channel, as the deepening activities would be completed within the footprint of the authorized CCSC channel width. However, some minor incidental widening would be expected to meet the side slope requirements of the deepened channel.

The proposed project consists of the following:

- Deepening from the authorized -54 feet MLLW to approximately -77 feet MLLW, with two feet of advanced maintenance and one foot of allowable overdredge, from Harbor Island at Station 54+00 into the Gulf of Mexico to Station -72+50.
- Deepening from the authorized -56 feet MLLW to approximately -80 feet MLLW, with two feet of advanced maintenance and one foot of allowable overdredge, from Station -72+50 to Station -620+00 in the Gulf of Mexico.
- The existing Inner Basin at Harbor Island would be expanded as necessary to allow VLCC turning there. This modification would also include a flare transition from the CCSC within Aransas Pass to meet the turning basin expansion.

The total length of the CCSC proposed for deepening is approximately 12.8 miles. The proposed project would generate an estimated 38.9 million cubic yards (MCY) of new work material from initial construction, consisting of approximately 39 percent clays (15.1 MCY) and 61 percent sand (23.7 MCY). The clay portion of the new work dredged material located in the offshore reaches (Station -620+00 to -72+50), approximately 13.8 MCY, would be placed at Offshore Dredge Material Disposal Site (ODMDS) No. 1 approximately located approximately 2.9 miles southeast of the Aransas Pass South Jetty and adjacent to the CCSC. The clay portion of new dredged material from Stations -72+50 to Station -54+00 would be used beneficial where possible to create perimeter dikes. Proposed placement options for the new work material are described in more detail in Section 1.2.

The total maintenance quantity is estimated at 1.083 MCY per year, which includes an incremental increase of approximately 0.39 MCY due to the channel deepening beyond the CCSCIP. The 10-year proposed action maintenance increment would be approximately 3.9 MCY. Dredged material from maintenance work would be placed in the existing ODMDS No. 1 in the vicinity of the CCSC, proposed offshore feeder berms B-1 through B-6, or existing PA 2, as material suitability allows. A screening of placement areas (PA) and beneficial use (BU) areas is detailed in Section 5.0. Maintenance materials for the CCSC are currently placed or are planned to be placed in the aforementioned existing PAs and

are routinely rotated between sites. ODMDS No. 1 and the proposed feeder berms B1-B6 are dispersive sites, and would be able to accommodate the project's relatively small incremental amount.

## **1.2 Proposed Dredged Material Placement Plan**

The dredged material placement plan selected for this project proposes to place new work material in a series of existing upland PA and BU sites and proposed new BU sites to beneficially use the new work dredged materials (approximately 38.9 MCY) as much as possible, to expand either existing upland PAs or BU sites, and address shoreline repair needs within Redfish Bay, Corpus Christi Bay, and the Gulf of Mexico in the vicinity of the Preferred Channel Alternative. The plan is shown in Sheet 5 of 17. Detailed views and conceptual cross sections are provided in Sheets 6 through 17 of 17. This plan was a result of the screening and formulation of placement alternatives discussed in Section 5.0. Table 1.1 below summarizes the elements of the placement plan, each representing a singular type of placement. In all but the case of offshore feeder berms B1 through B6, each represents a single site and placement or BU initiative.

The plan predominantly involves (1) use of the approved existing offshore New Work ODMDS, (2) other PA or BU expansion at existing sites used by the PCCA and the USACE to maintain the authorized Federal Project (Corpus Christi Ship Channel Improvement Project) to an authorized depth of -54 to -56 feet MLLW, or (3) new habitat restoration sites located in Redfish Bay, Corpus Christi Bay, or nature center that were identified/confirmed by resource agencies as desirable. These sites would be readily available given the use by the Federal project, for which PCCA is the Non-Federal Sponsor (NFS), and the desire to repair Hurricane Harvey damage and long term erosion.

One exception is dune and shore restoration at San Jose Island (SJI). The site is privately owned by the Bass Family and the planning team is coordinating with their representatives to ultimately gain approval to beneficially restore the extensive damage caused by Hurricane Harvey once additional restoration design detail is developed. Currently, the representatives indicate they view the concept positively and will engage in a series of meetings and coordination in early 2019 with the planning team to advance towards acceptance of this BU initiative. Because it provides substantial placement capacity, is nearby, and could make use of the large volumes of sand in the channel new work prism to restore very important barrier island resources, it is retained in the placement plan. Because of this, more capacity was identified than needed to provide flexibility. Therefore, the bottom of Table 1.1 includes various scenarios for excluding SJI and comparing it to needed new work placement capacity. With SJI removed, there is excess placement capacity available at other BU and PA features in the unlikely scenario that SJI is ultimately excluded from the project.

**Table 1.1: Selected New Work Placement Plan (See Sheet 5 of 17)**

Placement Option	Description	Placement Capacity (CY)	Proximity to New Work Dredging Operations	Provides Environmental Benefit
M3	Estuarine/aquatic creation creation extension Pelican Island	4,328,400	Located approximately 6 miles from Harbor Island	This option will convert featureless bay bottom to approximately 330 acres of estuarine/aquatic habitat.
M4	Restoring historic land and marsh loss at Dagger Island	867,000	Located approximately 7 miles from Harbor Island	This option will restore eroding marsh habitat for native shorebirds and coastal wildlife. Design of project elements will be coordinated to support TPWD's existing permitted project.
M9	Estuarine/aquatic creation creation adjacent to PA9	3,500,000	Located approximately 8 miles from Harbor Island	This option will convert featureless bay bottom to approximately 329 acres of estuarine/aquatic habitat.
M10	Estuarine/aquatic creation adjacent to PA10	10,933,600	Located approximately 10 miles from Harbor Island	This option will convert featureless bay bottom to approximately 770 acres of estuarine/aquatic habitat.
PA6	2 foot dike raise and fill	3,704,900	Located approximately 4 miles from Harbor Island	This option does not create any environmental benefit.
SS1	Restoring eroded shoreline and armoring to protect Harbor Island seagrass area	1,682,000	Located approximately 3 miles from Harbor Island	This option restores an eroding shoreline to its historic profile.
SS2	Restore shoreline washout along Port Aransas Nature Preserve as a result of Hurricane Harvey	695,600	Located approximately 2 miles from Harbor Island	This option restores two washouts of shoreline along the Port Aransas Nature Preserve as a result of Hurricane Harvey.
PA4	Reestablish eroded shoreline and land loss behind PA4	3,020,000	Located approximately 2 miles from Harbor Island	This option does not create any environmental benefit.
SJI	Dune & shore restoration San Jose Island	7,000,000	Located directly next to Channel Dredging Operations	This option restores several miles of beach profile that was washed away as a result of Hurricane Harvey.
NW ODMDS	Place on part of New Work ODMDS	13,800,000	Located directly next to Channel Dredging Operations	This option does not create any environmental benefit.
B1-B6	Feeder berms offshore of SJI and Mustang Island	7,200,000	Located less than 10 miles from Channel Dredging Operations	This option will nourish beach shoreline by natural sediment transport processes.
Scenarios for new work placement capacity provided and needed.		56,731,500	Total Capacity Provided	
		49,731,500	Total Capacity less SJI (should that option become unavailable)	
		38,926,000	Total NW placement capacity required for Channel Preferred Alternative – Base Option	
		10,805,500	Additional Capacity less SJI (should that option become unavailable)	

## **2.0 PURPOSE AND NEED FOR PROJECT**

The purpose of the proposed project is to:

- Allow for more efficient movement of U.S. produced crude oil to meet current and forecasted demand in support of national energy security and national trade objectives,
- Enhance the PCCA's ability to accommodate future growth in crude oil movement, and
- Construct a channel project that the PCCA can implement to accommodate industry needs.

Currently, crude oil is exported using Aframax and Suezmax vessels. The Suezmax vessels are sometimes light loaded (lightered) due to depth restrictions in the existing CCSC, and would continue to be light loaded when the current federally-authorized CCSC deepening project is completed. Reverse lightering translates into additional vessel trips, cost, man hours, operational risk, and air emissions. To efficiently and cost effectively move crude oil cargo, oil exporters are increasingly using fully loaded vessels, including VLCCs. Non-liquid commodity movements are also trending toward larger, more efficient vessels. In order to fulfill its mission of leveraging commerce to drive prosperity in support of national priorities, the PCCA must keep pace with the global marketplace.

The need for the proposed project is driven by the considerations below, which are explained in the following paragraphs:

- Bolstering national energy security through the growth of U.S. crude exports.
- Protecting national economic interests by decreasing the national trade deficit.
- Supporting national commerce by keeping pace with existing and expanded infrastructure being modified or already under development to export crude oil resulting from the large growth in the Permian and Eagle Ford oil field development, which has helped the U.S. recently become the top oil-producing nation in the world.
- Improve safety and efficiency of water-borne freight movements.

The infrastructure and proximity to the major Texas shale plays makes the Port an attractive location for efficiently exporting crude oil by VLCC vessels. The PCCA has received interest from new and existing customers for developing crude oil export terminals and facilities. Production and export of crude oil and natural gas have greatly increased over the years and are providing an economic boom to the Port and the region.

Investments at the PCCA that are directly aimed at product from the Eagle Ford Shale are over \$100 million. In the latter part of July 2018, the PCCA sold more than \$216 million in bonds to fund energy export products. A portion of this money will be used for the authorized deepening of the CCSC, but also will help fund other improvements, including a crude oil export terminal under design at Harbor Island. The new oil export terminals being planned at the Port will have loading arms, handling equipment, storage tanks, and other related facilities for larger ships including VLCCs.

More efficient transport of crude in greater volumes is the impetus for the PCCA to deepen the channel to accommodate fully loaded VLCCs. Presently, the existing channel depth requires that current crude carriers, whether VLCCs or other vessels, not depart fully loaded from the Port, or that VLCCs remain offshore while smaller tankers transfer their cargo to the larger VLCCs, a process known as reverse lightering. The inefficiency of this process is compounded by some of these smaller vessels not being able to be fully loaded while moving through the Port.

Production from the Permian and Eagle Ford basins continues to increase, and several of the major midstream companies are currently undergoing major expansions to facilitate the export of greater



volumes of crude. As these exports increase, the number of lightering vessels and product carriers will also increase, adding to shipping delays and congestion inside and outside of the Port. These delays and congestion will increase the cost of transportation, which in turn will increase the cost of crude oil with the ultimate consequence of making U.S. crude less competitive in the global market.

### **3.0 SITE ANALYSIS**

The proposed project is located in the Gulf of Mexico, the southern portion of Corpus Christi Bay, and Redfish Bay near Port Aransas as shown in Sheet 1 of 17. The Port is located in Corpus Christi Bay on the south-central portion of the Texas coast, approximately 200 miles southwest of Galveston and approximately 150 miles north of the mouth of the Rio Grande. The CCSC provides deep water access from the Gulf of Mexico to the Port via Port Aransas, through Corpus Christi Bay. The CCSC extends from deep water in the Gulf of Mexico approximately 4.3 miles offshore through the Port Aransas jettied entrance, then continues for 21 miles westward to the Inner Harbor. The proposed project would be constructed within the limits of the CCSC from the Gulf of Mexico to Harbor Island, which comprises the Entrance Channel segment and approximately 2,000 linear feet of the Lower Bay segment of the CCSC. The Entrance Channel segment of the CCSC is currently maintained to a depth of -49 feet MLLW, and the Lower Bay segment to a depth of -47 feet MLLW. The CCSC has been federally authorized to a depth of -56 feet MLLW from the Gulf of Mexico to the end of the jetties in the Entrance Channel segment, and to -54.0 feet MLLW in the Lower Bay segment. Dredging work to reach the authorized depths is scheduled to begin in early 2019.

#### **3.1 Affected Waters**

The proposed improvements to the CCSC would take place in the open water marine environment of the Gulf of Mexico and Corpus Christi Bay. Waters in the project area are navigable waters of the United States (WOUS) regulated by the USACE under Section 10 of the Rivers and Harbors Act of 1899. The areas of proposed channel deepening are unvegetated. Deepening of the CCSC would take place in WOUS, and the proposed improvements were detailed in Section 1.1 above, and were shown in Sheets 2 through 4 of 17. The estimated amounts of new work dredging and maintenance dredging were also listed in Sections 1.1 and 1.2. Similarly, waters occurring in the areas of proposed dredged material placement, whether for upland placement or for beneficial use, are also navigable waters of the United States (i.e. subject to the ebb and flow of the tide) regulated by the USACE. The channel amounts were determined using Computer Aided Design (CAD) and Geographical Information System (GIS) analysis with proposed channel widths and projected daylight lines (where channel template meets existing bathymetry) using the most current bathymetric data available from the USACE and surveyed for this project. The estimated amount of WOUS was 1,728 acres between the projected side slopes of the deepened channel. A summary of potential impacts of the channel WOUS including wetlands is summarized in Table 3.1.

For placement impacts, GIS features based on the proposed template extent using existing National Oceanic and Atmospheric Administration (NOAA) bathymetry and CAD analysis were used in conjunction with existing seagrass and oyster habitat mapping downloaded from NOAA, Texas General Land Office (TGLO) and Texas Parks & Wildlife Department (TPWD). The National Wetland Inventory (NWI) data was used to identify potential mapped wetland habitat. Open water acreage was derived using a land, shoreline and water data set sourced from ESRI and Texas Department of Transportation (TXDOT), which was found to match aerial imagery well. Habitat features were clipped using the placement footprints and review of the mapped habitat was conducted using a current ESRI aerial (2017) to verify the nature of mapped features. A summary of potential impacts of the placement plan to WOUS including wetlands, and other special aquatic sites is provided in Table 3.2. The comments in the table show individually the results of aerial review in examining the nature of the mapped habitat. In

several cases, the NWI identified features in an active PA. In others, the feature had eroded away. In various cases, the BU feature is a shoreline restoration that would protect resources in the interior of the BU feature, such as M4. The bottom of the table summarizes the acreage that after considering the aerial review would likely be impacted. For each impact at each site, measures that could minimize or replace the impacted habitat are identified.

**Table 3.1: Channel Impacts to Gulf and Estuarine Bottom (See Sheet 2 through 4 of 17)**

<b>Channel Impacts to Waters of the U.S.</b>		<b>Channel Acres</b>		
<b>Segment</b>	<b>Impact</b>	<b>Toe to Toe</b>	<b>Total Including Side Slope</b>	<b>Side Slope Acreage</b>
New Entrance Channel Extension	Deepening from natural depth (varies -62 ft to -80 ft MLLW) to -77 ft MLLW + 2 ft adv. maint.+ 1 ft overdredge <b>(-80 ft MLLW)</b>	639.6	770.3	130.7
CCSCIP Authorized Entrance Channel Extension	Deepening from -56 ft MLLW to -77 ft MLLW + 2 ft adv. maint + 1ft overdredge <b>(-80 ft MLLW)</b>	160.7	272.4	111.7
Existing Channel	Deepening from -56 ft MLLW to -77 ft MLLW +2 ft adv. maint +1 ft overdredge (-80 ft MLLW) and from -54 ft MLLW to -75 ft MLLW +2 ft adv. maint +1 ft overdredge <b>(-78 ft MLLW)</b>	428.2	685.5	257.3
Turning Basin (area outside of the existing basin footprint) and Flare	Deepen portions of the Lydia Ann Channel from between -54 ft MLLW to <b>-75 ft MLLW</b>	36.1	-	-
<b>TOTAL</b>		1,265	1,728	

Table 3.2: Impacts to Tidal Marsh (See Sheet 5 of 17)

Site ID	Total Site Acres	Mapped Habitat				Open Water WOUS (acres)	
		Wetland			Seagrass		
		Acres	Predominant Type	Comment	Acres		Comment
B1	124.0	-	-	-	-	-	124
B2	124.0	-	-	-	-	-	124
B3	124.0	-	-	-	-	-	124
B4	124.0	-	-	-	-	-	124
B5	124.0	-	-	-	-	-	124
B6	124.0	-	-	-	-	-	124
M3	361.3	-	-	-	17.1	Restoration of larger area to create estuarine/aquatic habitat including elevations suitable for seagrass establishment.	361.3
M4	685.9	68.0	Estuarine and Marine Wetland	Interior wetlands would be avoided and placement to restore shoreline would be integrated with exterior wetlands. Design of project elements will be coordinated to support TPWD's existing permitted project.	559.0	Interior acreage would not be impacted except at fringes. BU feature would protect this from further loss. Design of project elements will be coordinated to support TPWD's existing permitted project.	554.7
M9	329	-	Estuarine and Marine Wetland	-	-	Restoration of larger area to create estuarine/aquatic habitat including elevations suitable for seagrass establishment.	329
M10	770	-	Estuarine and Marine Wetland	-	-	Restoration of larger area to create estuarine/aquatic habitat including elevations suitable for seagrass establishment.	770
NW_ODMDS	1,180.4	-	-	-	-	-	1,180.4
PA4	163.1	51.5	Freshwater Emergent Wetland	Identified within active PA or Feature appears to have eroded away	0.01	Minor impact. BU would protect much larger seagrass area from future losses.	35.7
PA6	331.9	174.6	Lake	Identified within active PA	-	-	2.1

Site ID	Total Site Acres	Mapped Habitat				Open Water WOUS (acres)	
		Wetland		Seagrass			
		Acres	Predominant Type	Comment	Acres		Comment
SJI	265.7	512.2	Estuarine and Marine Wetland	Consists of entirely of shoreline to be restored	-	-	107.8
SS1	325	141.5	Estuarine and Marine Wetland	Would be replaced by created upland to protect seagrass area behind it from future loss	80.5	Restoration of shoreline to bolster against future erosion of much larger area of seagrass behind feature	134.9
SS2	94.8	36.5	Estuarine and Marine Wetland	Eroded away during Harvey	-	-	-
<b>TOTALS</b>	5,251.4	984.3			656.6		4,219.9
<b>Sum of all Habitats</b>							<b>5,860.9</b>
Summary of Aerial Review of Mapped Habitat							
		262.6	Portion inside an active PA or eroded away		559.0	Portion in interior to be largely avoided except at fringes, and would be protected by proposed BU.	
		721.7	Portion not inside an active PA (WOUS)		17.1	Portion that BU can be reconfigured to replace impacted seagrass acreage	
		512.2	Portion to directly restore as beach or dune (SJI)				
		68.0	Portion avoided or that would be integrated (M4)				
		<u>141.5</u>	<u>Portion that would be impacted</u>		80.5	Remaining portion that would be impacted by SS1	
		141.5	Portion that would be directly impacted by BU feature (SS1)				
Sum of Estimated Wetlands, Seagrass, and Open Water WOUS that would be impacted							
						Wetland WOUS	721.7
						Seagrass WOUS	97.6
						Total WOUS	4,219.9

### 3.2 Threatened and Endangered Species

The U.S. Fish and Wildlife Services (USFWS) Information for Planning Conservation (IPaC) report identified 16 federally listed or proposed to be listed species that have the potential to occur within Nueces and Aransas Counties. According to TPWD, there are 36 state listed species that have the potential to occur within Nueces and Aransas Counties. The National Marine Fisheries Service (NMFS) lists 15 marine species with the potential to occur along the Texas Gulf Coast. Table 3.3 summarizes species that are listed as endangered, threatened, or candidate by USFWS, TPWD, or NMFS.

Of the federally-listed species, the following species are expected to have the relevant type of habitat present in the waters and aquatic habitat of Corpus Christi and Redfish Bays, and along the barrier islands of Mustang Island and San Jose Island, in the vicinity of the proposed project: Piping Plover (*Charadrius melodus*), Red Knot (*Calidris canutus rufa*), West Indian Manatee (*Trichechus manatus*) Green sea turtle (*Chelonia mydas*) Hawksbill sea turtle (*Eretmochelys imbricate*), Kemp's Ridley sea turtle (*Lepidochelys kempii*), Leatherback sea turtle (*Dermochelys coriacea*), and Loggerhead sea turtle (*Caretta caretta*)

In addition to the federally-protected species, the TPWD maintains separate county-specific lists of threatened and endangered species that may potentially occur as resident or migrant species in the project area. The TPWD protected species are listed in the following table. All species listed in the following table were compiled from USFWS and TPWD county-specific lists for Nueces and Aransas Counties. State-listed species with “rare” designation were not considered due to their non-regulatory status under the Endangered Species Act.

**Table 3.3: Listed Threatened, Endangered, and Candidate Species for Nueces and Aransas Counties, TX**

Common Name	Scientific Name	Listing Status		
		USFWS IPaC List	TPWD	NMFS
<b>Amphibians</b>				
Black-spotted newt	<i>Notophthalmus meridionalis</i>	NL	T	NL
Sheep frog	<i>Hypopachus variolosus</i>	NL	T	NL
South Texas siren (large form)	<i>Siren</i> sp 1	NL	T	NL
<b>Birds</b>				
American Peregrine Falcon	<i>Falco peregrinus anatum</i>	NL	T	NL
Eskimo Curlew	<i>Numenius borealis</i>	NL	E	NL
Least Tern*	<i>Sterna antillarum</i>	E	NL	NL
Northern Aplomando Falcon	<i>Falco femoralis septentrionalis</i>	E	E	NL
Peregrine Falcon	<i>Falco peregrinus</i>	NL	T	NL
Piping Plover	<i>Charadrius melodus</i>	T	T	NL
Red Knot	<i>Calidris canutus rufa</i>	T	NL	NL
Reddish Egret	<i>Egretta rufescens</i>	NL	T	NL
Sooty Tern	<i>Onychoprion fuscatus</i>	NL	T	NL
Texas Botteri's Sparrow	<i>Peucaea botterii texana</i>	NL	T	NL
White-faced Ibis	<i>Plegadis chihi</i>	NL	T	NL
White-tailed hawk	<i>Buteo albicaudatus</i>	NL	T	NL

Common Name	Scientific Name	Listing Status		
		USFWS IPaC List	TPWD	NMFS
Whooping Crane	<i>Grus americana</i>	E	E	NL
Wood stork	<i>Mycteria americana</i>	NL	T	NL
<b>Fishes</b>				
Opossum pipefish	<i>Microphis brachyurus</i>	NL	T	NL
Smalltooth sawfish	<i>Pristis pectinata</i>	NL	E	NL
Oceanic whitetip shark	<i>Carcharhinus longimanus</i>	NL	NL	T
Giant manta ray	<i>Manta birostris</i>	NL	NL	T
<b>Mammals</b>				
Gulf Coast Jaguarundi	<i>Herpailurus yagouaroundi cacomitli</i>	E	E	NL
Ocelot	<i>Leopardus pardalis</i>	E	E	NL
Red wolf	<i>Canis rufus</i>	NL	E	NL
Southern yellow bat	<i>Dasypterus ega</i>	NL	T	NL
West Indian Manatee	<i>Trichechus manatus</i>	T	E	NL
White-nosed coati	<i>Nasua narica</i>	NL	T	NL
Fin whale	<i>Balaenoptera physalus</i>	NL	NL	E
Sei whale	<i>Balaenoptera borealis</i>	NL	NL	E
Sperm whale	<i>Physeter macrocephalus</i>	NL	NL	E
Gulf of Mexico Bryde's whale	<i>Balaenoptera edeni</i> – subspecies	NL	NL	C
<b>Corals</b>				
Lobed star coral	<i>Orbicella annularis</i>	NL	NL	T
Mountainous star coral	<i>Orbicella faveolata</i>	NL	NL	T
Boulder star coral	<i>Orbicella franksi</i>	NL	NL	T
Elkhorn coral	<i>Acropora palmata</i>	NL	NL	T
<b>Clams/Mollusks</b>				
Golden Orb	<i>Quadrula aurea</i>	C	T	NL
<b>Reptiles</b>				
Green sea turtle	<i>Chelonia mydas</i>	T	T	T
Hawksbill sea turtle	<i>Eretmochelys imbricata</i>	E	E	E
Kemp's Ridley sea turtle	<i>Lepidochelys kempii</i>	E	E	E
Leatherback sea turtle	<i>Dermochelys coriacea</i>	E	E	E
Loggerhead sea turtle	<i>Caretta caretta</i>	T	T	T
Texas horned lizard	<i>Phrynosoma cornutum</i>	NL	T	NL
Texas indigo snake	<i>Drymarchon melanurus erebennus</i>	NL	T	NL
Texas scarlet snake	<i>Cemophora coccinea lineri</i>	NL	T	NL
Texas tortoise	<i>Gopherus berlandieri</i>	NL	T	NL
Timber rattlesnake	<i>Crotalus horridus</i>	NL	T	NL
<b>Plants</b>				
Slender Rush-pea	<i>Hoffmannseggia tenella</i>	E	E	NL
South Texas Ambrosia	<i>Ambrosia cheiranthifolia</i>	E	E	NL

E = Endangered, T = Threatened, C = Candidate, DL - Delisted, NL = Not Listed

\*Only needs to be considered for wind related projects within migratory route

Of the five turtle species that are listed by the NMFS and USFWS, only the Kemp's Ridley, green, and loggerhead sea turtles are likely to occur in bay waters in the vicinity of the proposed project area. The hawksbill and leatherback sea turtles are not likely to be found within the project area due to a lack of suitable habitats. Hawksbill sea turtles are unlikely to occur in the project study area, as they prefer clear offshore waters where coral reef formations are present. Leatherback sea turtles are unlikely to occur in the project study area, as they primarily inhabit the upper reaches of the ocean, and also frequently descend into deep waters from 650 to 1,650 feet in depth.

Critical habitat in the proposed project footprint is shown in Figure 3.2. Critical habitat for the loggerhead sea turtle (Sargassum habitat) was designated in 2014 for the offshore waters of the Gulf of Mexico (LOGG-S-2 Gulf of Mexico Sargassum) that includes an existing ocean dredge material disposal site (NW ODMDS) and 10.57 nautical miles of the outer channel and approach channel dredging segments. LOGG-S-2 Gulf of Mexico Sargassum critical habitat contains developmental and foraging habitat for young turtles where surface waters form accumulations of floating material, especially Sargassum.

Dredging operations for the proposed project would be conducted primarily using hydraulic cutterhead dredges, which move at slow enough speeds that turtles would be able to move out of the way of the hydraulic cutterhead. Non-hopper dredges are not known to take sea turtles.<sup>1</sup> It is anticipated that hydraulic dredging for the project would not cause adverse impacts to sea turtles.

Hopper dredging may be used for channel segments where material and placement is more suitable for hopper dredging. In those cases, material would be transported and placed by hopper dredge. The impact of hopper dredging is being determined in the Biological Assessment (BA) but is expected that impacts would not adversely affect loggerhead sea turtles that use critical habitat when Sargassum is present, following recent clarification to the 2007 Gulf of Mexico Regional Biological Opinion (GRBO) on hopper dredging.<sup>2</sup> The best management practices (BMPs) recommended in the GRBO would be employed when hopper dredging. Therefore, dredging associated with the proposed project is unlikely to have long-term negative effects on this species other than temporary displacement of individuals from the channel area, which would also be expected during regular maintenance dredging of the channel.

The proposed NW ODMDS may impact this critical habitat during the placement of dredged material; however, this ODMDS is already approved for use, and a 2016 NMFS memo clarified that any temporary turbidity plumes generated by dredged material placement would be unlikely to cause lasting impacts to Sargassum habitat or juvenile sea turtles that may be foraging in the area.<sup>3</sup>

Critical habitat for wintering piping plovers on the Texas Gulf Coast was designated by the USFWS in 2001 and was expanded to its current extent in 2009. Numerous factors determine critical habitat placement, including consistent winter occupancy, wetlands inventory data, habitat fragmentation, and availability of foraging, feeding, and roosting areas. Proposed PA SJI located on San Jose Island and SS2 located within Corpus Christi Bay (along the southern toe of the CCSC and adjacent to the Port

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<sup>1</sup> NMFS. 2003. Endangered Species Act - Section 7 Consultation Biological Opinion – Dredging of Gulf of Mexico Navigation Channels and Sand Mining ("Borrow") Areas Using Hopper Dredges by COE Galveston, New Orleans, Mobile, and Jacksonville Districts (Consultation Number F/SER/2000/01287). National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, Protected Resources Division St. Petersburg, Florida

<sup>2</sup> NMFS. 2016. Roy E. Crabtree/NOAA Fisheries March 4, 2016 Memorandum to Alvin B. Lee, SES/USACE, South Atlantic Division, Subject: Continued Operations of Maintenance Dredging and Beach Sand Placement Actions under the 2007 Gulf of Mexico Regional Biological Opinion (GRBO)(I/SER/2015/17543).

<sup>3</sup> NMFS. 2016. Roy E. Crabtree/NOAA Fisheries March 4, 2016 Memorandum to Alvin B. Lee, SES/USACE, South Atlantic Division, Subject: Continued Operations of Maintenance Dredging and Beach Sand Placement Actions under the 2007 Gulf of Mexico Regional Biological Opinion (GRBO)(I/SER/2015/17543)



Aransas Nature Preserve) would impact designated final critical habitat. Both these proposed PAs experienced a significant amount of coastal erosion during Hurricane Harvey in 2017, and have been targeted for beach nourishment and beneficial use with this project.<sup>4</sup> Barrier island and beach erosion can be accelerated in the aftermath of large storm events<sup>5</sup>; therefore, preservation of this critical habitat is paramount in a time of increasing development and industrialization along the Texas Gulf Coast.

PA SJI is located almost entirely within critical habitat unit TX-15, designated as an essential feeding and foraging sparsely vegetated dune complex. Immediately behind and adjacent to PA SJI and TX-15 is a separate critical habitat unit, TX-16. TX-16 is composed primarily of tidal flats utilized by the piping plover for feeding and foraging. Although portions of the eroded foredunes within TX-15 may now operate as tidal flats, this habitat type is amply available within unit TX-16, which remained relatively intact despite the effects of Hurricane Harvey on other habitats along the coast. Restoring TX-15 to its former appearance and functionality will protect not only San Jose Island, but the function and durability of TX-16 as well.

PA SS2 along the southern toe of the CCSC and adjacent to the Port Aransas Nature Preserve would restore an eroded berm, originally composed of dredged material placed along the channel to combat vessel wake generated erosion. Hurricane Harvey and vessel wake from normal channel traffic have caused inflow into this tidal area at two locations, and placement of dredged material to shore up this berm would restore the channel shoreline to its former appearance and functionality. The U.S. Geological Survey (USGS) suggests that coastal areas that have demonstrated erosion after large storm events are more susceptible to erosion from normal tidal processes.<sup>6</sup> Fall or winter construction within PAs SJI and SS2 may temporarily displace wintering plovers from the area; however, the benefit of long-term habitat preservation of these areas accomplished by dredged material placement outweighs any negative short-term impacts that may result from construction.

As shown on the Figure 3.2, dredged material from maintenance work would be placed in the existing ODMD No. 1 in the vicinity of the CCSC, proposed offshore feeder berms B-1 through B-6, or existing PA 2, as material suitability allows.

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<sup>4</sup> Goff, J., Swartz, J.M., and S.P.S Gulick. 2017. An Outflow Event on the Left Side of Harvey: Erosion of Barrier Sand and Seaward Transport Through Aransas Pass. American Geophysical Union, Fall Meeting 2017. Available at: <http://adsabs.harvard.edu/abs/2017AGUFMNH34B..01G>

<sup>5</sup> Houser, C., Hapke, C., and S. Hamilton. 2007. Controls on coastal dune morphology, shoreline erosion, and barrier island response to extreme storms. *Geomorphology*. Vol 100:3-4. 18pp.

<sup>6</sup> *ibid*

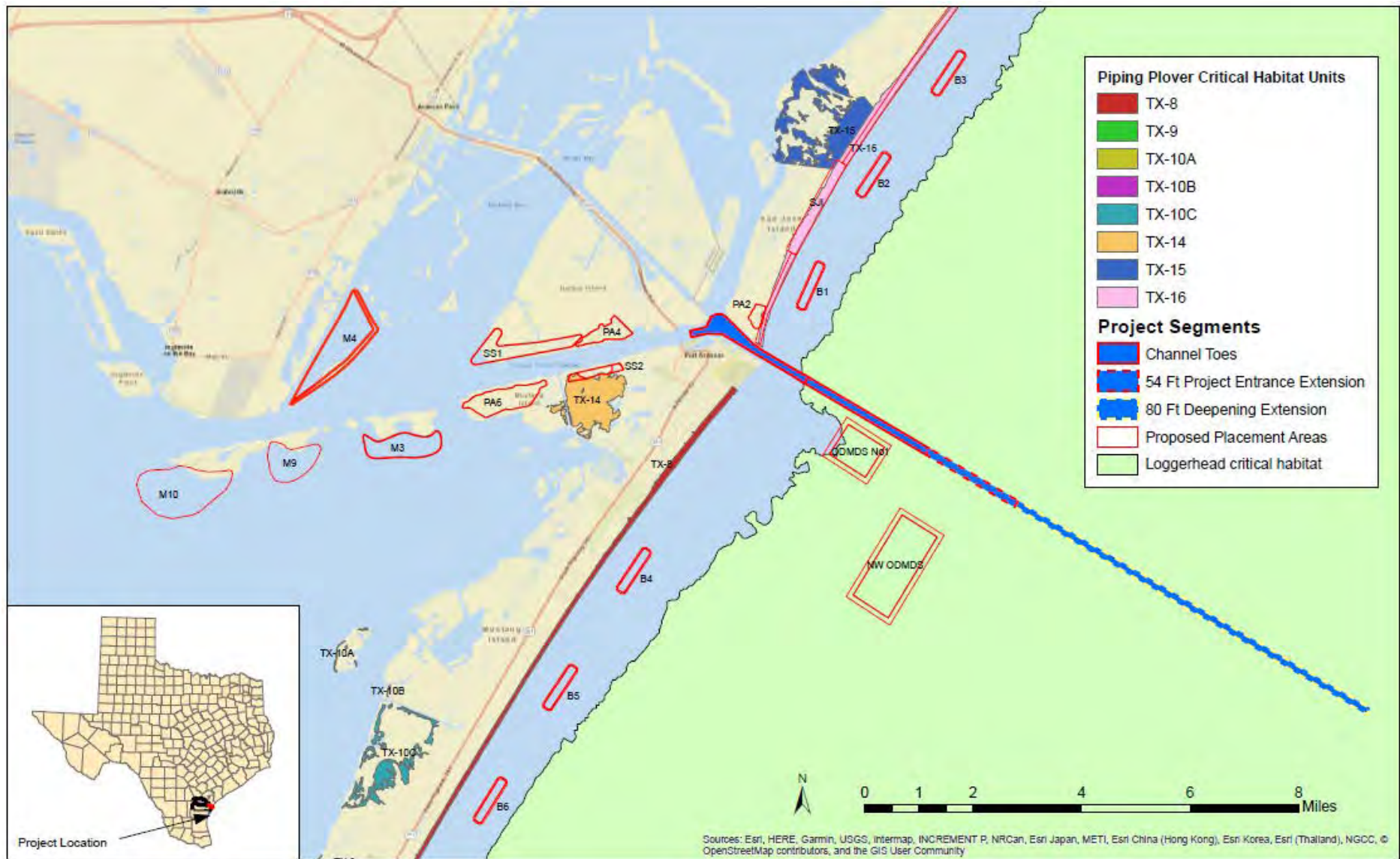


Figure 3.2: Critical Habitat within the Proposed Channel and Placement Areas

### **3.3 Cultural Resources**

The majority of the proposed channel deepening project is within the footprint of the currently authorized channel bottom and side slopes. The exception is the extension of the entrance channel into the Gulf of Mexico to meet deeper Gulf contours. Some minor incidental widening of the channel slopes is expected to meet side slope requirements of the deepened channel. Previous cultural resources investigations conducted for the channel deepening project authorized in 2003 would apply to the proposed project.

A 2018 review of the Texas Archeological Sites Atlas (TASA) maintained by the Texas Historical Commission (THC), and the online National Register of Historic Places (NRHP) database maintained by the National Park Service revealed that multiple cultural resources have been documented within one mile of the proposed project. Of the 42 recorded archeological sites within the one-mile review area, only two sites were identified within the proposed project area. One site was determined to be ineligible for listing in the NRHP, and the other site was assessed as being not significant. No structures greater than 50 years in age, no cemeteries, and no historical markers were identified within the boundaries of the proposed project.

Seventy-two shipwrecks that have not been assigned archeological site numbers were identified within the project review area. Twelve of the identified shipwrecks were located within the boundaries of the proposed channel deepening and PAs; however, only two located east of Aransas Pass are classified as State Archeological Landmarks, which suggests that these two resources may be eligible for listing in the NRHP. Sixty-eight previously completed cultural resources investigations were identified within the project review area. Fourteen of the investigations overlapped portions of the proposed project, with most of these being marine archeological surveys that examined portions of the CCSC and/or Aransas Pass. Only minor portions of some of the dredged material PAs were included in the surveys.

## **4.0 PROJECT ALTERNATIVES FOR CHANNEL IMPROVEMENTS**

### **4.1 Evaluation Criteria**

Preliminary criteria were developed to evaluate how well initial alternatives fulfilled the purpose and need of the proposed project. The initial alternatives were screened using the following general criteria:

- 1) Increase Export Efficiency – Key factors that affected the ability to fully load vessels with crude oil due to constraints of the existing channel and authorized channel were considered. This included draft limitations along the CCSC segments between the Entrance Channel and Harbor Island. This criterion considered whether the alternative allowed a VLCC to move more fully loaded and whether it eliminated or reduced lightering. Lightering would be eliminated for vessels using Harbor Island and lightering would be reduced for vessels using docks at other locations within the CCSC system.

Due to recent exponential growth in crude oil export, the Port of Corpus Christi has seen an increase in vessel tonnage. Several stakeholders' forecasts indicate that this trend will continue for a foreseeable future and beyond. As a result of PCCA's past investments in marine infrastructure and available capacity, PCCA has been capable of accommodating the recent historical shift in oil traffic from import to export. This trend is expected to continue as long as the Port's infrastructure allows it. There are concerns about future limitation to U.S. oil exports due to lack of or insufficient infrastructure capable of handling the export volumes. Lack of adequate infrastructure at U.S. ports including the Port Corpus Christi may lead to inefficient

shipping and ensuing crude price increase which may weaken the U.S.'s competitive edge (EIA 2018).

- 2) **Ability to Serve Multiple Tenants** – Part of the PCCA's mission is to meet the demand of commerce in the Coastal Bend region and throughout the world. To that end, PCCA plans its infrastructure to accommodate the needs of different stakeholders. PCCA has the ability to plan, fund, build and maintain marine infrastructures for common use such as navigation channels and dock infrastructure. PCCA owns and operates several public oil docks and bulk docks that are leased and used by different tenants. The ship channel is a common use infrastructure that is designed and operated to accommodate the different types of vessels used by PCCA's tenants. As cargo volume and vessel traffic increase, larger vessels are being used to improve shipping efficiency and reduce costs. To keep up with these trends, PCCA has undertaken several channel improvement programs. One is the dredging of the CCSC to a depth of 54-foot MLLW for which construction is imminent and will serve tenants all the way to the Inner Harbor. The other is this study to evaluate deepening up to the full depth required to accommodate fully loaded VLCCs. The terminal being planned by the PCCA at Harbor Island could be operated as a facility open for use to several users or companies. This criterion evaluates to what degree the alternative can benefit multiple tenants.
- 3) **Flexibility to Accommodate Future Growth/ Expansion** – This criterion considers the flexibility the alternative provides in being able to accommodate future growth in crude oil export tonnage and future growth in other sectors as well. Crude oil exports have exponentially increased in the last two years and are on pace to exceed the growth rate in 2018. Various long term projections predict much larger export tonnage if export infrastructure and the present bottlenecks in the supply chain end are improved. To that end, the ability to accommodate delivery from new crude export terminals or add capacity for exporting crude oil is important. In addition to crude oil, PCCA seeks to anticipate and be ready to accommodate all other future cargo needs and long term growth.
- 4) **Minimize Environmental Impacts** – All alternatives considered are located in the open waters of Corpus Christi Bay and the Gulf of Mexico. Therefore, environmental impacts would be limited to open water marine habitat and would primarily not involve terrestrial, wetland, or near-shore (tidal flats, beach, dunes etc.) impacts. Potential impacts to the marine environment are discussed below:

*Impact to Marine Habitats:* Existing marine habitat mapping information including seagrasses, tidal wetlands, and oyster reef from TPWD, NOAA and TGLO were obtained and used to gauge the potential for impacts. As environmental marine field surveys were reviewed, preliminary site-specific habitat locations were identified. Because the channel will be constructed within the footprint of an existing channel, no new impact to undisturbed habitat would occur within that footprint. The incremental widening that may be required to maintain the recommended design slope would be minimal and would limit undisturbed habitat impacts.

*Other environmental impacts:* Other environmental aspects that are considered for this criteria include potential impact of oil spills and air emissions from vessels and fuel transfer operations as described below. In conjunction with considerations of risk in #5 below, potential impacts to environmental resources considers the location of major habitat resources (coastal shore, seagrass etc.), climatic (e.g. prevailing wind), and spill response factors. Impacts on air emissions considers how the alternative reduces transit and loading emissions from what would occur during lightered crude oil transfer operations.

- 5) Risk, Safety and Security – Safety and security are primary concerns for all vessels operating at the Port of Corpus Christi. Safety and security concerns include risk and challenges associated with oil spills and ensuing responses, fire and fire suppression activities as well as worker safety as they relate to offshore and onshore operations. Security also considers vulnerability to challenges to physical and operational security such as sabotage, and vandalism. Vulnerability to weather related events including wave height, winds and hurricanes is considered as well.
- 6) Ability to Contribute to Beneficial Uses – PCCA’s environmental precepts include a) wildlife habitat development, improvements, and replacement when modification to existing habitat is necessary, and b) environmental sustainability in the development of port facilities and in ongoing port operations. Although this is normally in the context of executing projects in a manner that restores resources from the impacts of a project, the ability to contribute to resource restoration as a result of project actions regardless of project impact can be considered also. Continuing the practice of considering and incorporating BU where practicable in managing dredged material of its channel projects, as was done in the currently authorized -54-foot project, is desirable. The ability to do this under a given alternative is considered for this criterion.

#### **4.2 Initial Alternatives Considered**

The existing channel dimensions and the authorized channel dimensions are summarized as follows. As of July 2018, the CCSC has a dredged depth of -47 feet MLLW and plans are currently underway to dredge the channel to the authorized -54-foot MLLW depth, which would constitute the “No-Action” condition for the proposed channel deepening project. The CCSC is also planned to be extended into the Gulf of Mexico by 1.4 miles to the -56-foot MLLW contour as part of the federally-authorized project. The width of the channel varies as follows: from the current outer limit of the dredged channel (in the Gulf) to the Port Aransas jetties, the CCSC Entrance Channel is -47 feet MLLW deep with a width of 700 feet, and is authorized to -54 feet MLLW with a width of 700 feet. From the jetties to Harbor Island, the CCSC Entrance Channel is 600-feet wide. The remainder of channel to the La Quinta Junction has a width of 500 feet and is authorized to a width of 530 feet. It was against the limitation of the existing and authorized channel dimensions that initial alternative concepts were developed.

Initial alternatives considered to meet the project purpose included deepening the existing channel and offshore options that pump crude oil from onshore storage to offshore loading facilities. There are two basic types of such facilities: the simpler offshore single point mooring (SPM) buoy system, and the larger, more complex offshore platform or terminal system. An SPM system consists of onshore storage tanks (i.e. above ground storage tank farm) and pumps connected to pipelines leading offshore and terminating at an offshore buoy. The buoy is anchored to the seafloor that has floating loading hoses and mooring lines for the VLCC to hook up to and conduct loading operations. An SPM-based system can be built to provide loading abilities to a few vessels by adding SPMs, but would potentially require multiple pipelines depending on pipeline size and onshore pump capacity. An offshore platform or terminal system similarly uses onshore storage and pumps like the SPM, but the pipeline terminates into a pile-driven platform with conventional manifolds, loading arms and pipe racks, often with berths for several vessels. It is more complex and expensive than SPMs but typically provides more loading capacity. For both these options, the SPM or platform would have to be located in sufficiently deep offshore waters to account for draft, under keel and sea state. This would be between 13 or more miles offshore of Corpus Christi Bay at minimum considering the design depth. The following were the initial alternatives considered:

- **Alternative A – No Action.** No channel improvements and maintaining the channel at its existing depth. This option is equivalent to continuing with lightering and reverses lightering operations to offload and top off large vessels including VLCC's.
- **Alternative B – Channel Deepening.** This alternative consists of deepening the CCSC to -80 feet MLLW from the Gulf of Mexico to Harbor Island, including the approximate 10 mile-extension to the Entrance Channel necessary to reach sufficiently deep waters. As a result of one-way transit assumed for VLCCs, the planned widths for the -54-foot MLLW currently authorized project are nominally sufficient. Therefore no widening other than the minor incidental widening to keep these bottom widths and existing channel slopes at the proposed deeper depths, would occur. Deepening would take place largely within the footprint of the currently authorized -54-foot MLLW channel. As discussed earlier, PCCA is studying the feasibility of developing an export terminal at Harbor Island. The Harbor Island terminal is being planned independently of this proposed deepening project. Therefore, there is a strong possibility that this terminal would be developed at Harbor Island to accommodate partially loaded VLCCs even if the deepening project were not implemented. It is assumed 2 to 3 berths would be built at Harbor Island, and existing VLCC berth plans at Ingleside would provide three berths. Under this alternative, light-loaded VLCCs at Ingleside would top off at Harbor Island rather than lightering.
- **Alternative C – Offshore Single Point Mooring (SPM) Facility.** This alternative is an SPM-based system consisting of constructing onshore storage facilities, shore-to-SPM pipelines, and a series of SPMs to load several vessels simultaneously. Conceptually, the onshore storage could be those that would be installed in any one of the marine terminal facilities at Harbor Island or Ingleside if they were converted to offshore delivery, or it could be a new location on other undeveloped property. For purposes of the initial screening, it is assumed 3 to 4 SPMs, and the requisite onshore storage, pumps, and pipelines would be built to load 3 to 4 VLCCs. This number is in the range of facilities built in past offshore terminal projects such as the Louisiana Offshore Oil Platform (LOOP), Iraq's Al Basra Oil Terminal (ABOT), and Bulgarian/Greek Burgas-Alexandroupolis SPM facilities (Trans-Balkan Pipeline B.V.). This alternative would be located somewhere between 13 to 15 miles offshore.
- **Alternative D – Offshore Platform.** This alternative would be similar to Alternative C, except it would be constructed as an offshore platform or terminal. With a more complex system of pile-driven structures and loading arms, it is assumed that pipelines, arms, and berths to service a minimum of 4 vessels simultaneously would be constructed. A four-berth terminal was the constructed capacity of the ABOT. Similar to Alternative C, this alternative would be located in the 13 to 15 miles offshore band, and conceptually could rely on pumping from existing/planned storage either at Harbor Island or Ingleside, or a new location.

### 4.3 Performance of Alternatives

Alternative A (No Action) would not meet the purpose of the project, as it would neither provide for the short term need to more efficiently export crude oil, or provide the Port the capacity to respond to long term changes and future economic growth. However, it is retained only for NEPA purposes to compare and contrast action alternatives.

Alternative B (Channel Deepening) does respond to both the short term and long term aspects of the purpose. It improves the efficiency of crude transport by enabling full loading of VLCCs and eliminating or reducing lightering, and provides a deeper channel that could accommodate vessels for other commodities should tenants, cargo, and shipping needs change. The existing or planned terminals

would provide more loading berths than the typical size of multiple point/berth offshore options, although offshore options that match the onshore berth numbers could be built at greater cost. The capacity to accommodate growth in crude is more flexible as new tenants or terminals can be developed on remaining water frontage near the channel. Onshore loading (as would be used in Alternative B) is generally faster due to the greater flow rates of loading arms achievable at onshore berths compared to pumping 13 or more miles to SPM loading hoses under Alternative C. Pumping and loading arms under Alternative D, offshore platform can be made to provide high capacity loading. Dredging approximately 38.9 MCY would be required for Alternative B within the existing channel and proposed extension. Most of the impact would occur in already deepened channel, and approximately 770.3 acres of undredged Gulf bottom would be dredged to provide the entrance extension. Benthic impacts would be temporary and benthic communities would be expected to recover within 1-2 years. No seagrass, wetland or oyster reef would be impacted. This option would provide ample material to beneficially use in the many seagrass, and shoreline, habitat sites impacted by Hurricane Harvey and long term erosion. The option could potentially reduce more than 485,000 metric tons (MT) of CO<sub>2</sub> emissions by eliminating or reducing reverse lightering when annual export rate averages additional 3.5 MMBPD. This option could reduce between approximately 38 and 112 tons of oxides of nitrogen (NO<sub>x</sub>), and between 2,200 and 9,270 tons of volatile organic compounds (VOC), both USEPA criteria pollutants, depending on whether elimination of lightering at current (approximately 1.5 VLCCs/week serviced) or potential future export rates (4 to 8 VLCCs per week) is assumed.

Offshore Alternatives C (SPM) and D (Offshore Platform) do respond to the short term need of the purpose by enabling full loading of VLCCs and partially eliminating or reducing lightering. However, they are limited in responding to the longer term needs of future economic growth and changes in port tenants and shipping needs, because they are less flexible in accommodating different grades of crude due to pump distances and flushing that could be required to switch grades. The capacity to accommodate growth in crude would require building not only more onshore storage and pumps, but new pipelines and SPMs or platforms, which would tend to be more costly and difficult to add. These options could similarly reduce CO<sub>2</sub>, NO<sub>x</sub> and VOC emissions through lightering elimination or reduction, as Alternative B. However, more vessel hoteling and pumping emissions would be produced due to the offshore location. In contrast to Alternative B, for Alternatives C and D, offshore operations in the Gulf would present more safety and spill risk challenges. The main concern are proximity of these operations to sensitive receptors and coastal habitats such as the Padre Island National Seashore, San Jose Island, and the associated Kemp's ridley turtle nesting grounds and Piping plover critical habitat, and greater exposure to wind and wave climate of the open Gulf, which would make spill containment more difficult. These options would also be in a location where response times would be greater, and access by unauthorized personnel would be greater, again due to distance from the onshore location, further increasing the national security risk.

A summary of the initial screening of alternatives is provided in Table 4.1.

#### **4.4 Screening and Selection of Channel Alternatives**

The project alternatives were assessed using the screening criteria of increasing export efficiency, serving multiple tenants, accommodating future growth and expansion, and minimizing environmental impacts. The alternatives were compared with respect to their ability to meet the project need and purpose. Following the screening of possible action alternatives, the PCCA identified the No Action and the proposed channel deepening to Harbor Island as the alternatives to be evaluated for this project. The channel deepening project alternative would be completed primarily within the footprint of the existing CCSC, maintaining the same channel bottom width and necessitating only minor incidental widening to maintain the required side slopes. The proposed channel deepening alternative would meet the purpose and need of the project compared to the No Action alternative, as described below.

**No Action Alternative:** No channel improvements would be constructed and the existing channel would be maintained at its width and depth following the completion of the ongoing -54-foot deepening project. This alternative would not meet the need and purpose of the proposed project, as it would neither provide for the short-term need to more efficiently export crude oil, or provide the PCCA the capacity to respond to long-term changes and future economic growth. The No Action alternative is retained for comparison against the proposed action alternative.

**Channel Deepening to Harbor Island:** The action alternative would be the deepening of the CCSC to a depth of -80 feet MLLW (-77 feet MLLW plus two feet of advanced maintenance and one foot of allowable overdredge) from the Gulf of Mexico to Harbor Island. This alternative would meet the project need and purpose by supporting the efficient export of crude products from the Port through the elimination or reduction of reverse lightering operations. The channel deepening is proposed to be constructed primarily within the footprint of the existing CCSC. The incremental widening expected to be required to maintain the recommended design slope would be minor, and impacts to undisturbed habitat in the Gulf of Mexico would be limited.

The PCCA's environmental precepts include a) wildlife habitat development, improvements, and replacement when modification to existing habitat is necessary and b) environmental sustainability in the development of PCCA facilities and in ongoing port operations. The PCCA's goal is to execute projects in a manner that restores resources impacted by a project, and to contribute to resource restoration as a result of project actions even if the project impacts are minimal. The PCCA's practice is to consider and incorporate beneficial use activities where practicable in managing dredged material generated by channel projects.



**Table 4.1: Alternative Performance**

Screening Criteria	OPTIONS			
	Alternative A No Action	Alternative B Channel Deepening Project	Alternative C Offshore SPM Facility	Alternative D Offshore Platform
<b>1) Increase Export Efficiency</b>	<ul style="list-style-type: none"> <li>No increase in export efficiency. Inefficient lightering process, involving more vessel calls, transit, and longer VLCC loading process will still occur</li> <li>Would involve light-loaded VLCC transit on lower 3<sup>rd</sup> of CCSC</li> <li>Increase in congestion with future growth from more lightering vessels</li> </ul>	<ul style="list-style-type: none"> <li>Lightering can be eliminated or reduced, decreasing vessel traffic and shortening the duration of VLCC loading process</li> <li>Would still require VLCC transit on lower 3<sup>rd</sup> of CCSC, but elimination or reduction of lightering transit would free up channel availability for future growth.</li> <li>Multiple tenant accommodation discussed below would allow more fully loaded VLCC participation, increasing efficiency for more exporters</li> </ul>	<ul style="list-style-type: none"> <li>Lightering can be eliminated or reduced, thereby reducing vessels involved and shorten VLCC loading process</li> <li>Would eliminate VLCC transit.</li> <li>Exporting participants would be more limited than channel option, and exporting nonparticipants who couldn't fully load VLCCs would resort to smaller vessels or lightered VLCCs, leaving this congestion component in place as growth occurs. See multiple tenant and future growth discussion below.</li> </ul>	<ul style="list-style-type: none"> <li>Same as SPM for all attributes except where noted</li> </ul>
<b>2) Ability to Serve Multiple Tenants</b>	<ul style="list-style-type: none"> <li>No Change</li> </ul>	<ul style="list-style-type: none"> <li>Port can operate VLCC berths as public docks, servicing multiple tenants and shipping lines, encouraging healthy competition and raising revenue for the Port and local communities.</li> <li>Centralized and integrated land use planning of developable land assets at Harbor Island.</li> <li>Loading of different grades from onshore terminals would be easier compared to offshore options</li> </ul>	<ul style="list-style-type: none"> <li>Difficult to plan multiple offshore SPMs connected individually to individual tank farms.</li> <li>Accommodating different grades from different customers would be more cumbersome, requiring flushing of longer lengths of line to switch grades, compared to onshore terminals.</li> </ul>	<ul style="list-style-type: none"> <li>Same as SPM for all attributes except where noted</li> </ul>
<b>3) Ability to Accommodate Future</b>	<ul style="list-style-type: none"> <li>No accommodation of future growth</li> <li>Vessel draft limitations</li> </ul>	<ul style="list-style-type: none"> <li>Local and regional economy is enhanced as revenues are collected for ships calling at</li> </ul>	<ul style="list-style-type: none"> <li>Multiple single SPMs may need to be planned by the industry. Multiple permits</li> </ul>	<ul style="list-style-type: none"> <li>Same as SPM for all attributes except where noted</li> <li>Expansion of platform to add</li> </ul>

Screening Criteria	OPTIONS			
	Alternative A No Action	Alternative B Channel Deepening Project	Alternative C Offshore SPM Facility	Alternative D Offshore Platform
<b>Growth/Expansion</b>	<ul style="list-style-type: none"> <li>Increased vessel traffic due to large increase in reverse lightening</li> </ul>	<p>and products moving through the PCCA.</p> <ul style="list-style-type: none"> <li>Efficient use of capital to achieve growth and meet overall crude export forecast for the nation</li> <li>Allows for future growth within the PCCA under a single permitting process for deepening the channel</li> </ul>	<p>required for each individual project.</p> <ul style="list-style-type: none"> <li>Future expansion of offshore SPM facility more difficult to accommodate new users. Limited users can access the facility at any one time due to complex financing and project development challenges.</li> </ul>	<p>more users even more difficult and costly than SPM</p>
<b>4) Environmental Impact</b>	<ul style="list-style-type: none"> <li>No habitat impact</li> <li>Increase in air emissions due to increase from reverse lightening activities.</li> <li>CO<sub>2</sub> emissions would be greater than other options due to continuing lightening activities</li> </ul>	<ul style="list-style-type: none"> <li>Construction largely being undertaken within existing channel limits.</li> <li>New entrance channel extension would temporarily disturb 770.3 acres of 60-ft deep Gulf bottom, convert it to deeper bottom, but benthos would recolonize within a year, and water column would remain. Amount of conversion to deeper bottom would be insignificant compared to available Gulf Habitat.</li> <li>Dredged material will be evaluated for beneficial use and building resilient community.</li> <li>Potential to reduce more than 485,000 MT of CO<sub>2</sub> emissions by eliminating or reducing reverse lightening when annual export rate averages additional 3.5 MMBPD.</li> </ul>	<ul style="list-style-type: none"> <li>Puts active loading facility and new pipelines in previously undisturbed part of Gulf of Mexico.</li> <li>Permanent but negligible size (compared to available Gulf Habitat) of conversion of Gulf bottom and water column to SPM platform</li> <li>No potential beneficial use of dredged material</li> <li>Similar potential to reduce CO<sub>2</sub>, NO<sub>x</sub>, and VOC from eliminating or reducing lightening vessel emissions.</li> <li>Spillages are more likely to happen and not as easily confined or cleaned up.</li> <li>Potential for higher vapor emissions and higher CO<sub>2</sub> emissions from vessels hoteling due to reduced loading rates.</li> <li>Tugs needed for hose tending and VLCC</li> </ul>	<ul style="list-style-type: none"> <li>Same as SPM for all attributes except where noted</li> <li>Permanent but negligible size of conversion of Gulf bottom and water column to SPM platform – larger than SPM, but still negligible</li> </ul>

Screening Criteria	OPTIONS			
	Alternative A No Action	Alternative B Channel Deepening Project	Alternative C Offshore SPM Facility	Alternative D Offshore Platform
		<ul style="list-style-type: none"> <li>• Potential to eliminate 38-112 tons annual NOx and 2,200-9,270 tons of VOC from elimination of some lightering activity</li> <li>• Enables faster loading rates than SPM, reducing CO<sub>2</sub> emissions from hoteling vessels.</li> <li>• Ability to provide vapor recovery system and shore power to operate vessel systems for reduced emissions.</li> </ul>	<p>positioning during loading will have to transit over 30 miles (assuming support facilities are home based at Port Aransas) from the CCSC to service the platform increasing air emissions generated.</p> <ul style="list-style-type: none"> <li>• No technically feasible method for providing vapor recovery of vapour combustion systems for reducing emissions.</li> </ul>	
<b>5) Risk, Safety and Security</b>	<ul style="list-style-type: none"> <li>• More vessels in Harbor will make monitoring harder</li> </ul>	<ul style="list-style-type: none"> <li>• Severity of accidental spills would be reduced compared to offshore options as facilities and vessels are in a more controlled Port environment.</li> <li>• Environmental accidents better controlled at onshore facilities in protected waters.</li> <li>• Comprehensive spill response would be quicker than offshore options due to proximity to response resources</li> <li>• Incidents at onshore terminal can be more easily contained to avoid affecting other users.</li> <li>• Risk of in-channel vessel incident or allision present, but would be reduced greatly by slow vessel speed, multiple tug assist, and one way transit when bringing VLCCs in the</li> </ul>	<ul style="list-style-type: none"> <li>• Damage to subsea pipelines or the platform will render the facility unusable until repaired.</li> <li>• Environmental conditions such as high winds, high waves, and strong currents can be designed for, however potential is there for conditions that could restrict use of the facility.</li> <li>• Avoids potential for in-channel vessel incident, but trades it for more risk of pipeline failures due to miles of multiple necessary pipelines.</li> <li>• Comprehensive spill response times to address environmental accidents longer compared to onshore terminals</li> </ul>	<ul style="list-style-type: none"> <li>• Same as SPM for all attributes except where noted</li> </ul>

Screening Criteria	OPTIONS			
	Alternative A No Action	Alternative B Channel Deepening Project	Alternative C Offshore SPM Facility	Alternative D Offshore Platform
		<p>Port.</p> <ul style="list-style-type: none"> <li>• Loading spill incident would be closer to Redfish Bay seagrass and marsh areas, but would not significantly expose National Seashore or San Jose Island beaches to impact <ul style="list-style-type: none"> <li>- Prevailing SE winds directed towards terminal shore which would help containment</li> <li>- Tidal transport may vary however</li> </ul> </li> <li>• Strong security presence within the port environment to protect against deliberate damage and sabotage.</li> </ul>	<ul style="list-style-type: none"> <li>• Loading spill incident would not significantly expose Redfish Bay seagrass and marsh areas to impact, but an offshore facility may be potentially expose National Seashore or San Jose Island beaches to impact depending on the location <ul style="list-style-type: none"> <li>- Prevailing SE winds directed towards beaches which would hamper containment</li> </ul> </li> <li>• More accessible by non-authorized persons; can lead to accidental damage, deliberate damage and sabotage.</li> <li>• Higher risk to human safety with offshore operations.</li> <li>• Response time to the facility by emergency services will be greater and more costly due to offshore location.</li> </ul>	
<b>6) Ability to Contribute to BU</b>	<ul style="list-style-type: none"> <li>• Beneficial use occurring under the - 54 foot project would continue. As before, since there would be no change in dredging or other actions that could contribute.</li> </ul>	<ul style="list-style-type: none"> <li>• New work dredging would provide 38 MCY of varying sandy, clayey and some silty material some of which could be used for ecological or construction BU. Channel maintenance material could also be used long term for future BU such as restoring subsided or submerged marsh.</li> </ul>	<ul style="list-style-type: none"> <li>• Would require virtually no dredging, and therefore would not provide material that could be used to construct BU features.</li> </ul>	<ul style="list-style-type: none"> <li>• Would require virtually no dredging, and therefore would not provide material that could be used to construct BU features.</li> </ul>

## **5.0 ATTEMPTS TO AVOID JURISDICTIONAL AREAS AND MINIMIZE WATER QUALITY IMPACTS**

The proposed project would require the dredging of earthen material from the existing CCSC and from the bottom of the Gulf of Mexico to create a channel of sufficient depth to allow for the operation of VLCCs. Because the purpose of the proposed project is to deepen the current CCSC to reduce navigation inefficiencies associated with the current channel, the proposed channel improvements must occur in navigable waters of the U.S. Alternatives to achieve the need and purpose of the proposed project that would avoid jurisdictional waters of the U.S. are not available.

The proposed channel deepening activities represent the minimum impact to the Gulf of Mexico and Corpus Christi Bay to achieve the proposed project objective of increasing navigational efficiency of the CCSC. The proposed project alternative is the least environmentally damaging practicable alternative. This alternative meets the proposed project need and purpose with the least impact to the Gulf of Mexico and Corpus Christi Bay environments. The proposed depth and channel dimensions were optimized by taking several factors into consideration. First, world fleet registry data from IHS Fairplay was used to analyze and identify the appropriate target vessel dimensions (including draft) from the variation in size among the VLCC fleet to identify the majority of vessels expected rather than the maximum possible. Second, the fully loaded draft for the design vessel was calculated assuming the American Petroleum Institute gravity for West Texas Intermediate (WTI) crude oil, which will be the predominant controlling grade of crude oil exported from the Port of Corpus Christi. This was done in lieu of assuming the largest VLCC carrying the heaviest crude oil possible for this Port (heavy sour). Appropriate under keel clearance in consideration of sea state and climatic factors and guiding navigation standards (USACE and World Association for Waterborne Transport Infrastructure [PIANC]) was added. Ship simulation was accomplished in December 2018 at the Maritime Institute of Technology and Graduate Studies (MITAGS) to verify the depths and under keel clearances were navigable under a range of conditions. Therefore, the depth of the proposed deepening has been optimized. Another factor that will be considered under 33 U.S.C. Section 408 approval and coordination with USACE Operations is to use the steepest channel side slopes and narrowest bottom width allowable for one way passage. December 2018 ship simulation at MITAGS also examined alternate channel bottom widths for one way VLCC transit. This is also being coordinated with the USACE for acceptability under 33 U.S.C. Section 408 approval. If approved and possible, steeper side slopes and narrower bottom widths will be planned for implementation.

Dredged material generated from the project is proposed to be placed within an ODMS adjacent to the CCSC, and, for material judged by the project engineer to be suitable, would be placed in several locations along the coast and within Corpus Christi and Redfish Bays for beneficial use. The new work and maintenance dredge material from the proposed project would be placed in an environmentally acceptable and economically feasible manner, considering technical and logistical feasibility. The section below describes the process of the identification and evaluation of the dredge material placement alternatives that meet these requirements and represent the least environmentally damaging practicable placement alternative(s).

### **5.1 Initial Placement Alternatives Considered**

To help meet the planning objective of identifying practicable dredged material placement that considered engineering, economics and the environment, initial alternatives ranging from use of existing PAs and surrounding uplands, to potential beneficial use (BU) concepts were considered.

### **5.1.1 New Terrestrial Sites**

New terrestrial sites are more constrained by available contiguous land and parcel size, easement and access across roads, properties etc. needed for hydraulic pipelines. During initial planning of the channel project, the project limits under consideration extended to the La Quinta Junction near Ingleside. Near Harbor Island, surrounding uplands are limited, as they consist of Mustang Island and San Jose Island. Mustang Island has no sizable contiguous tracts within 10 miles that are not developed or are not natural barrier island, State or National refuge/parks, or aquatic habitat. The preponderance of tracts is small waterfront parcels. San Jose Island is a privately owned island that is almost entirely undeveloped natural barrier island and beach. Along with the planned crude terminal, Martin Midstream, and Gulf Copper are located on Harbor Island at the channel entrance which leave no available tracts for placement of dredged material. Therefore, BU and offshore placement in this vicinity was planned.

The next nearest mainland with larger tracts of land is Ingleside, 8 miles farther in, where several crude oil export facilities are being planned on the land nearest water. Flint Hills Resources, OXY Ingleside Energy Center, Kiewit Offshore, Chemours, Oxychem, Ingleside Ethylene, Cheniere, and Voestalpine Texas are existing facilities located along Ingleside. These limit upland placement options, and options to use material beneficially would be cost competitive due to the distance. Once the proposed channel project terminus was determined to be at Harbor Island, new terrestrial sites became even less likely to be cost effective or desirable. New upland sites would be less cost effective due to farther distances required to reach sizable contiguous tracts of land, could involve impacts to terrestrial wetlands, would require new property purchases, and routing and burial of temporary hydraulic pipelines across existing roads and properties. Depending on land elevation, pumping hydraulic pressure head limitations could be reached, which would force less cost effective transport by truck. These factors would complicate the usability and viability of terrestrial sites.

### **5.1.2 Initial Concepts**

Therefore, initial planning focused on existing PAs and potential beneficial use, as new upland placement opportunities were limited. Initial BU concepts were generated by considering existing agency restoration plans such as TGLO's Texas Coastal Resiliency Master Plan, recent storm damage caused by Hurricane Harvey, and BU features implemented elsewhere on the Gulf Coast. Since the proposed action consists entirely of dredging the CCSC, practical limitations associated with placement of dredged material were a primary constraint. For dredged material placement, distance over which material must be pumped or transported by scow, required water depths for hopper or scow use, and access to stage and route hydraulic pipelines, all constrain where cost effective dredge material placement can be achieved. For hydraulic dredging, most cost effective dredging occurs within 5 miles, requiring one to multiple booster pumps beyond this distance, which rapidly diminishes the cost effectiveness. An initial cost effectiveness limit of 10 miles was considered. Use of hoppers and scows can achieve placement over greater distances, but this is primarily in water and requires minimum depths for vessel draft. These technological constraints factored in planning dredged material placement. The major component of dredging driving placement capacity needed is new work dredging to construct the Proposed Action. Initial planning focused on accommodating projected new work dredging volumes.

To help, further develop dredged material placement that considered environmental impact and BU opportunities, the Applicant conducted an initial agency coordination meeting held in Corpus Christi Texas on September 21, 2018 obtain the input of Federal, State and local resource agencies, including the USACE Galveston District. Representatives from the following agencies participated in the meeting

and provided input on the initial planned PA use and preliminary BUs concepts presented during the meeting:

- University of Texas Marine Science Institute (UTMSI)
- UTMSI/Mission-Aransas National Estuarine Research Reserve
- Coastal Bend Bays and Estuaries Program
- Texas Parks and Wildlife Department (TPWD)
- Texas General Land Office
- Natural Resources Conservation Services
- U.S. Army Corps of Engineers (USACE)
- U.S. Environmental Protection Agency (USEPA) Region 6
- U.S. Fish and Wildlife Service (USFWS)
- Texas Department of Transportation

At the time of conception of initial placement alternatives, the new work quantities considered the additional new work quantities generated from the proposed project used to devise placement concepts. Figure 5.1 below, depicts the initial concepts presented during the agency coordination meeting. These concepts represented general categories of placement alternatives and the general vicinity where they would be located. Agency input generated a few more smaller initiatives, but did not result in major new BU sites being identified. However some concepts were reinforced and better defined based on discussions with agency representatives about site specific information and their knowledge of the ecosystem of Corpus Christi and Redfish Bays. These concepts were then analyzed in consideration of agency feedback, further conceptual development and volumetric analysis, and more research on constraints and impacts. The initial evaluation considered cost, existing technology, and logistics in light of the navigation purpose of the Propose Action. Inherent in cost and existing technology was consideration of the aforementioned dredging method constraints, and inherent in logistics was consideration of needed placement capacities. The following synthesizes the initial concepts, evaluation, and initial screening.

#### **5.1.2.1 Existing PAs for the Current Federally-authorized CCSCIP**

The Applicant is the Non-Federal Sponsor for the authorized Federal project, and is therefore aware of commitments and long-term capacity of existing upland PAs required for the authorized project. The following uses for existing PAs were considered

- Use of existing capacity – Most of the existing PA capacity is dedicated to accommodating the new work dredging and 50-year maintenance of the Federally-authorized -54 foot project. Due to lack of uncommitted capacity, only two existing PAs were identified for use: PA4 and PA6
- Expansion of existing PA – M3, M9, and M10 expand existing PAs by using dredged material beneficially. M3 would convert featureless bay bottom to approximately 330 acres of estuarine/aquatic habitat behind Pelican Island. M9 and M10 would convert featureless bay bottom to approximately 329 and 770 acres of estuarine/aquatic habitat behind PA9 and PA10, respectively.

#### **5.1.2.2 Existing 54 foot project BU sites**

Existing BU sites were examined for inclusion where possible. According to PCCA, only a handful of sites were available while others lack capacity especially with priority and consideration given to the

placement needs for the CCSCIP which is expected to be constructed over the next three years. Therefore, focus was shifted to expanded existing sites by adding adjacent estuarine/aquatic habitat features or dike raisings. Open-water, unconfined BU sites were avoided completely.

### **5.1.2.3 Bird Islands**

Rookery islands or bird islands serve as nesting, breeding, foraging and rearing areas for these birds because they are isolated from the mainland and are too small to sustain populations of predators. Dredged material is often used beneficially to construct or restore bird islands.

A recent study identified several existing or new bird islands in Aransas and Nueces counties. However, most were too small in regards to capacity or sited too far (more than 15 miles away) from the project to make construction economically feasible especially with the revised project footprint. The few options that were within the preferred pumping distance were surrounded by seagrass.

### **5.1.2.4 Oyster Pads**

Beneficially using dredged material as the pad to restore or create new for oyster reef was considered during initial planning. As identified in the TGLO's Texas Coastal Resiliency Master Plan, this option would provide vertical relief need for the restoration of oyster reefs. However, agency feedback indicated that the salinity in the area was not optimal for recruiting or supporting oyster growth.

### **5.1.2.5 Marsh Restoration at Mustang Island**

Marsh restoration opportunities along the bayside of Mustang Island were examined during early planning. However, the area is too far away from the project to make construction economically feasible. Additionally, public feedback during open houses held in September 2018 indicated concerns regarding impacts to existing, established marsh habitat during construction.

### **5.1.2.6 13A New BU Site**

Creating a BU feature similar to existing BU 6 was contemplated adjacent to the existing PA13. Once the project terminus changed to Harbor Island, this became a less favorable option due to distance. It was reconfigured in the second stage of placement plan development as a contingency upland extension to PA13.

### **5.1.2.7 New Work ODMDS**

Use of the portion of this site for new work placement that is not being used by the -54 foot Federal Project was proposed. This site is a dispersive site, and Multiple Dump Fate (MDFATE) modeling was conducted to analyze the capacity for project use.

### **5.1.2.8 San Jose and Mustang Island Feeder Berms or Shoreline Repair**

The project team reviewed recent aeriels and LiDAR data on San Jose Island to determine that there was a substantial amount of repair for dune breaches and foreshore erosion. Similarly, the Texas General Land Office (TGLO) identified areas of both Mustang and San Jose Islands that have experienced historical receding at the rate of 2 feet or more per year. The large amount of sand that would be produced by the project could be used to repair or indirectly nourish these islands



### **5.1.3 Screening of Initial Concepts**

Table 5.1 provides a summary of the screening of initial concepts. Some of these placement options have since been eliminated from further evaluation because of a change in project scope. The initial full built project, deepening the channel to La Quinta Junction, was eliminated from further consideration. The preferred alternative was determined to be deepening the channel to Harbor Island, a shorter reach, which requires less placement areas. As a result some of the concepts identified during the agency coordination meeting were also eliminated from further consideration. However, some of these were reconceived as different BU initiatives, such as expansion of existing PA and BU sites.

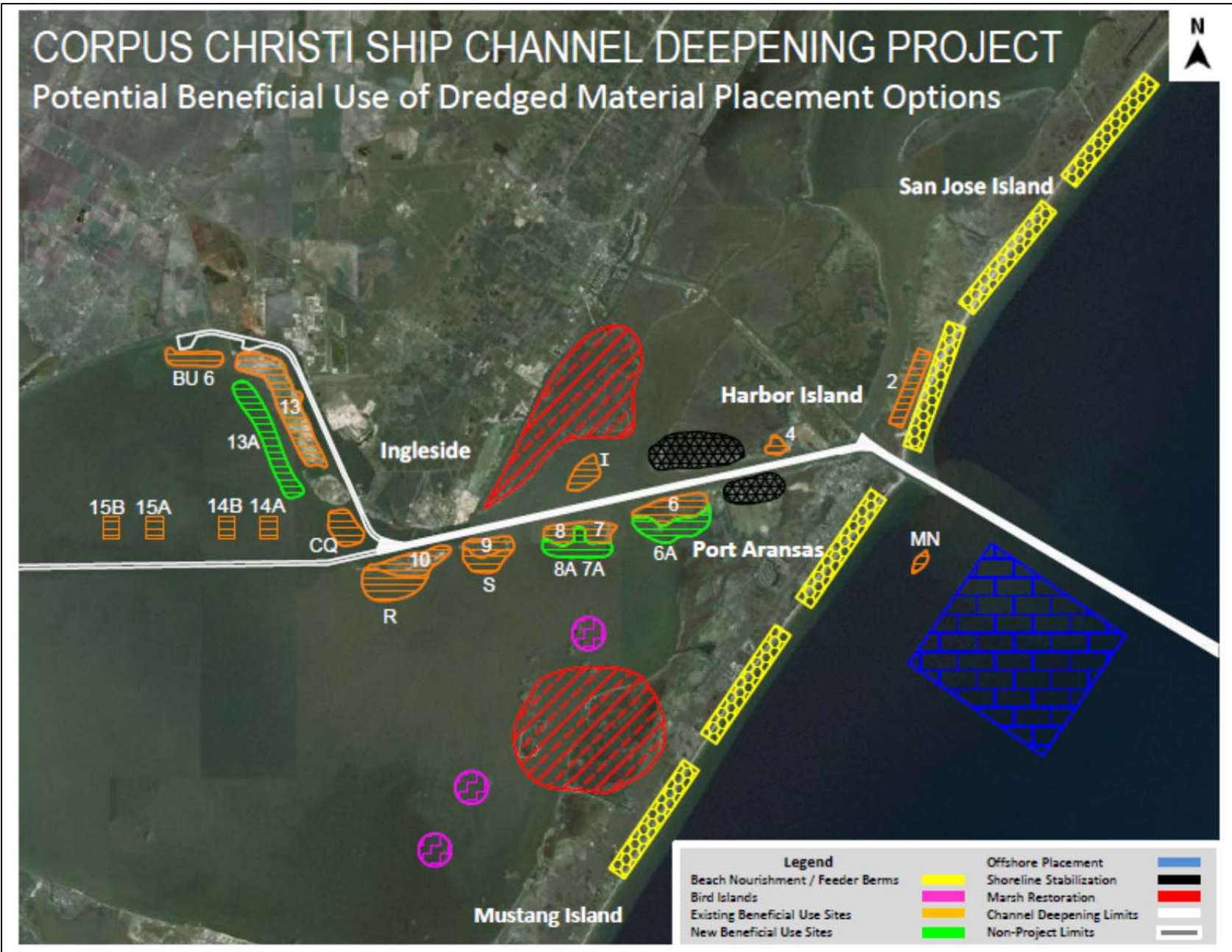


Figure 5.1: Initial Dredged Material Placement Concepts

**Table 5.1: Initial Placement Area Screening**

<b>Concept</b>	<b>Logistics</b>	<b>Technology</b>	<b>Cost</b>	<b>Determination</b>
New Terrestrial Upland Site	Too many issues involving infrastructure, distance, limited parcel size and availability	Pump distance and potential pumping constraints further inland	Logistics factors could make it costly to implement.	Eliminated
Existing PAs for the Current Federally-authorized -54 foot MLLW project	Limited available placement capacity	Feasible	Would be cost effective, but no capacity.	Eliminated for existing, but reconceived for expansion.
Existing 54 foot project BU sites	Limited available placement capacity	Feasible	Would be cost effective, but limited capacity.	Eliminated for existing, but reconceived for expansion.
Bird Islands	12 acre site size criteria limits capacity to place	Feasible	Would likely have higher unit implementation cost due to small size	Eliminated due to distance, and limited capacity
Oyster Pads	Distance from Harbor Island would be far.	Salinity in the area not optimal	Rock for cultch recruitment surface could be a major expense	Eliminated
Marsh Restoration at Mustang Island	Public concerns about impacting existing habitat	Feasible	Could be cost feasible	Eliminated
13A new BU Site	Distance from Harbor Island is far.	Feasible	Distance would make it more costly	Eliminated, but reconceived as contingency upland expansion site
NW ODMDS	Channel adjacent. Good option.	Feasible	Near channel. Minimal construction. Would be cost effective	Advanced
San Jose and Mustang Island Feeder Berms or Shoreline Repair	Channel adjacent. Good option.	Feasible	Near channel. Minimal construction. Would be cost effective	Advanced

## **5.2 Placement Alternatives Evaluated Further**

The initial alternatives that were advanced or reconceived were refined. Given the large amount of materials that could be beneficially used, especially the large volume of sand in one of the channel segments, and proximity of some of the desirable BU options, it became clear, a mix of existing offshore, expansion of existing BU sites and the Gulf side BU initiatives would be a viable, cost effective approach. Of 11 initiatives further refined, 10 were BU features that aimed to achieve a variety of shoreline restoration, land loss restoration, marsh cell expansion, and Gulf-side shoreline initiatives. The following alternatives were developed.

- M3 – Creation of an estuarine/aquatic habitat extension at Pelican Island. This would bring the elevation of an extension at this BU site to an elevation suitable to restore either marsh or seagrass.
- M4 – Restoring historic land and marsh loss at Dagger Island. This is an ecosystem restoration measure included in USACE’s Coastal Texas study and the TGLO Coastal Resiliency Master Plan. Design of project elements will be coordinated to support TPWD’s existing permit for this project.
- M9 – Creation of an estuarine/aquatic habitat extension at PA9. This would bring the elevation of an extension at this BU site to an elevation suitable to restore either marsh or seagrass.
- M10 – Creation of an estuarine/aquatic extension at PA10. This would bring the elevation of an extension at this BU site to an elevation suitable to restore either marsh or seagrass.
- PA6 – Raising the existing dike by 2 feet and filling it with new work material at the existing PA6.
- SS1 – Restoring eroded shoreline and armoring to protect the very large seagrass area behind Harbor Island. This shoreline restoration is desired for a nature center located there.
- SS2 – Restoring a shoreline washout along the Port Aransas Nature Preserve as a result of Hurricane Harvey. Piping plover sand flat critical habitat located behind this breach would be protected again.
- PA4 – Reestablish eroded shoreline and land loss behind PA4. The shoreline has undergone major erosion over the last few decades, and if it continues, would eventually expose the Harbor Island seagrass area to erosion and loss.
- SJI – Dune & shore restoration at San Jose Island using new work sands to repair severe damage caused by Hurricane Harvey
- New Work ODMDS – Placement on part of the New Work ODMDS
- B1-B6 – Feeder berms offshore of SJI and Mustang Island that would be located within the active transport zone in front of the depth of closure, and indirectly nourish these barrier islands.

## **5.3 Applicant’s Proposed Placement Plan**

All the proposed options would be viable due to proximity, material volume capacity, and need for material to achieve ecological restoration. The large volume of sands indicates that material placement would be better used for BU restoration of important coastal resources that were damaged by Hurricane Harvey and experience continuing erosion. The availability of other new work material such as clays could opportunely be used to stem land losses that would expose sensitive habitats to continual erosion. These materials would be better used in these initiatives than in upland placement that avoids the marine environment and provides no benefit. All options were selected, with M9 and M10 providing extra capacities as a contingency for unavailability of SJI. Therefore, more capacity was identified to provide flexibility in the plan. Table 5.1 lists the selected placement plan elements.

**Table 5.2: Selected New Work Placement Plan (See Sheet 5 of 17)**

Placement Option	Description	Placement Capacity (CY)	Proximity to New Work Dredging Operations	Provides Environmental Benefit
M3	Estuarine/aquatic habitat creation adjacent to Pelican Island	4,328,400	Located approximately 6 miles from Harbor Island	This option will convert featureless bay bottom to approximately 330 acres of estuarine/aquatic habitat.
M4	Restoring historic land and marsh loss at Dagger Island	867,000	Located approximately 7 miles from Harbor Island	This option will restore eroding marsh habitat for native shorebirds and coastal wildlife. Design of project elements will be coordinated to support TPWD's existing permitted project.
M9	Estuarine/aquatic habitat creation adjacent to PA9	3,500,000	Located approximately 8 miles from Harbor Island	This option will convert featureless bay bottom to approximately 329 acres of estuarine/aquatic habitat.
M10	Estuarine/aquatic habitat creation adjacent to PA10	10,933,600	Located approximately 10 miles from Harbor Island	This option will convert featureless bay bottom to approximately 770 acres of estuarine/aquatic habitat.
PA6	2 foot dike raise and fill	3,704,900	Located approximately 4 miles from Harbor Island	This option does not create any environmental benefit.
SS1	Restoring eroded shoreline and armoring to protect Harbor Island seagrass area	1,682,000	Located approximately 3 miles from Harbor Island	This option restores an eroding shoreline to its historic profile.
SS2	Restore shoreline washout along Port Aransas Nature Preserve as a result of Hurricane Harvey	695,600	Located approximately 2 miles from Harbor Island	This option restores two washouts of shoreline along the Port Aransas Nature Preserve as a result of Hurricane Harvey.
PA4	Reestablish eroded shoreline and land loss behind PA4	3,020,000	Located approximately 2 miles from Harbor Island	This option does not create any environmental benefit.
SJI	Dune & shore restoration San Jose Island	7,000,000	Located directly next to Channel Dredging Operations	This option restores several miles of beach profile that was washed away as a result of Hurricane Harvey.
NW ODMDS	Place on part of New Work ODMDS	13,800,000	Located directly next to Channel Dredging Operations	This option does not create any environmental benefit.
B1-B6	Feeder berms offshore of SJI and Mustang Island	7,200,000	Located less than 10 miles from Channel Dredging Operations	This option will nourish beach shoreline by natural sediment transport processes.
Scenarios for new work placement capacity provided and needed.		56,731,500	Total Capacity Provided	
		49,731,500	Total capacity less SJI (should that option become unavailable)	
		38,926,000	Total NW placement capacity required for Channel Preferred Alternative – Base Option	
		10,805,500	Additional Capacity less SJI (should that option become unavailable)	

## **6.0 SUMMARY OF PROPOSED PROJECT IMPACTS AND MITIGATION FOR AQUATIC HABITATS**

The majority of placement options involves BU to protect impacted resources, and would overall benefit seagrass, estuarine/aquatic habitats, and coastal habitats. The remaining impacts to seagrass or wetlands provided in Table 3.2 would be offset by reconfiguring these sites to be able to host the impacted habitat. As an example, at M3, part of the impacted seagrass could be offset by dedicating part of the created habitat to seagrass colonization, since planned elevations would be conducive to recruitment and establishment.

## **7.0 CONCLUSION**

The PCCA understands that discharges into waters of the United States should not occur unless it can be shown that the discharge would not result in an unacceptable adverse impact on the aquatic ecosystem. It is also understood that if there is a practicable alternative to the discharge, the discharge should not occur. A practicable alternative is not available that would meet the proposed project requirements and achieve the project purpose. The proposed project would increase crude oil export efficiency for the Nation, reducing trade deficits, and fostering economic development. The result of the proposed action would be a more efficient channel to export crude oil. The proposed project meets the project purpose and need. The placement alternatives were developed in coordination with resource agencies, and considered public input during open house meetings at the start of the project. The resultant proposed placement alternatives make extensive use of BU to address ecological restoration needs that agencies desire. The volume of material and volume of sands are valuable assets, and the dredging and placement presents a unique and major opportunity to address restoration needs in this estuary and barrier island system.

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Attachment B – Texas Commission on  
Environmental Quality  
Tier II  
401 Certification Questionnaire  
Alternatives Analysis Checklist

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## TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

### Tier II 401 Certification Questionnaire

The following questions seek to determine how adverse impacts will be avoided during construction or upon completion of the project. If any of the following questions are not applicable to your project, write NA ('not applicable') and continue.

Please include the applicant's name as it appears on the Corps of Engineers' permit application (and permit number, if known) on all material submitted. The material should be sent to:

Texas Commission on Environmental Quality  
Attn: 401 Coordinator (MC-150)  
P.O. Box 13087  
Austin, TX 78711-3087

#### **I. Impacts to surface water in the State, including wetlands**

- A. What is the area of surface water in the State, including wetlands, that will be disturbed, altered or destroyed by the proposed activity?

*The proposed activity will dredge approximately 770.3 acres of undredged ocean bottom below mean low lower water in the Gulf of Mexico, 369.0 acres of undredged and partially dredged ocean and estuarine bottom adjacent to the existing and authorized Corpus Christi Ship Channel (CCSC), 588.9 acres of the existing and authorized CCSC channel bottom, 36.1 acres of estuarine bottom in the Lydia Ann Channel, and in Aransas Pass as part of proposed channel improvements.*

*For the proposed placement plan, using available Texas Parks and Wildlife Department (TPWD), Texas General Land Office (TGLO), and U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) data, approximately 4,219.9 acres of surface waters, 656.6 acres of mapped seagrass, and 984.3 acres of mapped wetland were identified as located in the proposed placement features.*

*Of the wetlands, 262.6 acres are features mapped within an active Placement Area (PA) or have eroded away based on aerial review, 512.2 acres are San Jose Island shoreline that proposed placement would directly restore as beach or dune (SJI), 68.0 acres would be avoided or integrated into [Ducks Unlimited and TPWD's] planned Dagger Island shoreline restoration (M4). The remaining 141.5 acres would be impacted by beneficial use features proposed to protect large areas of seagrass.*



*Of seagrass, 559.0 acres would be in the interior of M4 at Dagger Island, and would be largely avoided except at the fringes of shoreline restoration which would protect this seagrass from further erosion, and 17.1 acres at M3 where proposed BU marsh can be reconfigured to replace impacted seagrass acreage. The remaining 80.5 acres would be impacted by shore and land loss restoration at SSI, which will protect a very large seagrass area behind Harbor Island.*

- B. Is compensatory mitigation proposed? If yes, submit a copy of the mitigation plan. If no, explain why not.

*Except for SSI, the remaining seagrass and wetland impacts would be addressed by reconfiguring the BU placement to provide suitable area for the reestablishment of impacted habitat. SSI establishes a protective barrier to larger seagrass areas that would otherwise be very prone to erosion if further shoreline loss is experienced,*

- C. Please complete the attached Alternatives Analysis Checklist.

*Alternatives Analysis Checklist is attached.*

## **II. Disposal of waste materials**

- A. Describe the methods for disposing of materials recovered from the removal or destruction of existing structures.

*No removal or destruction of existing structures is expected. Minor removal of debris and unsuitable materials encountered during dredging may be necessary during construction. Minimal disposal will be required. All material that is not re-usable will be disposed of at a properly permitted facility.*

- B. Describe the methods for disposing of sewage generated during construction. If the proposed work establishes a business or a subdivision, describe the method for disposing of sewage after completing the project.

*Sewage generated during construction would be collected on ship-board facilities or in self-contained portable toilets that would be serviced regularly. The proposed activity will be dredging in the marine environment and dredged material placement at existing placement areas (PA), beneficial use (BU) sites or proposed PA or BU sites. No wastewater services currently exist within the project area and none are included in the proposed construction.*

- C. For marinas, describe plans for collecting and disposing of sewage from marine sanitation devices. Also, discuss provisions for the disposing of sewage generated from day-to-day activities.

*N/A*

## **III. Water quality impacts**

- A. Describe the methods to minimize the short-term and long-term turbidity and suspended solids in the waters being dredged and/or filled. Also, describe the type of sediment (sand, clay, etc.) that will be dredged used for fill.

*The proposed action would generate approximately 38.9 million cubic yards (MCY) of new work dredged material. Based on review of existing borings, approximately 15.1 MCY of the new work material would consist of clay material and 23.7 CY would consist of sand material. Placement and use of these materials is planned as follows, employing standards dredged material placement construction techniques generally described here and in more detail under Item B:*

**Offshore Placement** – *For construction of the proposed action, the existing and currently approved dispersive offshore placement site (a.k.a. New Work ODMDS) would be used to place new work clay and silty material. Placement would be by scow, hopper, or direct pipeline placement, employing standard scow or hopper operation techniques to achieve controlled deposition.*

**Repair and nourishment of Gulf-side shorelines** – *For construction of the proposed action, pending owner approval, sandy material would be used to restore dunes in large dune breaches, and restore the eroded foreshore on San Jose Island (SJI) due to damage caused by Hurricane Harvey. Standard construction techniques for beach nourishment used elsewhere on the Texas coast would be employed such as the use of temporary dewatering dikes to effect deposition and material retention. Restored dunes would be planted with native stabilizing vegetation to anchor dunes. Sandy and other appropriate new work material would also be used to create a series of offshore feeder berms (B-1 through B-6) that would be located within the active shoreward transport zone to indirectly nourish San Jose and Mustang Islands. According to the Texas General Land Office (TGLO) 2014 Coastwide Erosion Response Plan (CERP) and Bureau of Economic Geology (BEG) Shoreline Change Map, these islands have experienced historical shoreline erosion of approximately 2 or more feet per year. These berms would be constructed using standard submerged placement techniques for either hydraulic placement at sites closer to the point of dredging and potentially by scow for sites more distant from the point of dredging.*

**Repair of bay-side shorelines and land loss** – *For construction of the proposed action, new work dredged material would be used to repair eroded shorelines at Harbor Island (SS1), Port Aransas Nature Preserve [PANS] (SS2), and Dagger Island (M4) to stem further land, tidal flat and seagrass habitat loss due to damage experienced during Hurricane Harvey and over time. At SS1, containment dikes for dewatering would be used, and would have seeding on dike crowns and interiors, and armoring on the channel side. At SS2, the previous shoreline profile would be restored and would be backfilled behind it to bolster and reestablish the original land barrier to tidal sand flats in the PANS, using armoring where it previously was used in the breaches. At M4, material would be used to construct containment dikes on certain sides of Dagger Island to prevent channel sediment migration and to build/preserve marsh and seagrass elevation behind it, with these areas potentially seeded for initial stabilization and blending in with existing seagrass. M4 would provide material to implement breakwater and land loss restoration measures already permitted by TPWD and included in the USACE Coastal Texas Study and TGLO Coastal Resiliency Master Plan. Suitable new work material would also be used to build containment dikes toward the channel and fill in behind them at the existing PA4 on Harbor Island to restore severe upland losses experienced over the years. This would also help preserve the land buffer between Aransas Pass the large seagrass habitat area behind Harbor Island to protect the seagrass habitat from future damage. Containment dikes would be seeded on the crowns and interiors, and armored on the channel side.*

**Upland Placement** – For construction of the proposed action, new work material would also be used for raising containment dikes on PA 6, and to fill the interior using capacity created by dike raising. Upon the completion of construction, the dikes would be seeded and vegetated to minimize erosion.

**Estuarine/Aquatic Habitat Creation** – M3, M9, and M10 will create estuarine/aquatic habitat by placing material on bay bottom to raise elevation to optimal subtidal and intertidal marsh elevation, likely using erodible containment dike techniques previously employed elsewhere in Texas. These features would ultimately be planted or colonized by appropriate native vegetation.

**Maintenance** – Over the 10-year permit life, approximately 1.08 MCY of maintenance materials would be generated annually from the deepened channel, of which approximately 399,000 CY would be additional material due to the deepened channel. The material is expected to consist of fine grained silts, sands, and clays, and would be dredged and placed in either existing upland placement areas (PA2), ODMDS No. 1, or proposed BU feeder berms B-1 through B-6, as material suitability allows. Use of the existing sites is consistent with the current operations and maintenance (O&M) placement of the existing and authorized CCSC managed by the USACE Galveston District.

The Port of Corpus Christi Authority (PCCA) would follow the current USACE CCSC procedures used for dredging and dredged material placement during construction dredging and channel maintenance. These include standard dredging techniques to construct submerged and emergent containment dikes, and interior placement of material. These techniques are described further in Item B below.

- B. Describe measures that would be used to stabilize disturbed soil areas, including: dredge material mounds, new levees or berms, building sites, and construction work areas. The description should address both short-term (construction related) and long-term (normal operation or maintenance) measures. Typical measures might include containment structures, drainage modifications, sediment fences, or vegetative cover. Special construction techniques intended to minimize soil or sediment disruption should also be described.

Techniques used successfully in Texas, around the U.S., and by USACE to construct stable PA and BU restoration features were described in general above. The following provides more details on these techniques which prevent short and long term erosion and turbidity.

- **Beach nourishment temporary dewatering dikes** – This would involve the use of in-situ sand to form a series of temporary retention dikes to dewater hydraulically pumped sand, constructed as placement moves along the shoreline.
- **In-water placement for submerged berm, in-water dike construction or in-water fill** – This would involve one of two potential general methods: 1) the use of diffusers and downspouts at the end of pipelines to slow exit velocities to achieve focused placement to build the intended template, 2) the use of hydraulically loaded scows or hopper dredges to discharge by gravity fall during a controlled release, to minimize sediment migration and achieve focused placement around the scow or hopper.
- **Upland dike construction** – Material would be hydraulically pumped to create containment dikes. After dike construction riprap, rock, etc. would be added where

*armorings is indicated and dike side slopes would be seeded and vegetated as soon as practicable with robust and rapidly establishing species to provide long term stability.*

- ***Interior filling*** – *Where practicable for the type of feature, containment dikes with limited weir outlets or spill boxes designed or planned to allow retention and eventually dewatering as features become emergent. For placement on emergent interiors, interior training dikes, ditching and other enhanced dewatering techniques would be employed to further optimize material retention and dewatering.*

- C. Discuss how hydraulically dredged materials will be handled to ensure maximum settling of solids before discharging the decant water. Plans should include a calculation of minimum settling times with supporting data (Reference: Technical Report, DS-7810, Dredge Material Research Program, GUIDELINES FOR DESIGNING, OPERATING, AND MAINTAINING DREDGED MATERIAL CONTAINMENT AREAS). If future maintenance dredging will be required, the disposal site should be designed to accommodate additional dredged materials. If not, please include plans for periodically removing the dried sediments from the disposal area.

*Technical Report, DS-78-10 is a former Waterways Extension Service (WES) publication that has been superseded by newer USACE guidance contained in Engineering Manuals (EM) including EM 1110-2-5025 Dredging and Dredged Material Management, and EM 1110-2-5027 Confined Disposal of Dredged Material, for the design of contained dredged material placement. Where applicable and appropriate, these design criteria would be used during the detailed design phase to configure feature geometry and discharge placement. For other unconfined feature construction (e.g. beach nourishment), use of the above described hydraulic placement techniques would be used.*

*The proposed action is deepening of the existing and authorized Federal channel. Maintenance for the incremental annual amount of 399,000 CY of extra shoaled material would be accomplished as part of the existing channel maintenance cycle using the existing, approved offshore dispersive sites ODMDS No. 1 and MN, and if suitable material is generated, the existing PA2 on San Jose Island, and the proposed offshore feeder berms B-1 through B-6.*

- D. Describe any methods used to test the sediments for contamination, especially when dredging in an area known or likely to be contaminated, such as downstream of municipal or industrial wastewater discharges.

*The segment of the CCSC to be dredged for the proposed action has two wastewater discharges located directly adjacent to the channels. One is a private domestic wastewater (TCEQ Permit #12731-001) and the other brine discharge (Permit No. WQ0005253000). However, dredged materials from the CCSC to be dredged for the proposed action are not known or likely to be contaminated. The CCSC is tested and maintained in accordance with USACE sediment testing guidelines. No increases in contaminant levels is expected during dredge and fill operations.*

*The potential for contaminants has been evaluated through chemical analyses, grain-size analyses, bioassays, and bioaccumulation tests in the surrounding area as part of the Corpus Christi Ship Channel, Texas Channel Improvement Project for the current authorized Federal channel. These tests spanned a wide variety of volatile, semi-volatile (e.g. PAH),*

*pesticide and persistent organic (e.g. PCB, dioxin) compounds, and metal constituents. The 2003 “Corpus Christi Ship Channel, Texas Channel Improvement Project, Volume I Final Feasibility Report and Final Environmental Impact Statement” concluded that contaminant studies showed that new work and maintenance dredged material from all sections of the channel, with the exception of the Inner Harbor (which is not part of the proposed action), is acceptable for offshore placement, beneficial uses in the bay or ocean, or upland placement.*

*More recent testing conducted in 2018 for the Entrance Channel segment and entrance channel extension of the CCSC for the current authorized Federal channel to support offshore placement for the purposes Marine Protection, Research and Sanctuaries Act (MPRSA) Section 103 included chemical, grain-size, bioassays, and bioaccumulation tests on new work material samples between current depths and the proposed depth of -54 feet MLLW. Testing results indicated no contaminant concerns and supported offshore placement. This recently tested segment comprises the majority of the project segment for the proposed action. The proposed action would dredge new work, in-situ geological material below the recently tested layer (from -54 feet MLLW to -80 feet MLLW), and thus would be less prone to surface human impacts. The proposed action would also dredge existing Gulf of Mexico seafloor materials to extend the entrance channel further to the -80 foot MLLW contour. This segment would be as or less prone to impacts than the recently tested extension for the authorized Federal channel. The proposed areas to be dredged have been extensively tested previously and/or are not prone to contamination.*



## TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

### Tier II Alternative Analysis Checklist

#### I. Alternatives

- A. How could you satisfy your needs in ways which do not affect surface water in the State?

*Work below mean low lower water of the Gulf of Mexico, Corpus Christi Bay, and Redfish Bays within the proposed project area is necessary to meet the project needs of increasing crude oil export efficiency and safety. Crude oil export efficiency and safety in the Corpus Christi Ship Channel (CCSC) cannot be improved without affecting waters in the State. Activities may affect water quality within the proposed project area by temporarily increasing turbidity and suspended sediment load in the estuarine water column. However, these temporary conditions would not be expected to adversely impact marine mammals, essential fish habitat or other aquatic resources in the study area to a significant degree.*

- B. How could the project be re-designed to fit the site without affecting surface water in the State

*Initial crude oil export alternatives were evaluated and screened including alternatives to deepening the channel, which consisted of offshore loading facility options (See Attachment A of the Permit Application). Offshore options did not meet the purpose and need of the proposed action as well as the channel deepening alternative, and channel deepening performed better in most major criteria including export efficiency, flexibility to accommodate growth, and environmental and safety risk. Offshore options would expose San Jose Island and Mustang Island (with the National Seashore) to a greater risk of oil spills during loading activities compared to channel deepening which brings loading activities in a more controlled environment of Corpus Christi Bay. Both barrier islands which host Piping plover (*Charadrius melodus*) critical habitat and endangered sea turtle nesting beaches. Therefore, channel deepening was selected. The proposed project terminus is Harbor Island, and deepening to accommodate full loading of Very Large Crude Carriers (VLCC) and Suezmax tankers is the only navigation improvement being examined, only one channel extent and alignment was examined. Deepening of the CCSC cannot be done without affecting surface water in the State.*

- C. How could the project be made smaller and still fit your needs?

*The deepening could be done to an optimized depth that serves the majority of the intended design vessel (VLCC) class and likely prevailing crude oil type instead of absolutely maximizing the depth for all versions of the design vessel, carrying the densest crude oil. This has already been examined and incorporated into the channel alternative selected for the proposed action. First, world fleet registry data from IHS Fairplay was used to analyze and identify the appropriate target vessel dimensions (including draft) from the variation in size among the VLCC fleet. A 99<sup>th</sup> percentile set of dimensions was identified, and individual vessel dimensions clustered tightly around the selected dimensions. Second, the fully loaded draft for the design vessel was calculated assuming the American Petroleum Institute gravity for West Texas Intermediate (WTI) crude oil, which will be the predominant controlling grade of crude oil exported from the Port of Corpus Christi. This was done in lieu of assuming the largest VLCC carrying the heaviest crude oil possible for this Port (heavy sour). Appropriate under keel clearance in consideration of sea state and climatic factors and guiding navigation standards (USACE and World Association for Waterborne Transport Infrastructure [PIANC]) was added. Ship simulation was accomplished in*

December 2018 at the Maritime Institute of Technology and Graduate Studies (MITAGS) to verify the depths and under keel clearances were navigable under a range of conditions. Therefore, the depth of the proposed deepening has been optimized.

Another way the project could be made smaller is to use the steepest channel side slopes and narrowest bottom width allowable for one way passage. Geotechnical borings and analyses have been accomplished to determine the steepest stable slopes for the in situ material. Steeper slopes than the existing side slope are being coordinated with the USACE for acceptability under 33 U.S.C. Section 408 approval. December 2018 ship simulation at MITAGS also examined alternate channel bottom widths for one way VLCC transit. This is also being coordinated with the USACE for acceptability under 33 U.S.C. Section 408 approval. If approved and possible, steeper side slopes and narrower bottom widths will be planned for implementation.

**D. What other sites were considered?**

*Offshore alternatives that were initially considered, but would be located a minimum of 13 or more miles. For the reasons discussed in Item I.B above, these offshore options were eliminated. Alternative sites for increasing the efficiency of moving crude oil would require new development of terminal facilities and/or dredging completely new navigation channels; both of which are not practical, nor least environmentally damaging, and therefore were not considered. Alternative sites for dredged material placement considered were existing placement areas (PA), offshore disposal, and beneficial use (BU) sites, and a variety of new and expanded PA and BU site initiatives, within the practical distance for hydraulic dredging pipeline or scow placement. New terrestrial sites were considered in general, but were not practical due to distance, existing infrastructure and residential development, and presence of ecologically sensitive habitat and refuges in nearby terrestrial sites (e.g. Mustang Island). Details of the alternatives considered for both channel improvement and placement are in Attachment A of the Permit Application*

**1. What geographical areas were searched for alternative sites?**

*The proposed deepening must occur within the proposed project area, thereby precluding the consideration of alternative sites. For dredged material placement, initially, existing PA and BU sites used for the current and authorized CCSC stretching from the Gulf of Mexico to Ingleside, initial new BU concepts coordinated with resource agencies located from the Gulf-side of Mustang and San Jose Islands north and south of the CCSC, and throughout Corpus Christi Bay and Redfish Bay, were all considered.*

*As the proposed channel was refined to an extent from the Gulf to Harbor Island, and existing PA capacities ruled out all but a few current PA and BU sites available for use, the initial PA and BU concepts were further developed and focused to the lower Corpus Christi Bay and Gulf of Mexico. Existing sites are located on existing PAs located on Harbor Island (PA4), Mustang Island (PA6), offshore waters adjacent near the existing channel (New Work ODMDS) or originally developed in the Bay (PA13). New BU sites located adjacent to existing PAs (M3, M9, and M10) in Corpus Christi Bay, in Redfish Bay (M4), near the Port Aransas Nature Preserve (SS1), and in nearshore waters along Mustang and San Jose Islands (B1 through B6) and on San Jose Island (SJI), were considered. Most of these BU sites were associated with restoring habitat and shoreline from Hurricane Harvey damage or long term erosion and land loss. The dredged material placement alternatives were generally limited to within the 10 miles as a practical and cost-feasible radius for hydraulic dredging and dredged material placement or use of scows.*

**2. How did you determine whether other non-wetland sites are available for development in the area?**

*Aerial imagery, appraisal district data, and distance criteria were used to determine if terrestrial sites without wetlands were likely to be viable. Both existing development, refuge and habitat presence, and property parcel sizes versus needed capacity were used to screen out the viability of terrestrial sites that might be free of wetlands. Once it was determined to use existing and new or*

*expanded PA and BU sites, National Wetland Inventory (NWI), and Texas Parks and Wildlife (TPWD) and National Oceanic and Atmospheric Administration (NOAA) sea grass mapping were used to configure and refine PA concepts to minimize impacts. Very little mapped wetland is present in the BU sites and mapped seagrass directly in the footprint of the proposed placement is limited to natural recruitment at the shallow bathymetric margins of PA dike slopes. The initiatives to use the material beneficially will create more tidal marsh, restore shoreline that protects seagrass habitat, or repair damaged dunes and beaches in sensitive barrier island habitat.*

3. In recent years, have you sold or leased any lands located within the vicinity of the project? If so, why were they unsuitable for the project?

*No.*

- E. What are the consequences of not building the project?

*The No Action alternative would not increase efficiency of moving crude oil exports from the Port of Corpus Christi in support of national energy security and national trade objectives, which is the proposed project's purpose and would not increase the safety of this movement, which is an underlying need. This would result in a channel depth that forces shippers to light load their vessels, requiring multiple smaller lightering vessels to shuttle oil to deeper waters, increasing the numbers of vessels needed to move crude oil, which would increase shipping costs and volatile organic chemical (VOC) vapor and greenhouse gas emissions. This would substantially affect the ability of the CCSC to efficiently and safely accommodate the projected increase in tanker tonnage to be handled at existing and planned VLLC-capable crude oil terminals at Harbor Island and at Ingleside, as well the larger VLCCs to which industry is moving towards. This would increase costs to shippers and consumers from continued light-loading of tanker vessels. The No Action alternative would not satisfy the PCCA's mission of leveraging commerce to drive prosperity for the region and community.*

## **II. Comparison of alternatives**

- A. How do costs compare for the alternatives considered above?

*No costs were estimated for the initial channel concepts. However, offshore options consisting of Single Point Moorings (SPM) and offshore loading platforms have substantially higher long term operating and maintenance costs due to the distance over which product must be pumped from onshore storage facilities to loading points out in the Gulf of Mexico which could be as far as 13 or more miles. They are also more costly to expand additional loading points, compared to adding berths along water frontage served by a deepened channel. For this and the aforementioned reasons discussed in I.B. the offshore options were screened out. The preferred channel improvement project is the least cost alternative that increases crude oil export efficiency. For dredged material placement, the proposed placement alternatives considered are cost effective compared to new upland sites, meet the placement capacity needed, and make beneficial use of the dredged material or use of existing PA and BU sites.*

- B. Are there logistical (location, access, transportation, etc.) reasons that limit the alternatives considered?

*The logistical factor that limits the consideration of alternatives is the location of the CCSC and future expected crude terminal developments. Alternative sites would require development in a new area and were not considered. The proposed project is designed to provide the needed increase in crude oil export efficiency while minimizing adverse environmental impacts to the Gulf of Mexico and Corpus Christi Bay. For dredged material placement, distance over which material must be pumped or transported by scow, required water depths for hopper or scow use, and access to stage and route hydraulic pipelines, all constrain where cost effective dredge material placement can be achieved. Terrestrial sites are more constrained by available contiguous land and parcel size, easement and access across roads, properties*



*etc. needed for pipelines. In the vicinity of Harbor Island, there are no sizable contiguous tracts to accommodate an upland PA to contain substantial planned new work volumes on the adjacent islands of Mustang or San Jose that aren't local or national refuges, seagrass habitat, or T&E critical habitat. Along with the planned crude terminal, Martin Midstream, and Gulf Copper are located on Harbor Island at the channel entrance. Therefore, BU and offshore placement in this vicinity was planned. The next nearest mainland with larger tracts of land is Ingleside, 8 miles farther in, where several crude oil export facilities are being planned on the land nearest water. Flint Hills Resources, OXY Ingleside Energy Center, Kiewit Offshore, Chemours, Oxychem, Ingleside Ethylene, Cheniere, and Voestalpine Texas are existing facilities located along Ingleside. These limit upland placement options, and options to use material beneficially would be cost competitive due to the distance.*

C. Are there technological limitations for the alternatives considered?

*For the channel alternative selected, several technological limitations result in the selected depth, width and side slope ratios. These are the required draft to fully load a VLCC with the intended product (WTI crude), the design criteria from USACE Engineering Manuals and PIANC guidelines to determine required under keel clearances to accommodate dynamic movement due to sea state and climatic conditions, wind and current conditions constraining minimum one-way passage widths, and geotechnical slope stability. For placement, technological limitations mainly involve cost-effective hydraulic pump distances (typically 10 miles), and required draft and cost-effective travel distances for scows and hoppers,*

D. Are there other reasons certain alternatives are not feasible?

*For channel alternatives, the primary reasons offshore alternatives are not feasible are discussed in II.A above. For placement, new upland sites would be less cost effective due to farther distances required to reach sizable contiguous tracts of land, could involve impacts to terrestrial wetlands, would require new property purchases, and routing and burial of temporary hydraulic pipelines across existing roads and properties. Depending on land elevation, pumping hydraulic pressure head limitations could be reached, which would force less cost effective transport by truck. These factors would complicate the usability and viability*

**III. If you have not chosen an alternative which would avoid impacts to surface water in the State, please explain:**

A. Why your alternative was selected, and

*The preferred channel alternative would provide a substantial increase in the efficiency of crude oil exports, increase the safety of loading operations, provides more efficient loading and flexibility for future growth than offshore options, and provides material for beneficial use to areas in need of restoration. It meets the overall purpose and needs of the proposed action the best. The selected depth optimizes the necessary draft to address efficient export while minimizing environmental impacts. The proposed dredged material placement alternatives were chosen because they meet a variety of needs for providing sufficient and additional new work and maintenance dredged material placement capacity. Existing placement capacity for the CCSC is limited to take on new work material, new upland sites would likely be more costly and disruptive, and PCCA engaged planning and coordination to identify desirable BU and PA expansion/extension where possible. Attachment A provides the full discussion and justification for selecting the channel and placement alternatives.*

B. What do you plan to do to minimize adverse effects on the surface water in the State impacted?

*The construction techniques described in Section III of the Tier II 401 Certification Questionnaire would be employed to minimize migration of placed material. These techniques are standard industry methods of placement employed in USACE and non-Federal projects to construct PAs, and BU sites. In summary, these methods are discharge end measures to slow deposition velocity for hydraulic placement, controlled*

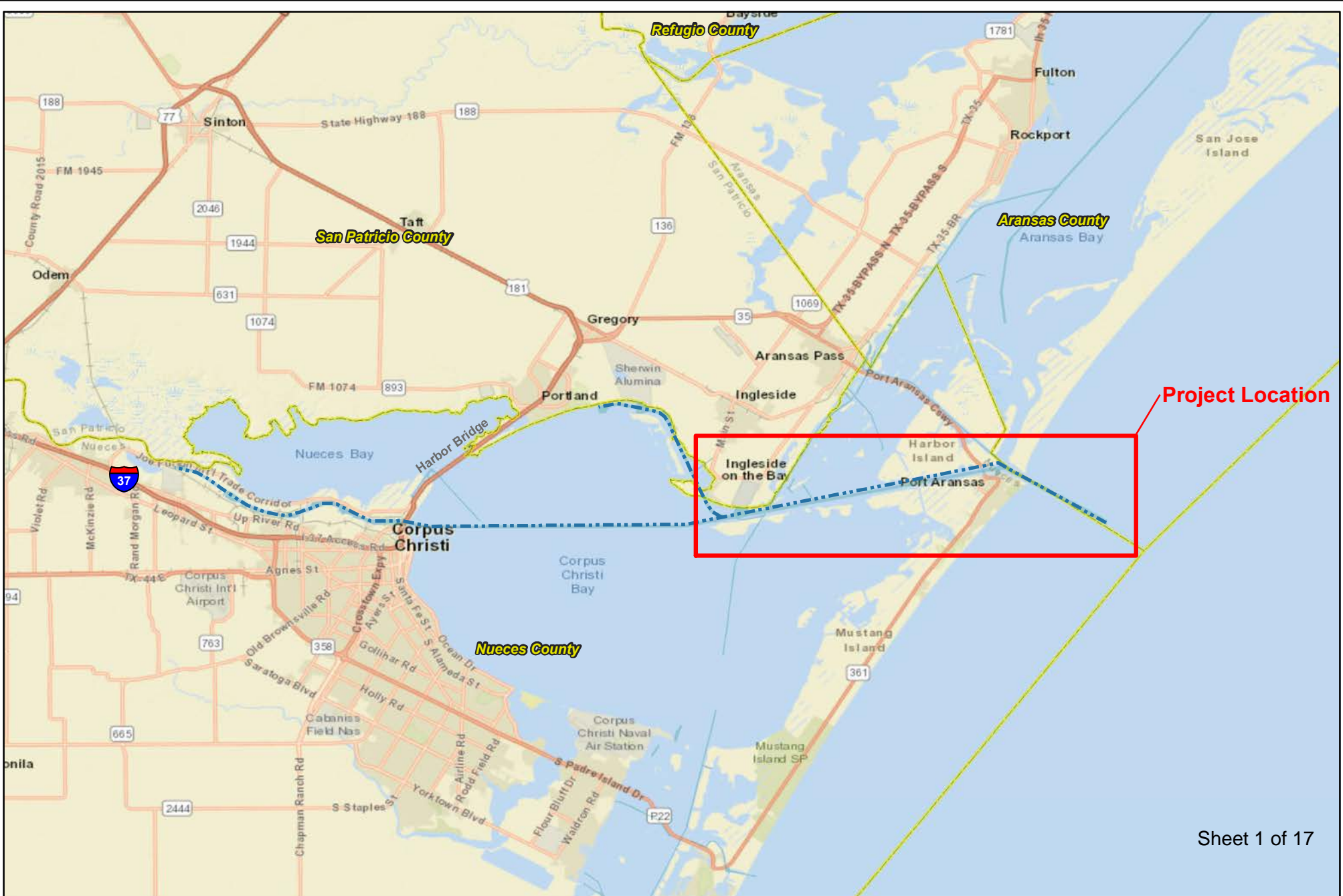
*release from scows or hoppers, diked and contained dewatering methods, and dike erosion control methods including seeding and armoring.*

**IV. Please Provide Comparison of Each Criteria (From Part II) For Each Site Evaluation in The Alternatives Analysis**

*See Attachment A of the Permit Application for details. The outcome of initial screening of channel alternatives is summarized in the table below.*

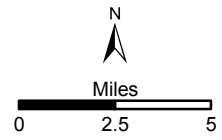
Screening Criteria	OPTIONS			
	Alternative A No Action	Alternative B Channel Deepening Project	Alternative C Offshore SPM Facility	Alternative D Offshore Platform
<b>1) Increase Export Efficiency</b>	<ul style="list-style-type: none"> <li>No increase in export efficiency. Inefficient lightering process, involving more vessel calls, transit, and longer VLCC loading process will still occur</li> <li>Would involve light-loaded VLCC transit on lower 3<sup>rd</sup> of CCSC</li> <li>Increase in congestion with future growth from more lightering vessels</li> </ul>	<ul style="list-style-type: none"> <li>Lightering can be eliminated or reduced, decreasing vessel traffic and shortening the duration of VLCC loading process</li> <li>Would still require VLCC transit on lower 3<sup>rd</sup> of CCSC, but elimination or reduction of lightering transit would free up channel availability for future growth.</li> <li>Multiple tenant accommodation discussed below would allow more fully loaded VLCC participation, increasing efficiency for more exporters</li> </ul>	<ul style="list-style-type: none"> <li>Lightering can be eliminated or reduced, thereby reducing vessels involved and shorten VLCC loading process</li> <li>Would eliminate VLCC transit.</li> <li>Exporting participants would be more limited than channel option, and exporting nonparticipants who couldn't fully load VLCCs would resort to smaller vessels or lightered VLCCs, leaving this congestion component in place as growth occurs. See multiple tenant and future growth discussion below.</li> </ul>	<ul style="list-style-type: none"> <li>Same as SPM for all attributes except where noted</li> </ul>
<b>2) Ability to Serve Multiple Tenants</b>	<ul style="list-style-type: none"> <li>No Change</li> </ul>	<ul style="list-style-type: none"> <li>Port can operate VLCC berths as public docks, servicing multiple tenants and shipping lines, encouraging healthy competition and raising revenue for the Port and local communities.</li> <li>Centralized and integrated land use planning of developable land assets at Harbor Island.</li> <li>Loading of different grades from onshore terminals would be easier compared to offshore options</li> </ul>	<ul style="list-style-type: none"> <li>Difficult to plan multiple offshore SPMs connected individually to individual tank farms.</li> <li>Accommodating different grades from different customers would be more cumbersome, requiring flushing of longer lengths of line to switch grades, compared to onshore terminals.</li> </ul>	<ul style="list-style-type: none"> <li>Same as SPM for all attributes except where noted</li> </ul>
<b>3) Ability to Accommodate Future Growth/Expansion</b>	<ul style="list-style-type: none"> <li>No accommodation of future growth</li> <li>Vessel draft limitations</li> <li>Increased vessel traffic due to large increase in reverse lightening</li> </ul>	<ul style="list-style-type: none"> <li>Local and regional economy is enhanced as revenues are collected for ships calling at and products moving through the PCCA.</li> <li>Efficient use of capital to achieve growth and meet overall crude export forecast for the nation</li> <li>Allows for future growth within the PCCA under a single permitting process for deepening the channel</li> </ul>	<ul style="list-style-type: none"> <li>Multiple single SPMs may need to be planned by the industry. Multiple permits required for each individual project.</li> <li>Future expansion of offshore SPM facility more difficult to accommodate new users. Limited users can access the facility at any one time due to complex financing and project development challenges.</li> </ul>	<ul style="list-style-type: none"> <li>Same as SPM for all attributes except where noted</li> <li>Expansion of platform to add more users even more difficult and costly than SPM</li> </ul>
<b>4) Environmental Impact</b>	<ul style="list-style-type: none"> <li>No habitat impact</li> <li>Increase in air emissions due to increase from reverse lightering activities.</li> <li>CO<sub>2</sub> emissions would be greater than other options due to continuing lightering activities</li> </ul>	<ul style="list-style-type: none"> <li>Construction largely being undertaken within existing channel limits.</li> <li>New entrance channel extension would temporarily disturb 770.3 acres of 60-ft deep Gulf bottom, convert it to deeper bottom, but benthos would recolonize within a year, and water column would remain. Amount of conversion to deeper bottom would be insignificant compared to available Gulf Habitat.</li> <li>Dredged material will be evaluated for beneficial use and building resilient community.</li> <li>Potential to reduce more than 485,000 MT of CO<sub>2</sub> emissions by eliminating or reducing reverse lightering when annual export rate averages additional 3.5 MMBPD.</li> <li>Potential to eliminate 38-112 tons annual NOx</li> </ul>	<ul style="list-style-type: none"> <li>Puts active loading facility and new pipelines in previously undisturbed part of Gulf of Mexico.</li> <li>Permanent but negligible size (compared to available Gulf Habitat) of conversion of Gulf bottom and water column to SPM platform</li> <li>No potential beneficial use of dredged material</li> <li>Similar potential to reduce CO<sub>2</sub>, NOx, and VOC from eliminating or reducing lightering vessel emissions.</li> <li>Spillages are more likely to happen and not as easily confined or cleaned up.</li> <li>Potential for higher vapour emissions and higher CO<sub>2</sub> emissions from vessels hoteling due to reduced loading rates.</li> <li>Tugs needed for hose tending and VLCC positioning during loading will have to transit</li> </ul>	<ul style="list-style-type: none"> <li>Same as SPM for all attributes except where noted</li> <li>Permanent but negligible size of conversion of Gulf bottom and water column to SPM platform – larger than SPM, but still negligible</li> </ul>

Screening Criteria	OPTIONS			
	Alternative A No Action	Alternative B Channel Deepening Project	Alternative C Offshore SPM Facility	Alternative D Offshore Platform
		<p>and 2,200- 9,270 tons of VOC from elimination of some lightering activity</p> <ul style="list-style-type: none"> <li>• Enables faster loading rates than SPM, reducing CO<sub>2</sub> emissions from hoteling vessels.</li> <li>• Ability to provide vapour recovery system and shore power to operate vessel systems for reduced emissions.</li> </ul>	<p>over 30 miles (assuming support facilities are home based at Port Aransas) from the CCSC to service the platform increasing air emissions generated.</p> <ul style="list-style-type: none"> <li>• No technically feasible method for providing vapour recovery of vapour combustion systems for reducing emissions.</li> </ul>	
<b>5) Risk, Safety and Security</b>	<ul style="list-style-type: none"> <li>• More vessels in Harbor will make monitoring harder</li> </ul>	<ul style="list-style-type: none"> <li>• Severity of accidental spills would be reduced compared to offshore options as facilities and vessels are in a more controlled Port environment.</li> <li>• Environmental accidents better controlled at onshore facilities in protected waters.</li> <li>• Comprehensive spill response would be quicker than offshore options due to proximity to response resources</li> <li>• Incidents at onshore terminal can be more easily contained to avoid affecting other users.</li> <li>• Risk of in-channel vessel incident or allision present, but would be reduced greatly by slow vessel speed, multiple tug assist, and one way transit when bringing VLCCs in the Port.</li> <li>• Loading spill incident would be closer to Redfish Bay seagrass and marsh areas, but would not significantly expose National Seashore or San Jose Island beaches to impact <ul style="list-style-type: none"> <li>- Prevailing SE winds directed towards terminal shore which would help containment</li> <li>- Tidal transport may vary however</li> </ul> </li> <li>• Strong security presence within the port environment to protect against deliberate damage and sabotage.</li> </ul>	<ul style="list-style-type: none"> <li>• Damage to subsea pipelines or the platform will render the facility unusable until repaired.</li> <li>• Environmental conditions such as high winds, high waves, and strong currents can be designed for, however potential is there for conditions that could restrict use of the facility.</li> <li>• Avoids potential for in-channel vessel incident, but trades it for more risk of pipeline failures due to miles of multiple necessary pipelines.</li> <li>• Comprehensive spill response times to address environmental accidents longer compared to onshore terminals</li> <li>• Loading spill incident would not significantly expose Redfish Bay seagrass and marsh areas to impact, but an offshore facility may be potentially expose National Seashore or San Jose Island beaches to impact depending on the location <ul style="list-style-type: none"> <li>- Prevailing SE winds directed towards beaches which would hamper containment</li> </ul> </li> <li>• More accessible by non-authorized persons; can lead to accidental damage, deliberate damage and sabotage.</li> <li>• Higher risk to human safety with offshore operations.</li> <li>• Response time to the facility by emergency services will be greater and more costly due to offshore location.</li> </ul>	<ul style="list-style-type: none"> <li>• Same as SPM for all attributes except where noted</li> </ul>
<b>6) Ability to Contribute to BU</b>	<ul style="list-style-type: none"> <li>• Beneficial use occurring under the - 54 foot project would continue. As before, since there would be no change in dredging or other actions that could contribute.</li> </ul>	<ul style="list-style-type: none"> <li>• New work dredging would provide 38 MCY of varying sandy, clayey and some silty material some of which could be used for ecological or construction BU. Channel maintenance material could also be used long term for future BU such as restoring subsided or submerged marsh.</li> </ul>	<ul style="list-style-type: none"> <li>• Would require virtually no dredging, and therefore would not provide material that could be used to construct BU features.</li> </ul>	<ul style="list-style-type: none"> <li>• Would require virtually no dredging, and therefore would not provide material that could be used to construct BU features.</li> </ul>



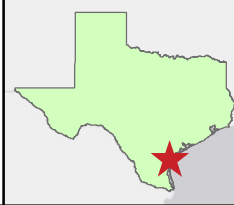
**Project Location**

Sheet 1 of 17

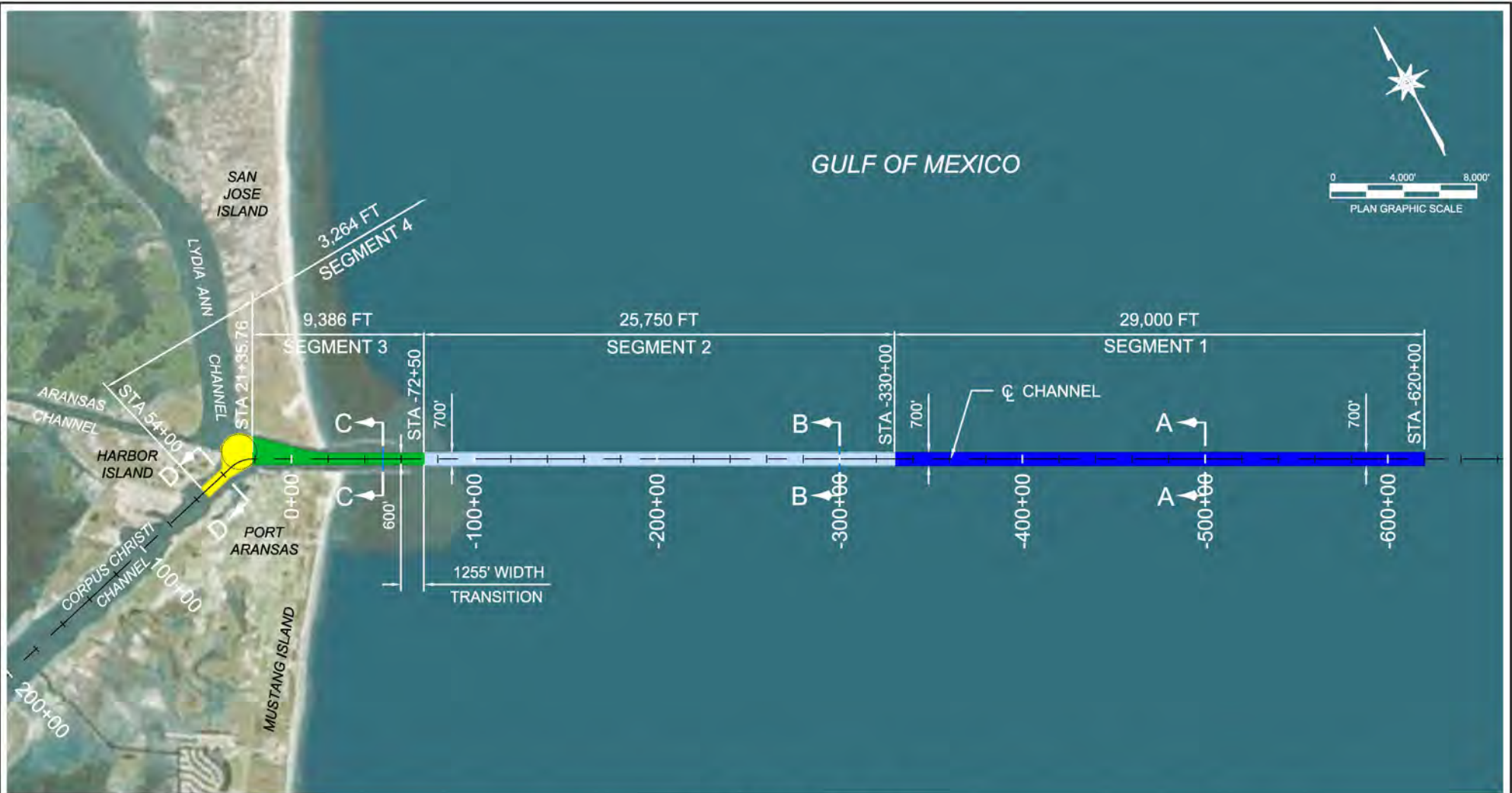


**Legend**

- - - Corpus Christi Ship Channel
- Project Location
- USACE Maintained Channels
- County Boundary



<b>Vicinity Map</b>			
Title:		<b>Corpus Christi Ship Channel Channel Deepening Project</b>	
Project:		<b>Port of Corpus Christi Authority</b>	
Client:			
Drawn By:	Date:	Project No.:	
DS	12/26/2018	60578532	



### DREDGING PLAN

SCALE: 1" = 8000'

Sheet 2 of 17

SEGMENT	STATIONING (@ CHANNEL CL)		*DEPTH (FT BELOW MLLW)	DESCRIPTION	PLAN VIEW LEGEND
	FROM	TO			
1	STA -620+00	STA -330+00	-77.0	<i>Outer Channel</i>	
2	STA -330+00	STA -72+50	-77.0	<i>Approach Channel</i>	
3	STA -72+50	STA 21+35.76	-75.0	<i>Jetties to Harbor Island Turning Basin</i>	
4	STA 21+35.76	STA 54+00	-75.0	<i>Harbor Island Junction</i>	

\* DESIGN DEPTH SHOWN. DOES NOT INCLUDE 2.0 FT ADVANCED MAINTENANCE DREDGING OR 1.0 FT ALLOWABLE OVER DREDGE.

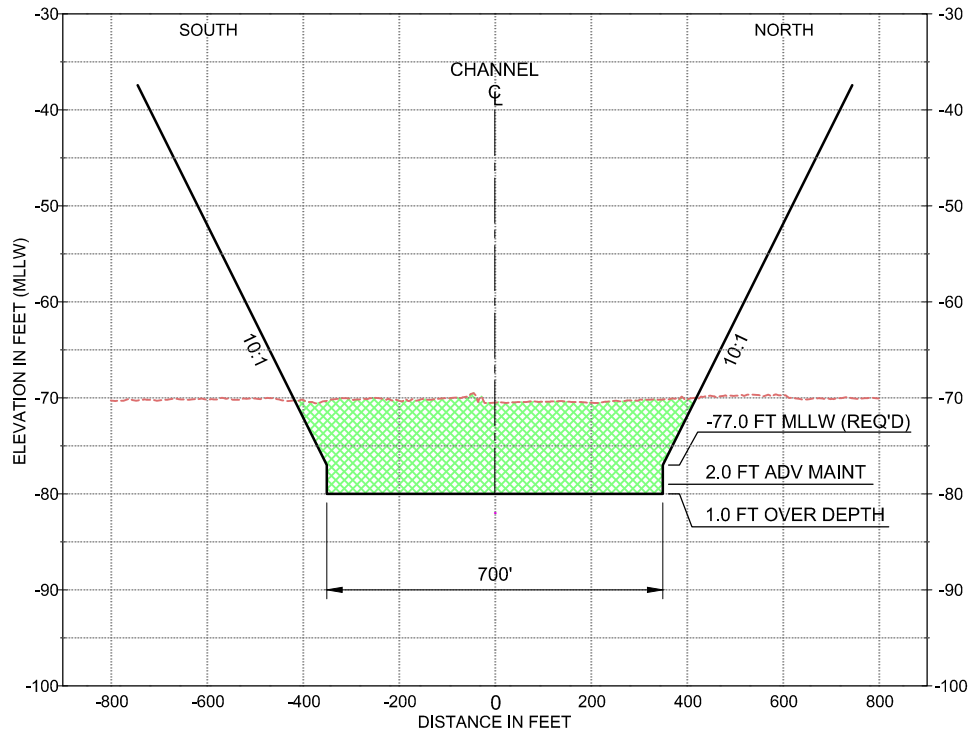
Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-XXXX-XXXX

**Preferred Channel Alternative  
Full Extent**

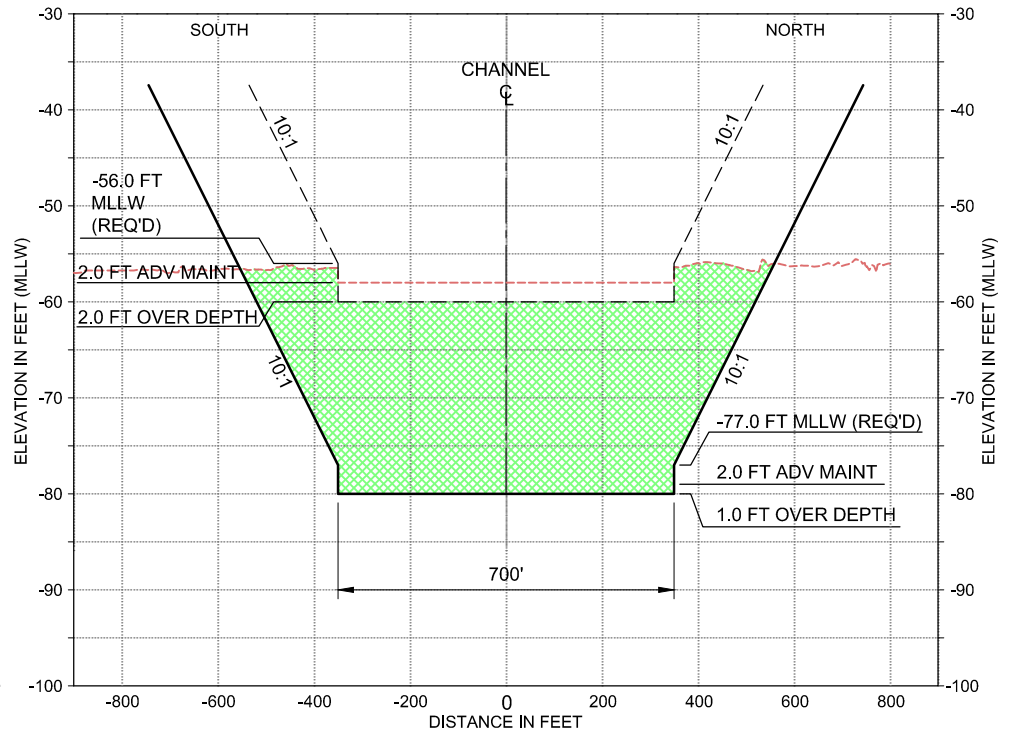
County: Aransas and Nueces  
Application By: Port of Corpus Christi Authority

State: Texas  
Date: December 2018

CROSS SECTION A-A (TYPICAL SECTION)  
-500+00.00



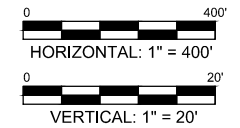
CROSS SECTION B-B (TYPICAL SECTION)  
-300+00.00



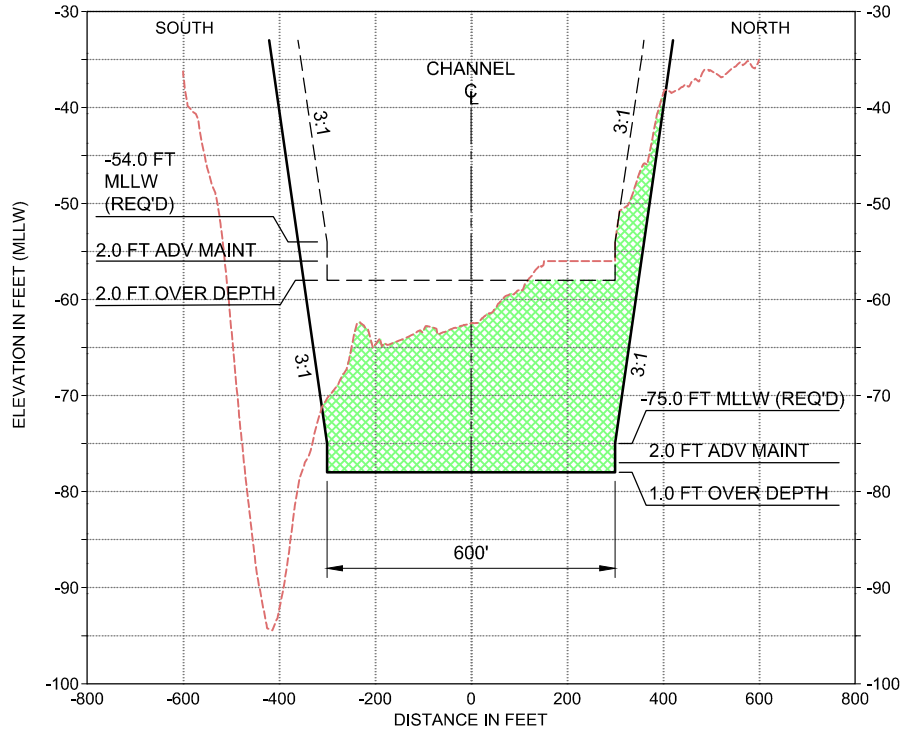
**CROSS SECTION LEGEND:**

- EXISTING BOTTOM
- EXISTING CHANNEL DREDGE TEMPLATE
- PROPOSED CHANNEL
- PROPOSED AREA TO BE DREDGED

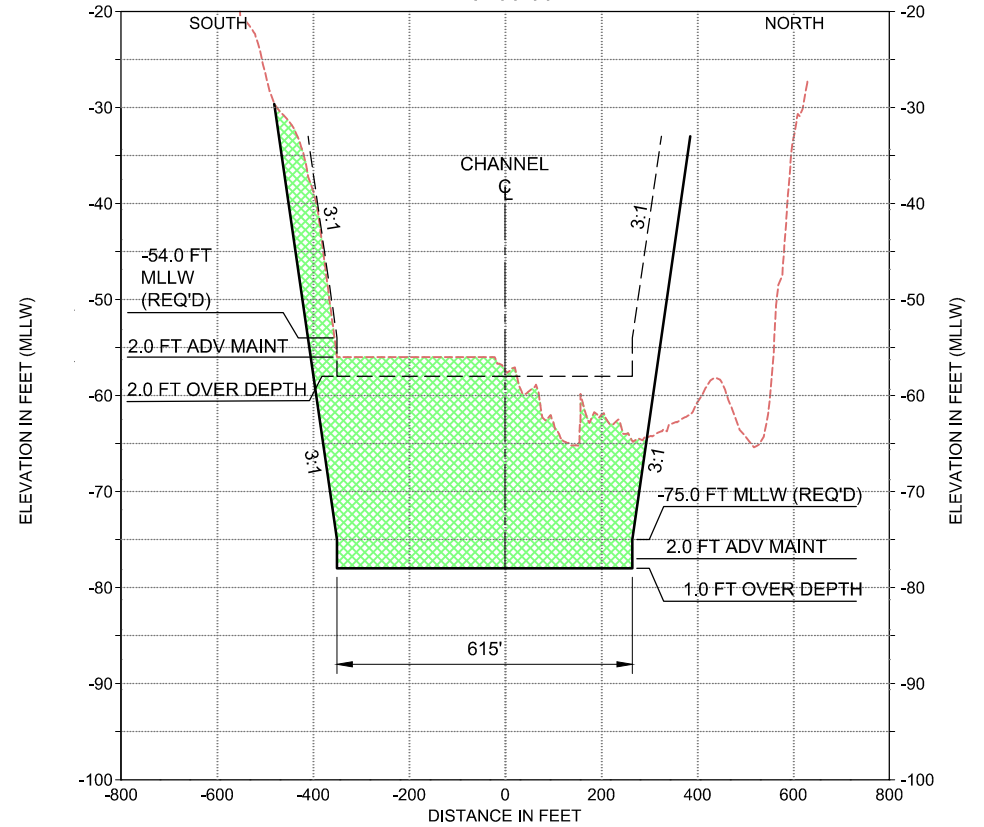
**CROSS SECTION GRAPHIC SCALES:**



CROSS SECTION C-C (TYPICAL SECTION)  
-50+00.00



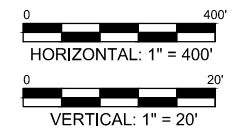
CROSS SECTION D-D (TYPICAL SECTION)  
40+00.00



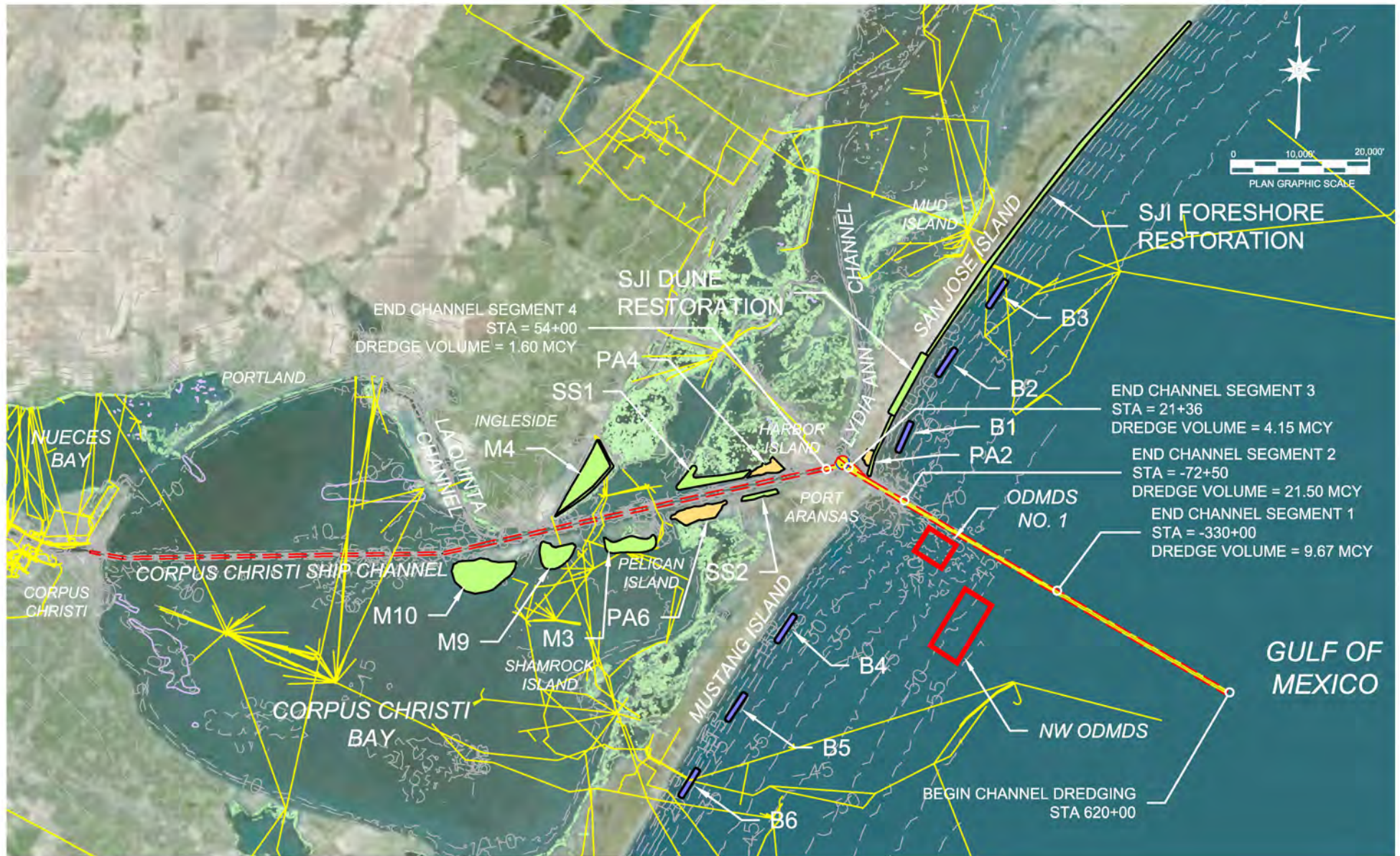
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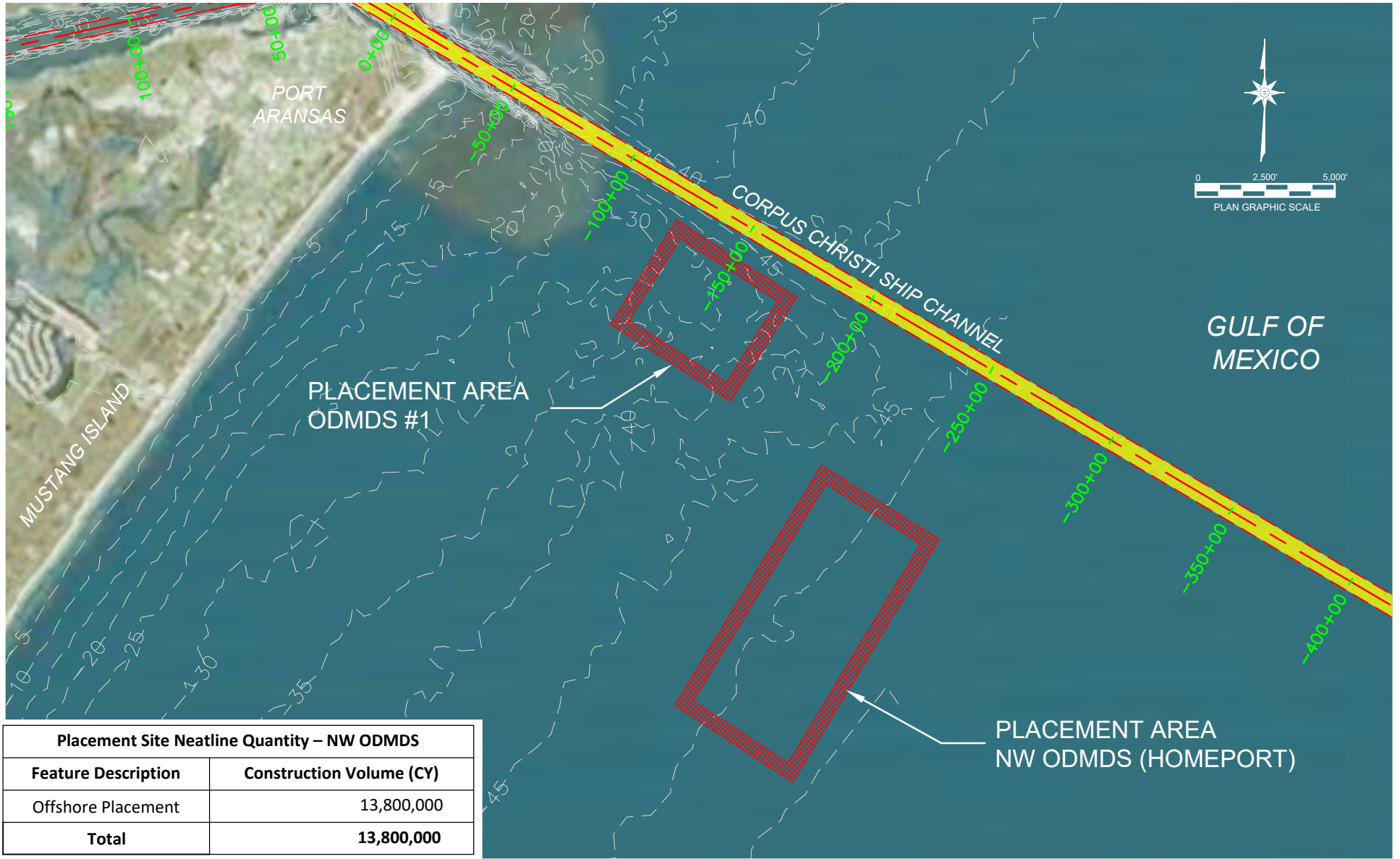
- - - EXISTING BOTTOM
- - - EXISTING CHANNEL DREDGE TEMPLATE
- PROPOSED CHANNEL
- PROPOSED AREA TO BE DREDGED

CROSS SECTION GRAPHIC SCALES:












Placement Site Neatline Quantity – NW ODMDS	
Feature Description	Construction Volume (CY)
Offshore Placement	13,800,000
<b>Total</b>	<b>13,800,000</b>

**GENERAL NOTES**

1. BASE MAPPING SHOWN IS ESRI WORLD IMAGERY, RETRIEVED FROM ARCGIS TO AUTOCAD IN JANUARY 2019 - LAST UPDATED IN SEPTEMBER 2018.
2. HORIZONTAL COORDINATE SYSTEM IS NAD83 TEXAS STATE PLANE, SOUTH ZONE, US FOOT.
3. VERTICAL DATUM IS REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
4. PIPELINE DATA FOR ARANSAS AND NUECES COUNTIES RETRIEVED FROM RAILROAD COMMISSION OF TEXAS ON NOVEMBER 19, 2018.

**LEGEND**

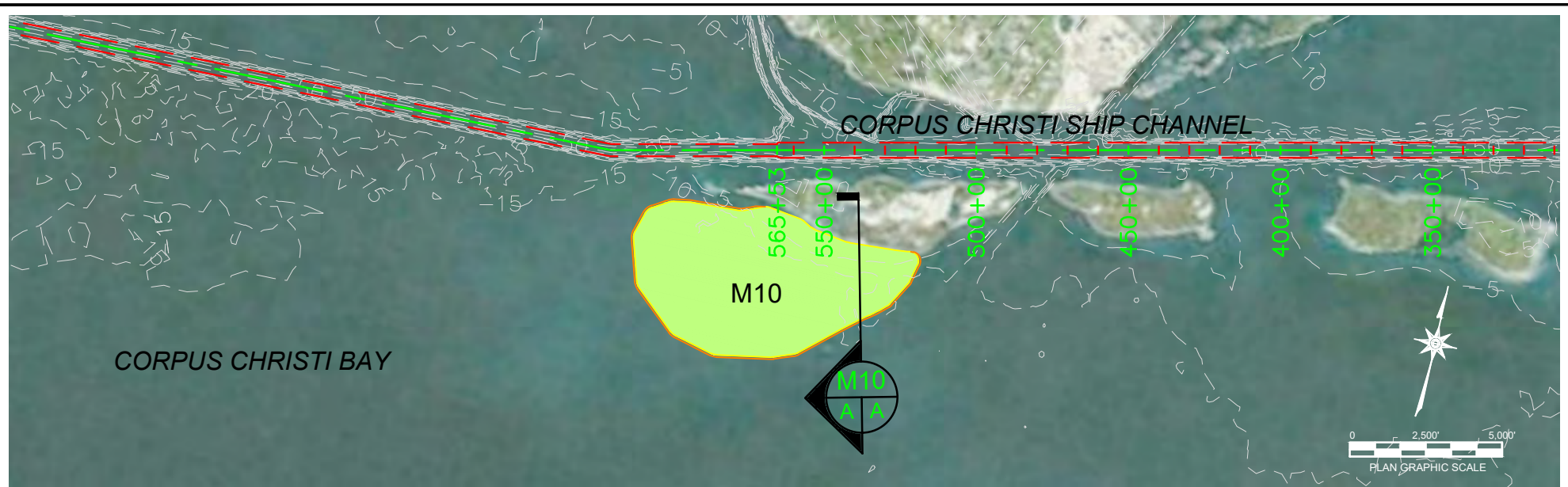
-  DEEPENING IMPROVEMENTS (-75' / -77' MLLW)
-  EXIST OFFSHORE PLACEMENT AREA
-  EXIST CONTOURS

Sheet 6 of 17

Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-XXXX-XXXX

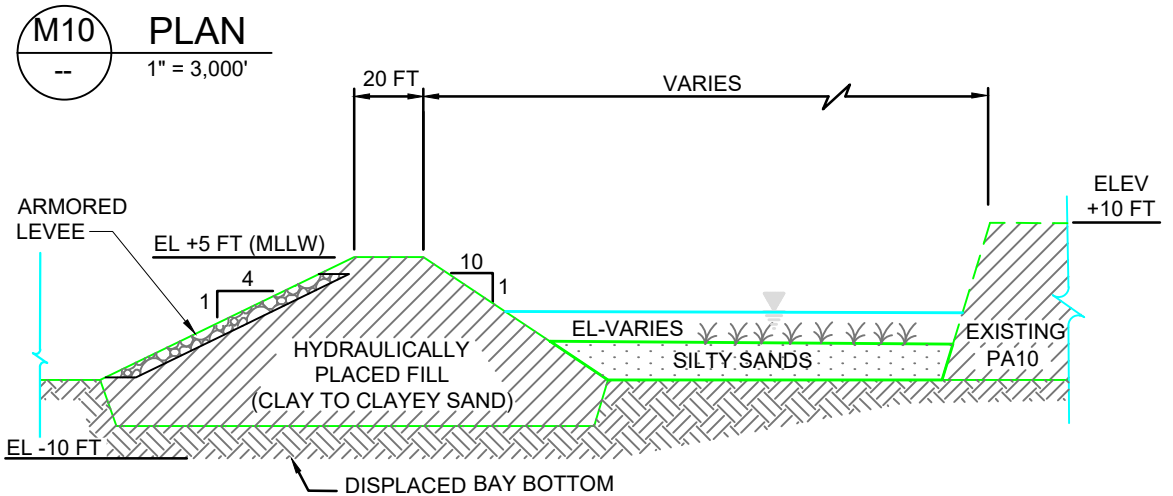
**OFFSHORE DREDGE  
MATERIAL PLACEMENT  
NW ODMDS (HOMEPORT)**

County: Aransas and Nueces      State: Texas  
Application By: Port of Corpus Christi Authority      Date: December 2018



Placement Site Neatline Quantity – Site M10	
Feature Description	Construction Volume (CY)
Armoring*	10,667
Levee Creation	997,300
770 Acre Estuarine / Aquatic Habitat	9,936,300
<b>Total</b>	<b>10,933,600</b>

\*Note: Quantity not included in CY total



### LEGEND

- EXISTING SHIP CHANNEL
- DREDGE MATERIAL PLACEMENT
- EXIST CONTOURS

### GENERAL NOTES

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- PIPELINE DATA FOR ARANSAS AND NUECES COUNTIES RETRIEVED FROM RAILROAD COMMISSION OF TEXAS ON NOVEMBER 19, 2018.

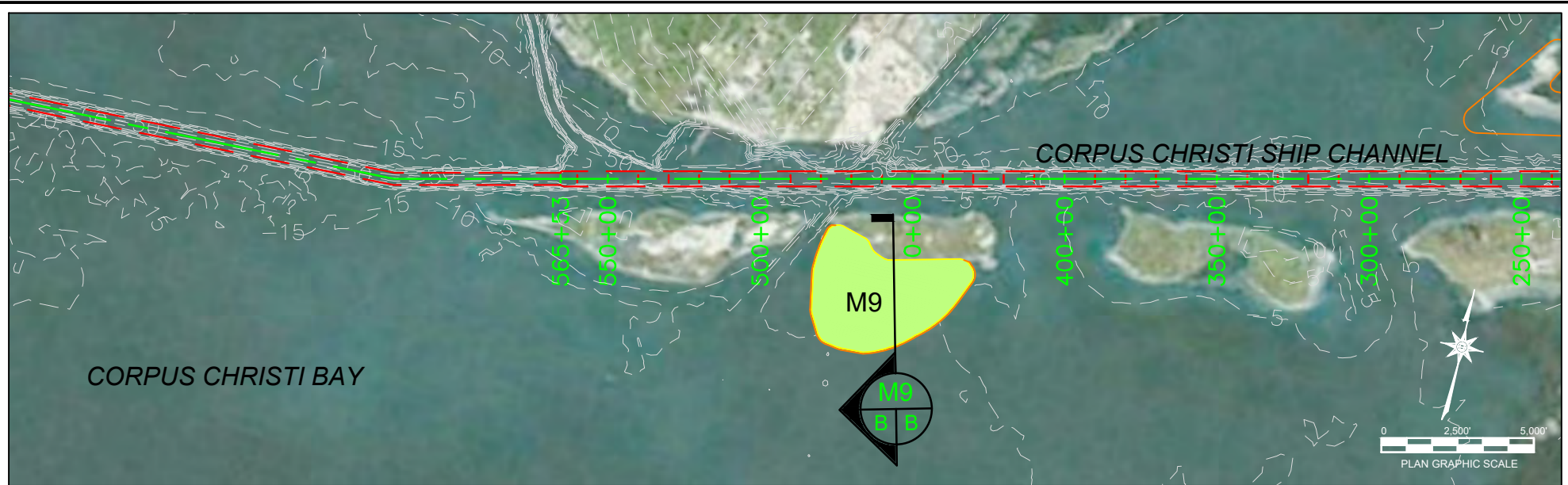


Sheet 7 of 17

Corpus Christi Ship Channel Deepening Project  
 Individual Permit Application SWG-XXXX-XXXX  
**BENEFICIAL USE SITE  
 AND SECTION VIEW - M10  
 770 ACRE ESTUARINE / AQUATIC HABITAT**

County: Aransas and Nueces  
 Application By: Port of Corpus Christi Authority

State: Texas  
 Date: December 2018



CORPUS CHRISTI BAY

CORPUS CHRISTI SHIP CHANNEL

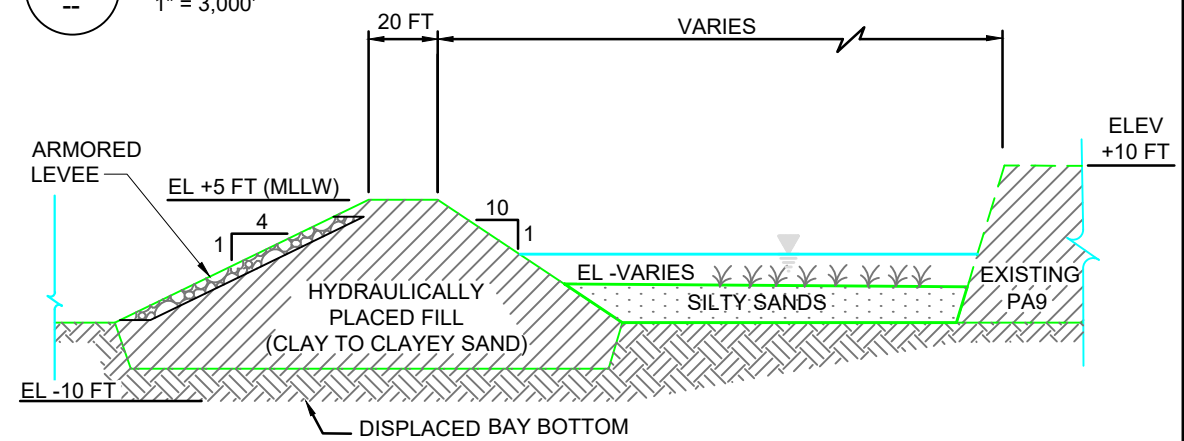
M9

M9  
B B



M9 PLAN  
1" = 3,000'

Placement Site Neatline Quantity – Site M9	
Feature Description	Construction Volume (CY)
Armoring*	5,333
Levee Creation	312,000
329 Acre Estuarine / Aquatic Habitat	3,188,000
<b>Total</b>	<b>3,500,000</b>
*Note: Quantity not included in CY total	



M9 SECTION  
NOT TO SCALE

**LEGEND**

- EXISTING SHIP CHANNEL
- DREDGE MATERIAL PLACEMENT
- EXIST CONTOURS

**GENERAL NOTES**

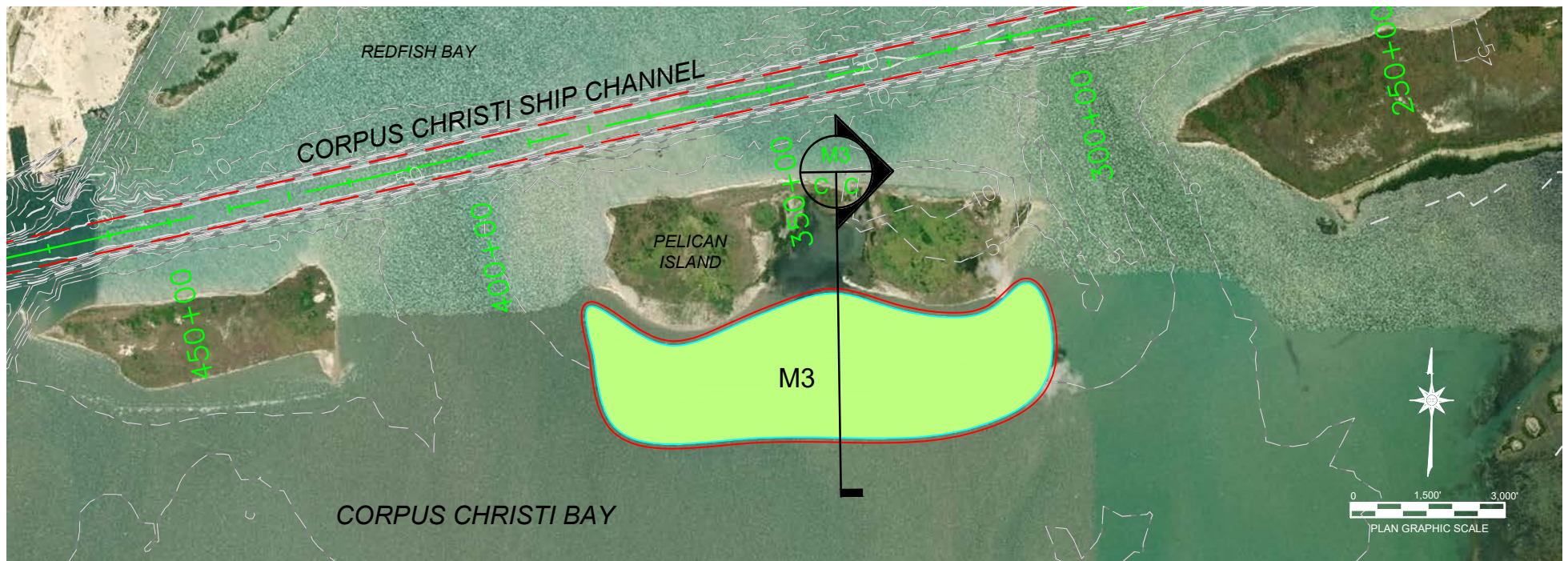
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4. PIPELINE DATA FOR ARANSAS AND NUECES COUNTIES RETRIEVED FROM RAILROAD COMMISSION OF TEXAS ON NOVEMBER 19, 2018.

Sheet 8 of 17

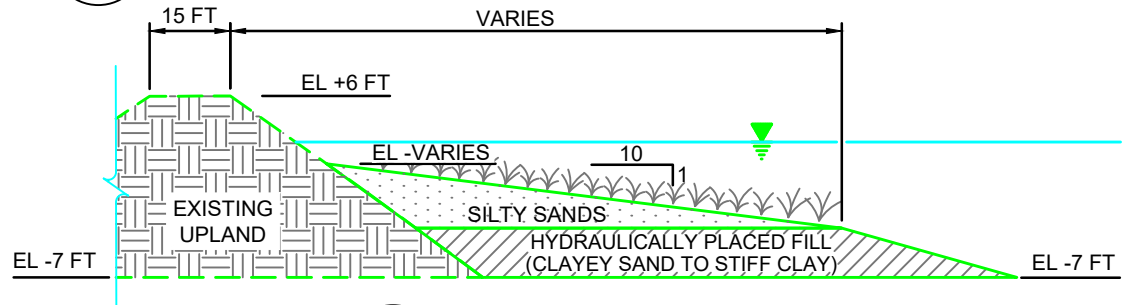
Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-XXXX-XXXX

**BENEFICIAL USE SITE  
AND SECTION VIEW - M9  
329 ACRE ESTURINE / AQUATIC HABITAT**

County: Aransas and Nueces      State: Texas  
Application By: Port of Corpus Christi Authority      Date: December 2018



**M3 PLAN**  
1" = 2,500'



**M3 SECTION**  
NOT TO SCALE

Placement Site Neatline Quantity – Site M3	
Feature Description	Construction Volume (CY)
Foundation Fill	3,269,200
330-Acre Estuarine / Aquatic Habitat	1,059,200
<b>Total</b>	<b>4,328,400</b>

**LEGEND**

- EXISTING SHIP CHANNEL
- DREDGE MATERIAL PLACEMENT
- EXIST CONTOURS

**GENERAL NOTES**

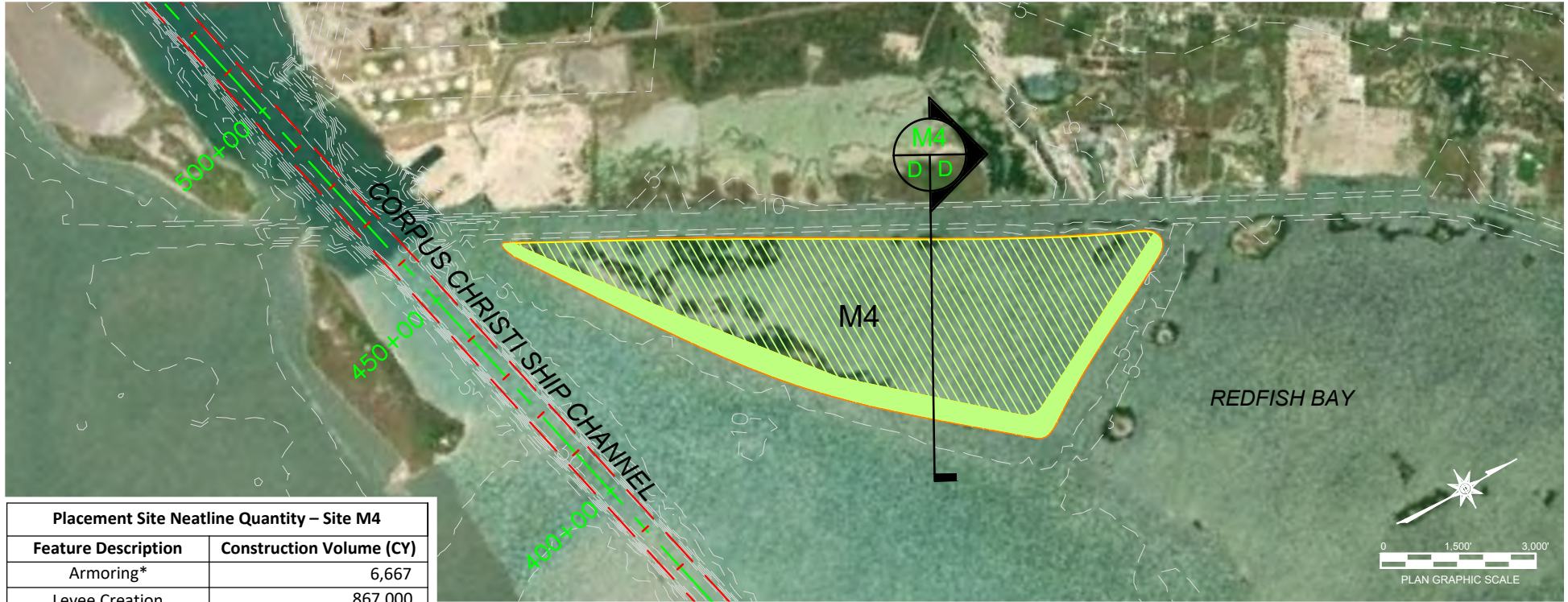
1. BASE MAPPING SHOWN IS ESRI WORLD IMAGERY, RETRIEVED FROM ARCGIS TO AUTOCAD IN DEC 2018 - LAST UPDATED IN SEPT 2018.
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Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-XXXX-XXXX

**BENEFICIAL USE SITE  
AND SECTION VIEW - M3**

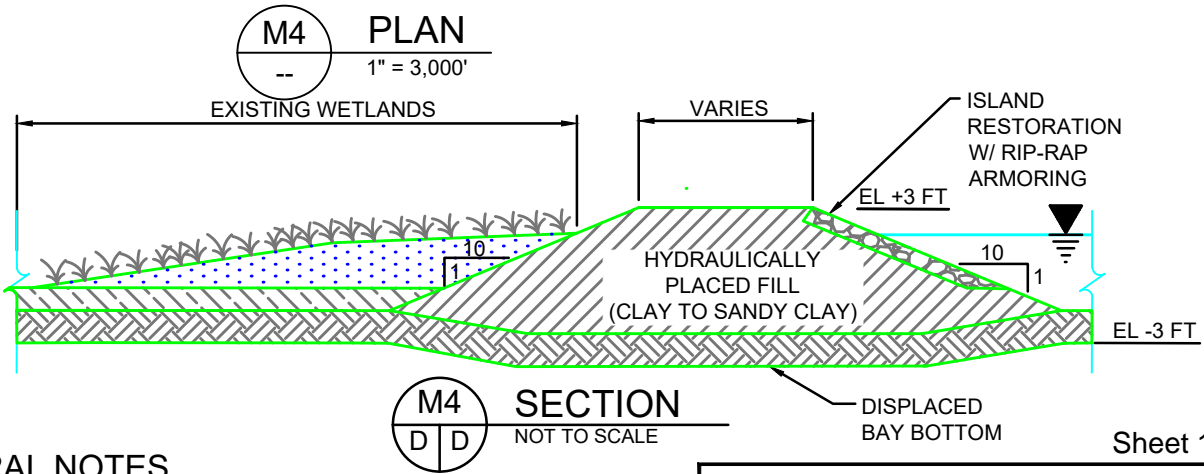
**330 ACRE ESTUARINE / AQUATIC HABITAT**

County: Aransas and Nueces      State: Texas  
Application By: Port of Corpus Christi Authority      Date: December 2018



Placement Site Neatline Quantity – Site M4	
Feature Description	Construction Volume (CY)
Armoring*	6,667
Levee Creation	867,000
<b>Total</b>	<b>867,000</b>

\*Note: Quantity not included in CY total



**LEGEND**

- EXISTING SHIP CHANNEL
- DREDGE MATERIAL PLACEMENT
- POTENTIAL RESTORATION
- EXIST CONTOURS

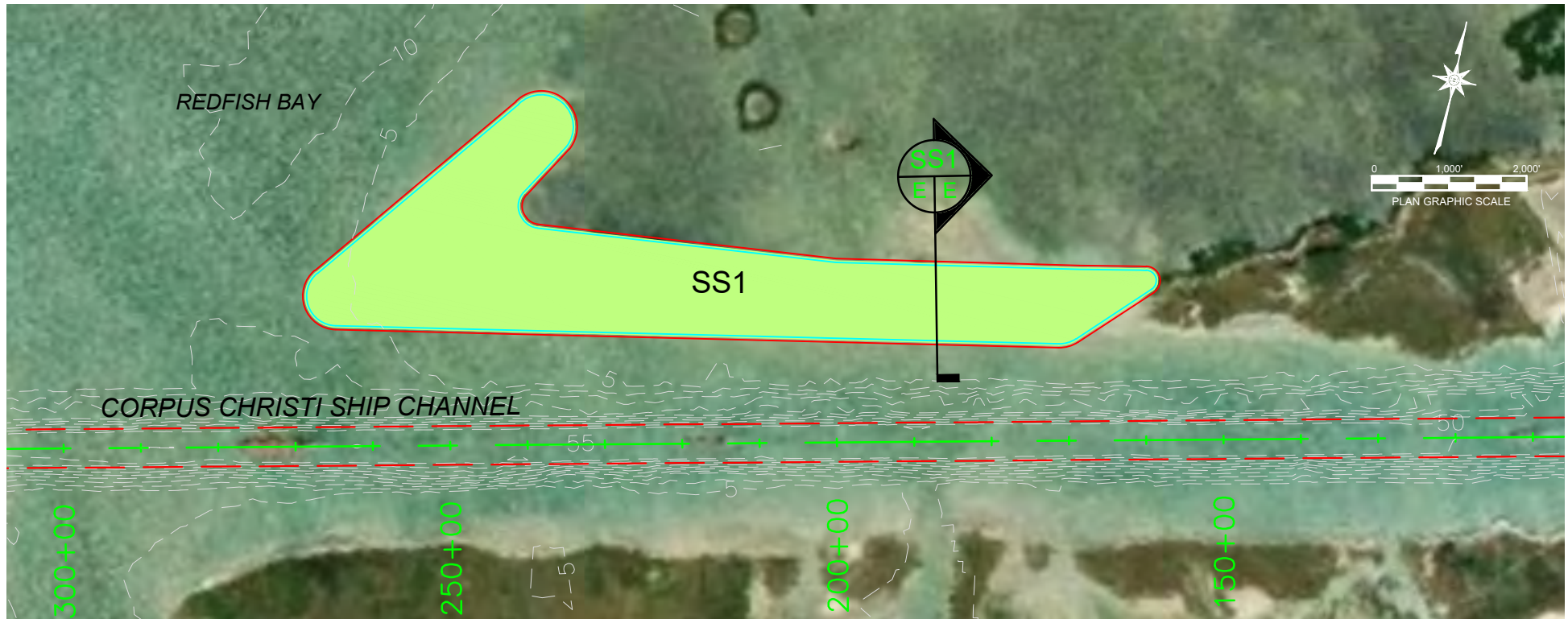
**GENERAL NOTES**

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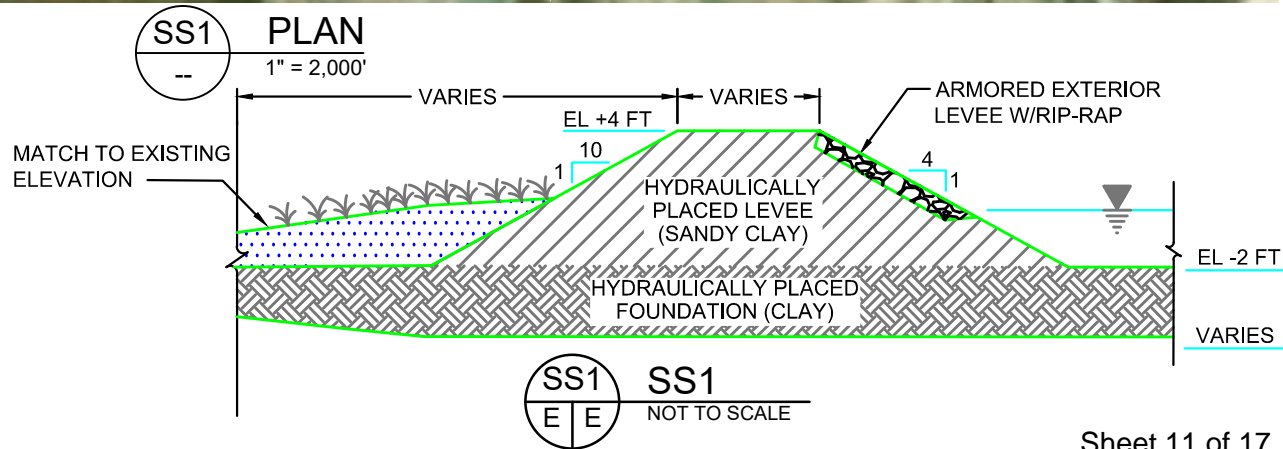
Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-XXXX-XXXX

**BENEFICIAL USE SITE AND SECTION VIEW - M4  
DAGGER ISLAND LEVEE CREATION**

County: Aransas and Nueces      State: Texas  
Application By: Port of Corpus Christi Authority      Date: December 2018



Placement Site Neatline Quantity – Site SS1	
Feature Description	Construction Volume (CY)
Armoring*	5,555
Levee	107,400
Foundation Fill	1,574,500
<b>Total</b>	<b>1,681,900</b>
*Note: Quantity not included in CY total	



### LEGEND

- EXISTING SHIP CHANNEL
- DREDGE MATERIAL PLACEMENT
- EXIST CONTOURS

### GENERAL NOTES

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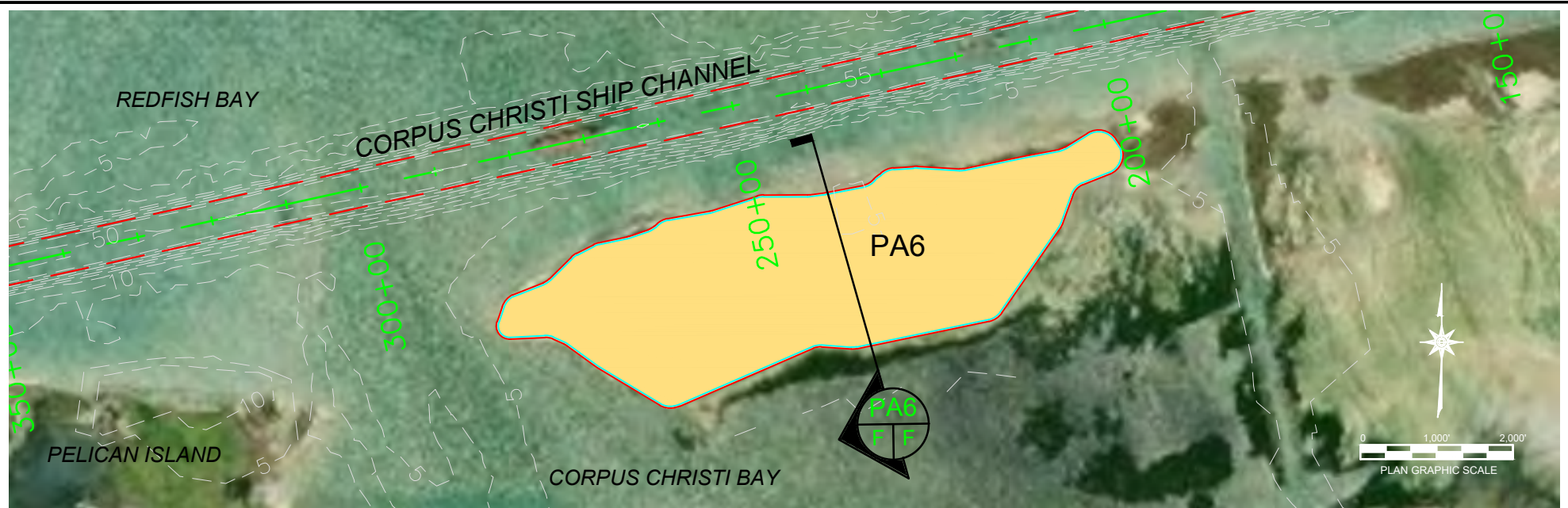
Sheet 11 of 17

Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-XXXX-XXXX

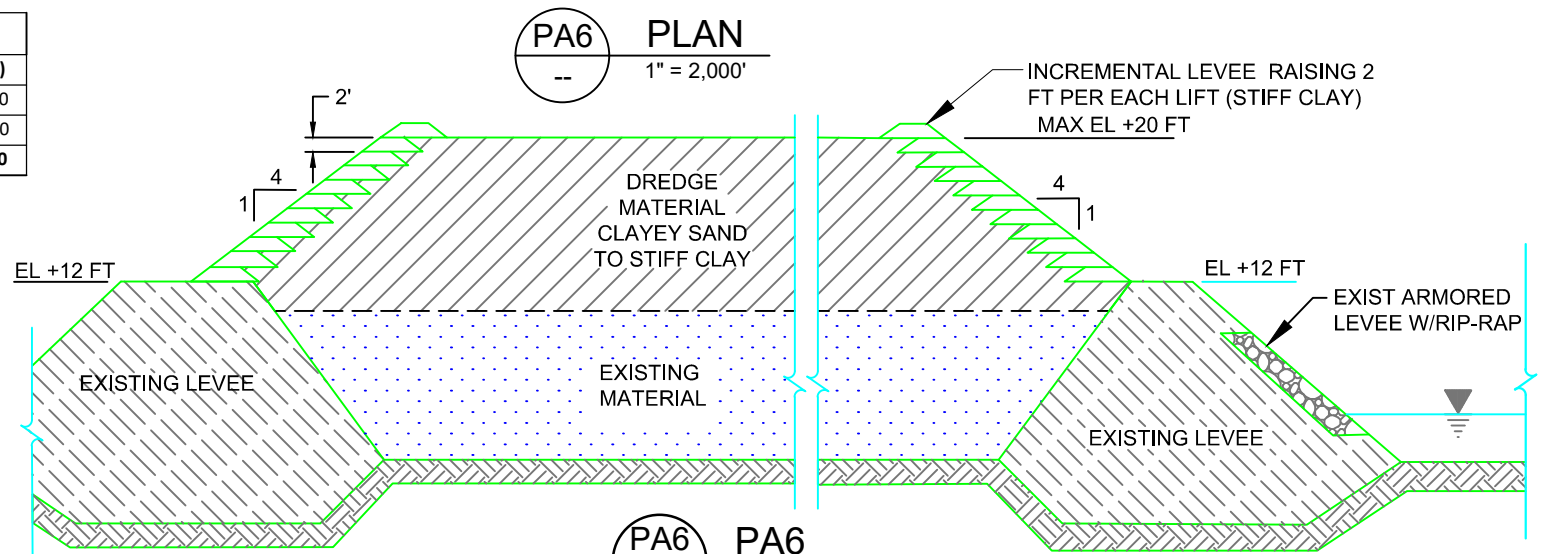
## BENEFICIAL USE SITE AND SECTION VIEW - SS1 SHORELINE RESTORATION

County: Aransas and Nueces  
Application By: Port of Corpus Christi Authority

State: Texas  
Date: December 2018



Placement Site Neatline Quantity – Site PA 6	
Feature Description	Construction Volume (CY)
2-ft Levee Raise	116,100
PA Fill	3,588,800
<b>Total</b>	<b>3,704,900</b>



### LEGEND

- EXISTING SHIP CHANNEL
- DREDGE MATERIAL PLACEMENT
- EXIST CONTOURS

### GENERAL NOTES

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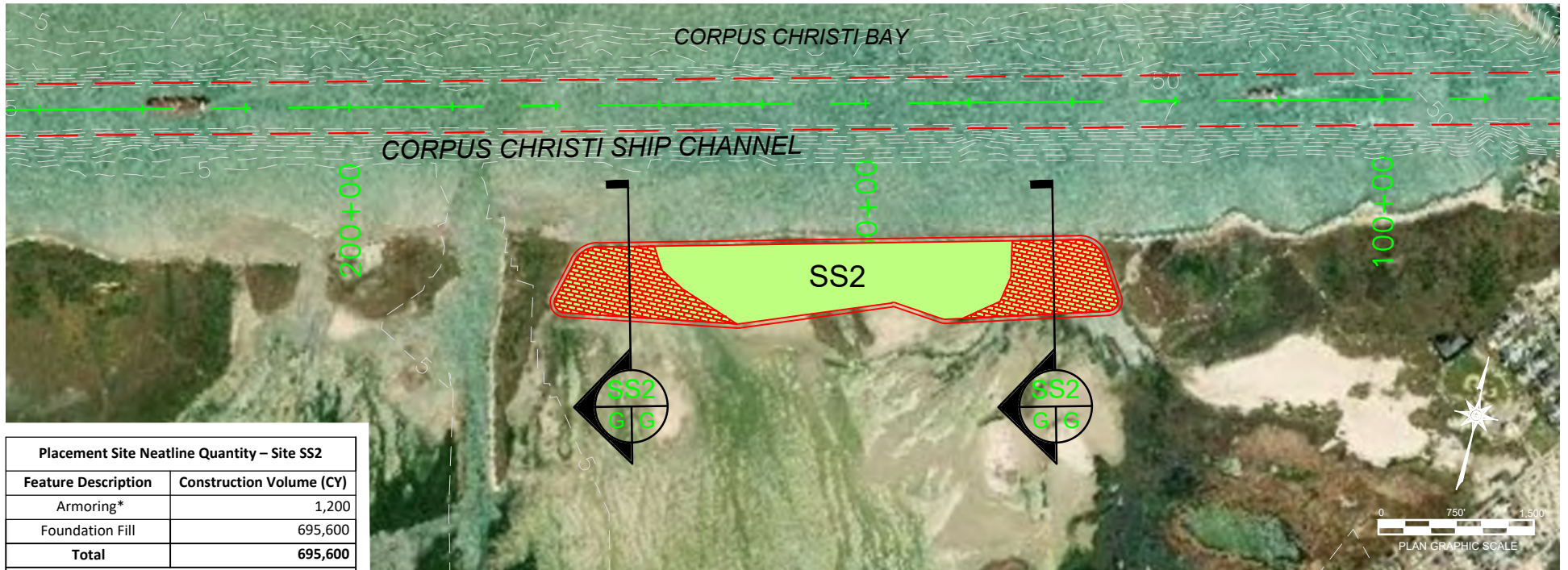
Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-XXXX-XXXX

### DREDGE MATERIAL PLACEMENT SITE AND SECTION VIEW - PA6 LEVEE RAISE & FILL

County: Aransas and Nueces  
Application By: Port of Corpus Christi Authority

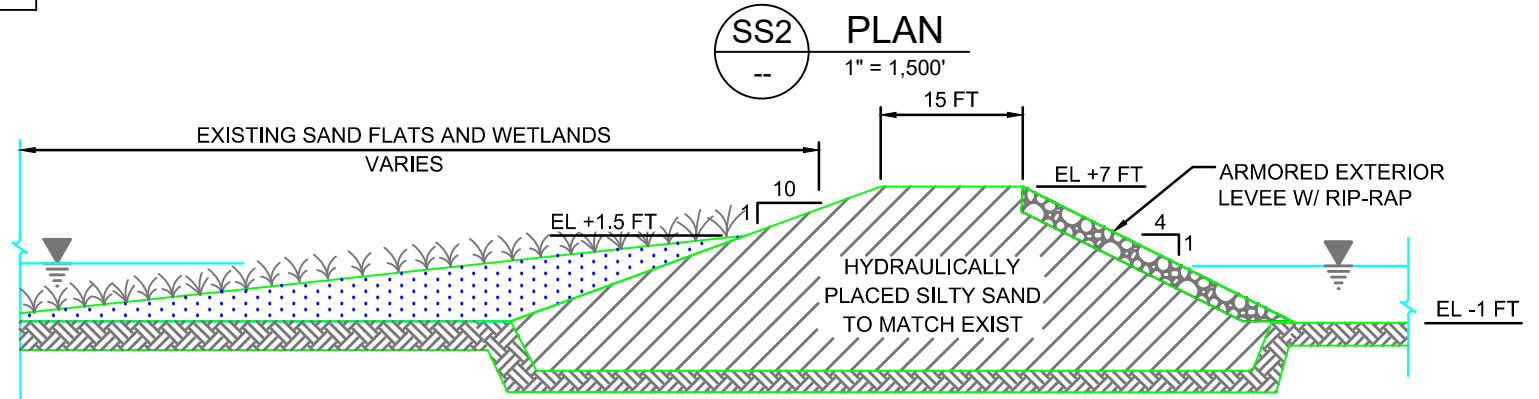
State: Texas  
Date: December 2018





Placement Site Neatline Quantity – Site SS2	
Feature Description	Construction Volume (CY)
Armoring*	1,200
Foundation Fill	695,600
<b>Total</b>	<b>695,600</b>

\*Note: Quantity not included in CY total



**LEGEND**

- EXISTING SHIP CHANNEL
- DREDGE MATERIAL PLACEMENT
- EXIST CONTOURS

**GENERAL NOTES**

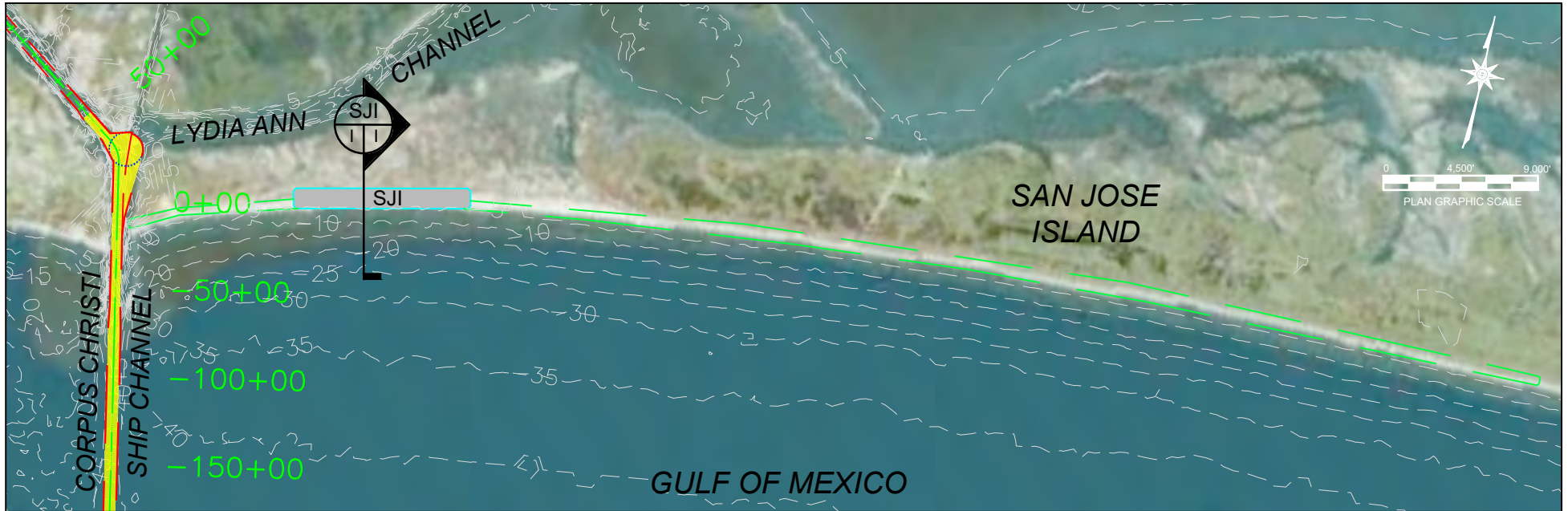
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**SS2 SECTION**  
NOT TO SCALE

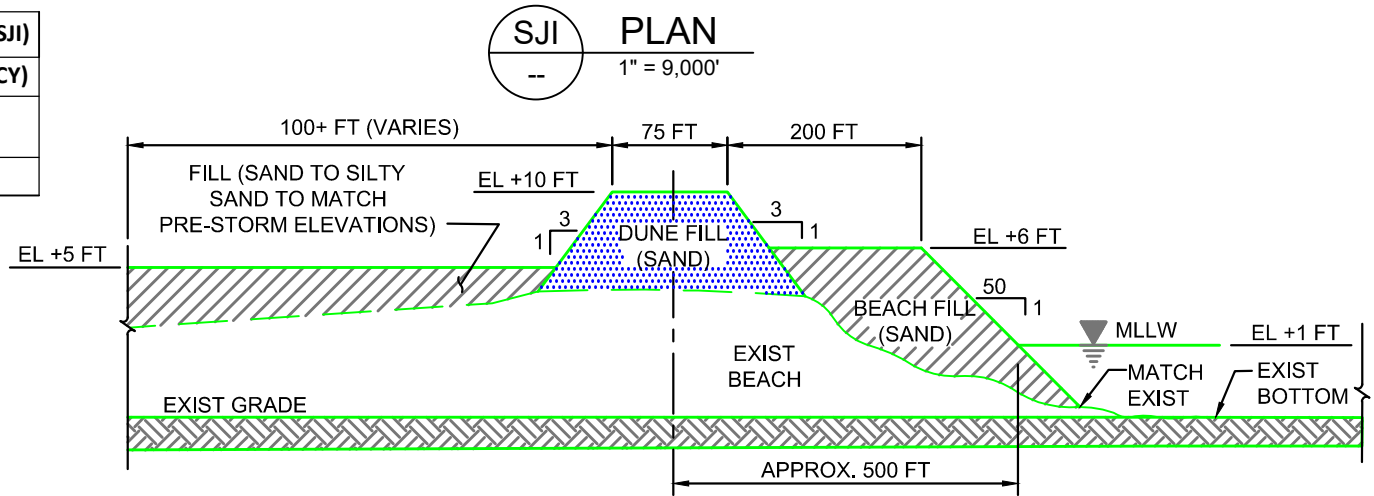
Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-XXXX-XXXX

**BENEFICIAL USE SITE AND SECTION VIEW - SS2 SHORELINE BREACH FILL IN**

County: Aransas and Nueces      State: Texas  
Application By: Port of Corpus Christi Authority      Date: December 2018



Placement Site Neatline Quantity – San Jose Island (SJI)	
Feature Description	Construction Volume (CY)
Dune and Foreshore Restoration	7,000,000
<b>Total</b>	<b>7,000,000</b>



### LEGEND

- PROPOSED SHIP CHANNEL DEEPENING
- EXIST CONTOURS
- DUNE RESTORATION
- FORESHORE RESTORATION

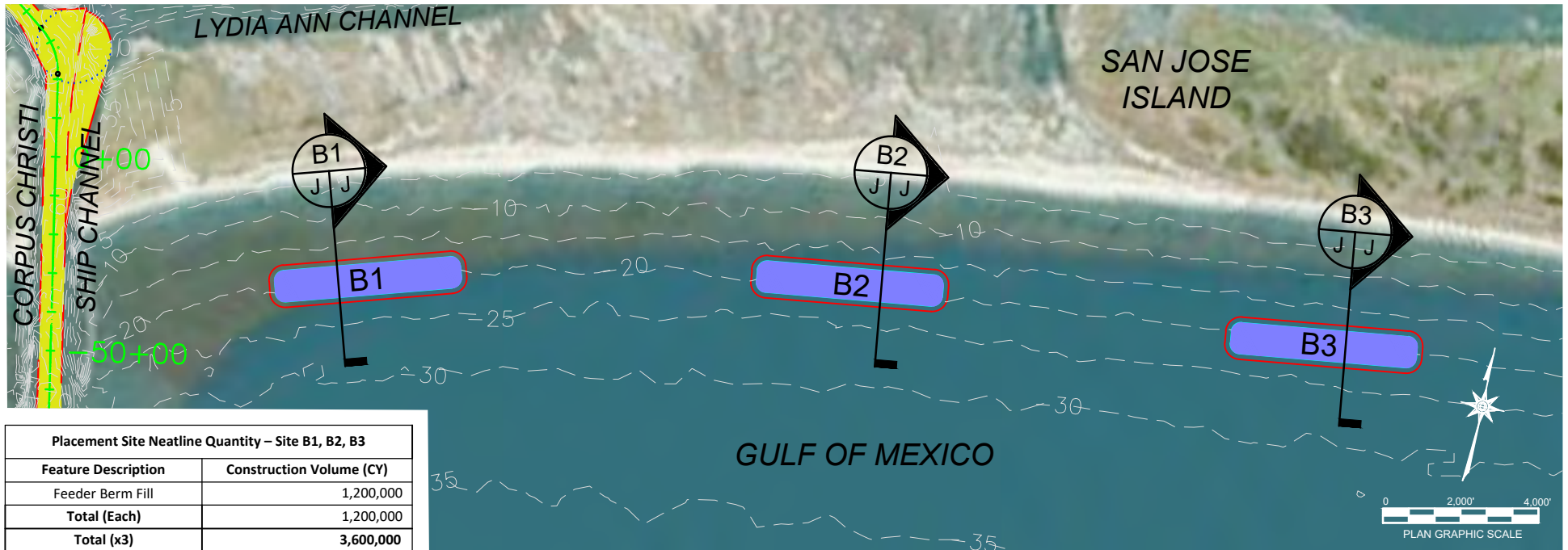
### GENERAL NOTES

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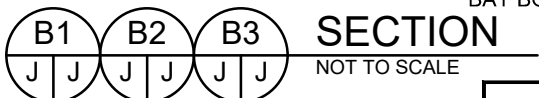
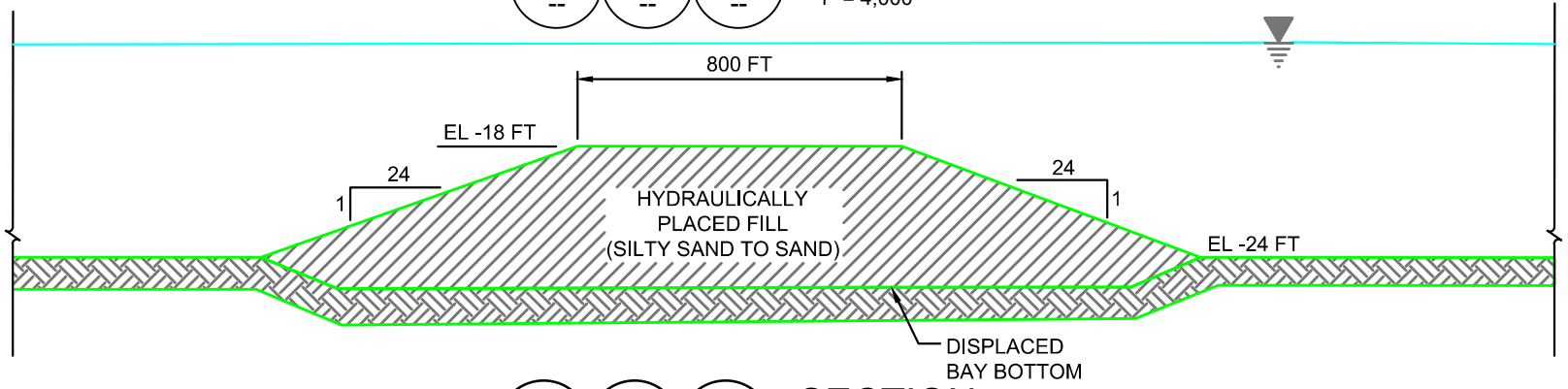
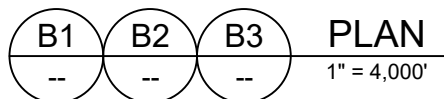
Corpus Christi Ship Channel Deepening Project  
 Individual Permit Application SWG-XXXX-XXXX  
**BENEFICIAL USE SITE AND SECTION VIEW - SJI DUNE AND FORESHORE RESTORATION**

County: Aransas and Nueces  
 Application By: Port of Corpus Christi Authority

State: Texas  
 Date: December 2018



Placement Site Neatline Quantity – Site B1, B2, B3	
Feature Description	Construction Volume (CY)
Feeder Berm Fill	1,200,000
<b>Total (Each)</b>	<b>1,200,000</b>
<b>Total (x3)</b>	<b>3,600,000</b>



**LEGEND**

- PROPOSED SHIP CHANNEL DEEPENING
- DREDGE MATERIAL PLACEMENT
- EXIST CONTOURS

**GENERAL NOTES**

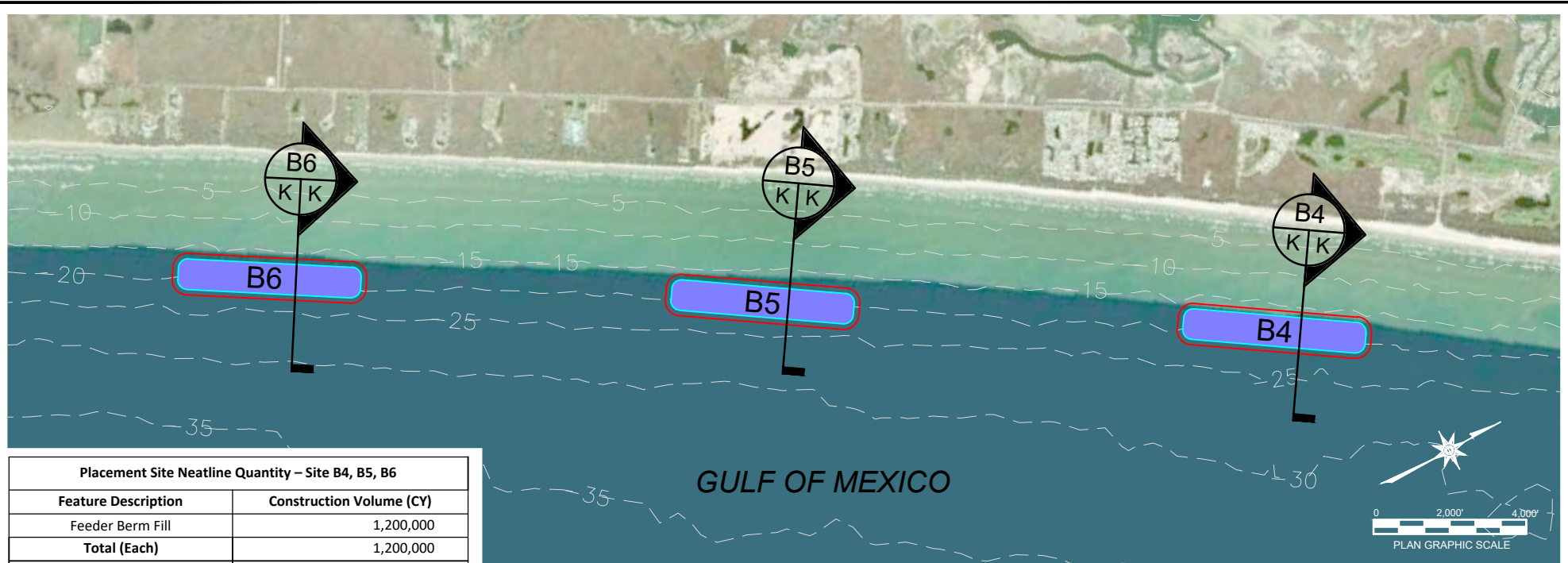
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Sheet 15 of 17

Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-XXXX-XXXX

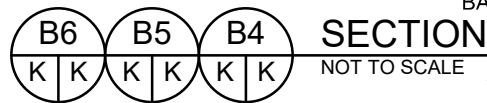
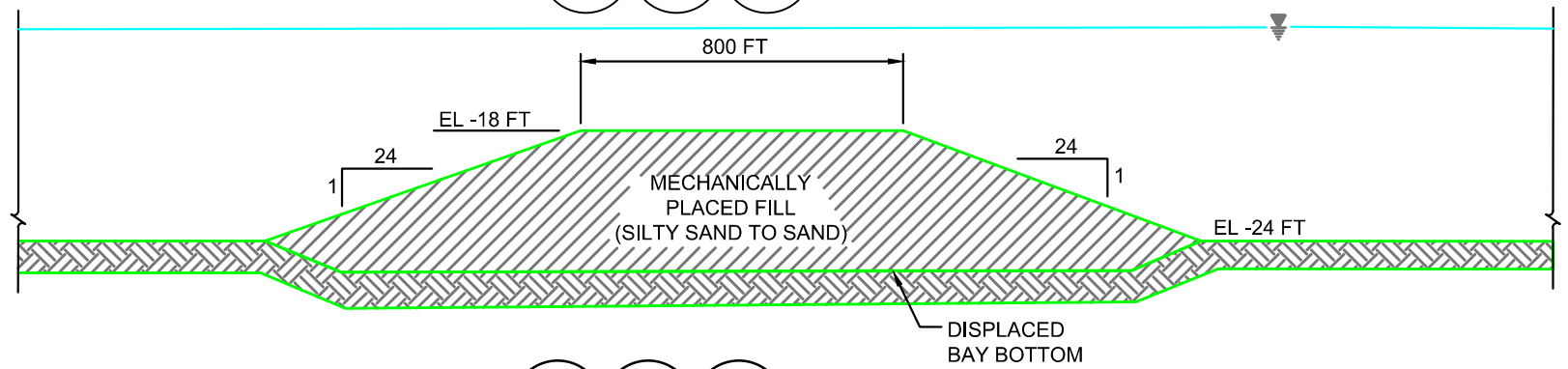
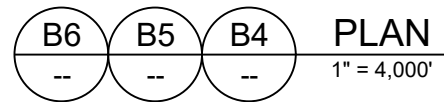
**BENEFICIAL USE SITE AND  
SECTION VIEW - B1, B2 & B3  
OFFSHORE FEEDER BERMS**

County: Aransas and Nueces      State: Texas  
Application By: Port of Corpus Christi Authority      Date: December 2018



Placement Site Neatline Quantity – Site B4, B5, B6	
Feature Description	Construction Volume (CY)
Feeder Berm Fill	1,200,000
<b>Total (Each)</b>	<b>1,200,000</b>
<b>Total (x3)</b>	<b>3,600,000</b>

GULF OF MEXICO



**LEGEND**

- DREDGE MATERIAL PLACEMENT
- EXIST CONTOURS

**GENERAL NOTES**

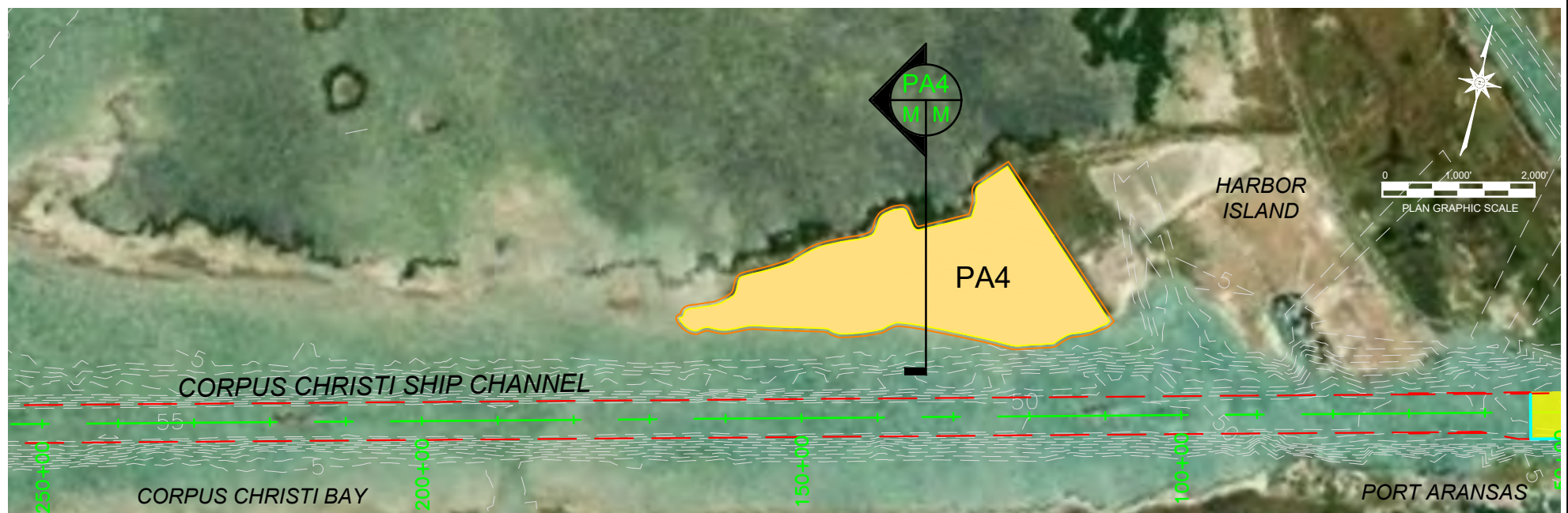
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Sheet 16 of 17

Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-XXXX-XXXX

**BENEFICIAL USE SITE AND SECTION VIEW - B4, B5 & B6 OFFSHORE FEEDER BERMS**

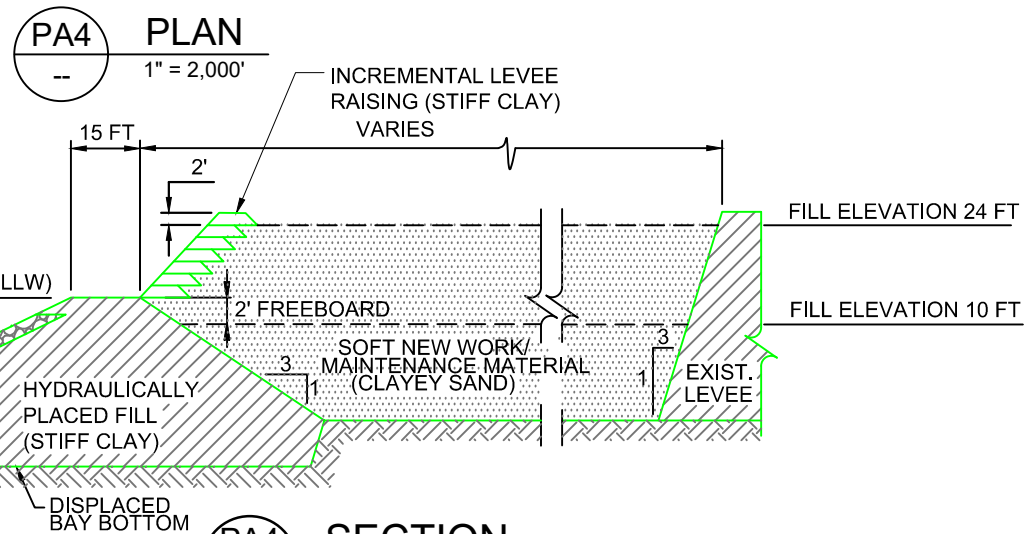
County: Aransas and Nueces      State: Texas  
Application By: Port of Corpus Christi Authority      Date: December 2018



**Placement Site Neatline Quantity – Site PA 4**

Feature Description	Construction Volume (CY)
Armoring*	4,667
Levee	158,600
PA Fill	2,861,400
<b>Total</b>	<b>3,020,000</b>

\*Note: Quantity not included in CY total



**LEGEND**

- EXISTING / PROPOSED SHIP CHANNEL DEEPENING
- DREDGE MATERIAL PLACEMENT
- EXIST CONTOURS

**GENERAL NOTES**

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Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-XXXX-XXXX

**DREDGE MATERIAL PLACEMENT  
SITE AND SECTION VIEW - PA4  
LEVEE CONSTRUCTION & FILL**

County: Aransas and Nueces  
Application By: Port of Corpus Christi Authority

State: Texas  
Date: December 2018

**Block 25 Addresses of Adjoining Property Owners (from Nueces and San Patricio Counties 2018)**

Owner	Mailing Address	City	State	Zip
<b>San Patricio County</b>				
FLINT HILLS RESOURCES CORPUS CHRISTI LLC ATTN PROPERTY TAX DEPT	PO BOX 3755	WICHITA	KS	67201-2917
G&H TOWING COMPANY	PO DRAWER 2270	GALVESTON	TX	77553
GULF MARINE FABRICATORS L P PORT OF CORPUS CHRISTI AUTHORITY OF NUECES COUNTY	16225 PARK TEN PLACE, SUITE 280	HOUSTON	TX	77084
	PO BOX 1541	CORPUS CHRISTI	TX	78403
<b>Nueces County</b>				
12 BANYAN LLC	3200 Bryker Dr	Austin	TX	78703-1330
231 PORT A LLC	203 Humble Ave	San Antonio	TX	78225-1317
5D PROPERTIES LLC	107 Five Oaks Dr	San Antonio	TX	78209-2405
6221 STATE HIGHWAY 361 LLC	PO Box 781348	San Antonio	TX	78278-1348
663 ANCHOR DR., A SERIES OF GRIZZO'S INVESTMENTS, LLC	12 Park Mtn	San Antonio	TX	78255-2104
ABELL REALTY LMTD PARTNERSHIP	4608 CRESTWAY DR	AUSTIN	TX	78731-5204
ALLEN BRUCE D TRUSTEE	61 Lincoln Dr	New Boston	NH	03070-4304
ANDERSON EVAN D & WF ANEESA W	503 Hummingbird Ln	Austin	TX	78734-4791
ARANSAS FIRST	81 GRIFFITH DR	ROCKPORT	TX	78382
ARNOLD HAYS L III & KRISTEN PLASTINO-ARNOLD	154 Country Ln	San Antonio	TX	78209-2228
ARNOLD MICHAEL J & WF SHERYL L	PO BOX 1118	PORT ARANSAS	TX	78373-1118
ARNOLD MICHAEL J ET UX	SHERYL L	PORT ARANSAS	TX	78373-1118
BADALICH CARL AND SHERRY BADALICH	P O BOX 18150	CORPUS CHRISTI	TX	78480
BANYAN BEACH PROPERTY OWNERS ASSOCIATION INC	14613 S Padre Island Dr	Corpus Christi	TX	78418-6037
BEACH VIEW ESTATES OWNERS ASSN	211 COSTA BELLA DR	AUSTIN	TX	78734-2662
BENTON ELAINE ROBINSON EXEMPT APPT TRUST # 1	2403 Rockmoor Ave	Austin	TX	78703-1516
BERNSEN COASTAL BUILDERS LLC	722 Tarpon Unit J	Port Aransas	TX	78373-5182
BES INVESTMENTS LLC	502 E Center Ave	Carlsbad	NM	88220-6106
BIEDENHARN ALBERT M III	1250 NE LOOP 410	SAN ANTONIO	TX	78209-1525
BIEHN DAVID P	9319 Waterview Rd	Dallas	TX	75218-2745
BIG SAND HILL DEVELOPMENT LP	19802 Messina	San Antonio	TX	78258-3192
BLACKERT JOSEPH	12607 Silver Creek Dr	Austin	TX	78727-2808
BLISS JIMMY AND MARCI BLISS	1016 BLUFF	PORTLAND	TX	78374
BODE BILLY WADE AND WF	5409 Northwest Trl	Corpus Christi	TX	78410-4814
BOGO/ORTIZ LTD	13817 Captains Row	Corpus Christi	TX	78418-6807
BRAMAN RANCHES LLC	PO Box 400	Victoria	TX	77902-0400
BREADY MARK AND STEVE BREADY	1142 Rip Jay Cir	Canyon Lake	TX	78133-4000
BREWSTER REVOCABLE TRUST	PO Box 368	Marietta	OK	73448-0368
BUECHEL FREDERICK MD TR	61 FIRST ST	SOUTH ORANGE	NJ	07079
C & F WEIL TRUST ETAL	500 N Shoreline Blvd Ste 1118	Corpus Christi	TX	78401-0359
C02 INC	110 Allen Ln	Center Point	TX	78010-5494
CABELA JOSEPH & JENNIFER CABELA	220 Roy Creek Trl	Dripping Springs	TX	78620-4197
CALDWELL DOLORES M	6403 LOCHMOOR DR	SAN DIEGO	CA	92120
CAMPBELL CHARLES H FAMILY PARTNERSHIP LTD	5540 Saratoga Blvd	Corpus Christi	TX	78413-2999
CARLISLE THOMAS L	500 N WATER ST STE 900	CORPUS CHRISTI	TX	78471-0019
CASA OCEANSIDE LLC	3303 Rivercrest Dr	Austin	TX	78746-1718
CASERTA DIANE	1009 REDDING RD	FAIRFIELD	CT	06430
CHEEMA JASBIR S	4053 E. MORADA LANE	STOCKTON	CA	95212
CHOKE CANYON MOTEL, INC	PO Box 2181	Port Aransas	TX	78373-2181

**Block 25 Addresses of Adjoining Property Owners (from Nueces and San Patricio Counties 2018)**

<b>Owner</b>	<b>Mailing Address</b>	<b>City</b>	<b>State</b>	<b>Zip</b>
CINNAMON SHORE COMMUNITY ASSOCIATION INC	PO Box 342585	Austin	TX	78734-0044
CITY OF CORPUS CHRISTI	PO BOX 9277	CORPUS CHRISTI	TX	78469-9277
CITY OF PORT ARANSAS	710 W AVENUE A	PORT ARANSAS	TX	78373-4128
COBBS JEFFREY DAN AND WF	11 HEWIT DR	CORPUS CHRISTI	TX	78404-1609
COCHRAN IRENE TR OF THE	GULF REALTY TRUST	APALACHICOLA	FL	32329-0400
COUNCIL OF CO-OWNERS OF	14493 S Padre Island Dr	Corpus Christi	TX	78418-9997
CRANDALLS COTTAGE LLC	1511 Blackbird Ln	San Antonio	TX	78248-1743
CRENWELGE DALE A	PO Box 717	Comfort	TX	78013-0717
CUTLER HAYDN H JR	3825 Camp Bowie Blvd	Fort Worth	TX	76107-3355
DANGER SIX REVOCABLE MANAGEMENT TRUST	34 Royal Gardens Dr	San Antonio	TX	78248-1574
DENMAN BRYAN S	P O BOX 775	GONZALES	TX	78629
DOYLE DAVID G & WF AMY L	318 Blue Bonnet Blvd	San Antonio	TX	78209-4633
DTB INVESTMENTS LP	28615 Interstate 10 W	Boerne	TX	78006-9126
DULCE DOG FAMILY LIMITED PARTNERSHIP	PO Box 1111	Leakey	TX	78873-1111
EASON KENNETH D AND SHIRLEY A WFE	4717 Miron Dr	Dallas	TX	75220-2018
EPISCOPAL CHURCH CORP IN	WEST TEXAS	SAN ANTONIO	TX	78209
ERF PORT ARANSAS INC	555 N Carancahua St #700	Corpus Christi	TX	78401-0800
ERWIN JOHN W & WF AMY D	13647 TREASURE TRAIL DR	SAN ANTONIO	TX	78232-3508
ESTRELLA BEACH LLC	5009 State Highway 361	Port Aransas	TX	78373-4833
EVANS JOHN R AND PATRICIA A EVANS WF	21 Inverness Blvd	San Antonio	TX	78230-5652
FACEY ENTERPRISES NVLTD.	A DELAWARE CORP	SAN MARINO	CA	91108
FCI-JJC LP A TEXAS LIMITED PARTNERSHIP	P O BOX 366698	BONITA SPRINGS	FL	34136-6698
FISCHER JERRY E	P O BOX 2464	CORPUS CHRISTI	TX	78403
FOREMAN SCOTT L AND WF	PO BOX 576	COLLEYVILLE	TX	76034-0576
FREEBORG GREGORY J AND CAROL A	1290 Gasparilla Dr NE	Saint Petersburg	FL	33702-2752
FRIESENHAHN DEVELOPMENT PROPERTIES LP	1204 Zanderson Ave	Jourdanton	TX	78026-3512
FRISHMAN BENJAMIN AND	4403 BALCONES DR	AUSTIN	TX	78731-5709
GARCIA HILARIO JR AND	PO Box 855	Pleasanton	TX	78064-0855
GARNER JEFF A AND WF CYNTHIA W	15513 Palmira Ave Apt A	Corpus Christi	TX	78418-6788
GATES THOMAS A	500 N Shoreline Blvd	Corpus Christi	TX	78401-0356
GATES THOMAS ALBERT JR AND WF	338 CATALINA PL	CORPUS CHRISTI	TX	78411-1602
GER PORT ARANSAS HOUSE LTD	P O BOX 9556	AUSTIN	TX	78766
GHADIMI RAMIN G AND DONA	E GHADIMI WFE	AUSTIN	TX	78746-6303
GINGRICH KATIE EILEEN	18214 Crystal Ridge Dr	San Antonio	TX	78259-3613
GOLDEN STEPHEN L AND WF	300 Convent St	San Antonio	TX	78205-3710
GONZALEZ ARNULFO JR ET UX	1510 CALLE DEL NORTE	LAREDO	TX	78401
GORCZYCA KIMBER LEI	520 Ocean Vw	Port Aransas	TX	78373-5711
GREEN WING INVESTMENTS LLC AVENUE G SERIES	101 W Goodwin Ave Ste 410	Victoria	TX	77901-6550
GRODSKY DAVID N AND JUNE PEARSON	P O BOX 864	PORT ARANSAS	TX	78373
GROSSE RICHARD M ET UX	BOX 872	PORT ARANSAS	TX	78373
GUENTHER LIFE INSURANCE TRUST	153 TREELINE PARK	SAN ANTONIO	TX	78209
GULF REALTY TRUST	P O BOX 400	APALACHICOLA	FL	32329-0400
GULFWIND DEVELOPERS LTD	120 GULF WIND DR	PORT ARANSAS	TX	78373
HAGER CECILIA	3121 White Oak Rd	Fredericksburg	TX	78624-7894
HANMORE EROL R	P O BOX 1541	PORT ARANSAS	TX	78373

**Block 25 Addresses of Adjoining Property Owners (from Nueces and San Patricio Counties 2018)**

<b>Owner</b>	<b>Mailing Address</b>	<b>City</b>	<b>State</b>	<b>Zip</b>
HART JEFFERY L AND PATRICIA KILDAY HART	1504 Hardouin Ave	Austin	TX	78703-2519
HAUCK AMY K AND JOHN R HAUCK	11715 Spring Ridge Dr	San Antonio	TX	78249-2741
HAUSSER ROBERT JR ETALS	9901 W Interstate 10	San Antonio	TX	78230-2255
HVERDA GARY CARLTON	PO Box 1411	Port Aransas	TX	78373-1411
HAVSAM PROPERTIES LLC	200 Patterson Ave	San Antonio	TX	78209-6264
HAWN EDWIN D	14222 Playa del Rey	Corpus Christi	TX	78418-7503
HEY PETER MALCHAM	121 Northoak Dr	San Antonio	TX	78232-1209
HH FAMILY INVESTMENTS II LTD	PO Box 207916	San Antonio	TX	78220-7916
HILL THOMAS W	PO BOX 3229	PORT ARANSAS	TX	78373
ILC REALTY LTD	TEXAS LIMITED PARTNERSHIP	SAN ANTONIO	TX	78258-7538
IMCO INDUSTRIES LTD	2801 - 5TH STREET NISKU			
ISLAND RETREAT II	CONDO COUNCIL OF CO-OWNERS	PORT ARANSAS	TX	78373-6012
JEAN KENNETH NORMAN & WF MICHELE	3606 W Deer Crossing Dr	Stillwater	OK	74074-7640
JENKINS CHARLES K ETUX	KATRINA C	HOUSTON	TX	77056-1414
JWW PROPERTIES LLC	615 N Upper Broadway St	Corpus Christi	TX	78401-0753
KINCAID JANET C AND	2009 Fringewood Dr	Midland	TX	79707-5051
KITE L WAYNE	PO Box 490	Port Aransas	TX	78373-0490
KJLSWS PROPERTIES LLC	145 Bluestem Ln	Boerne	TX	78006-7035
KLEBERG MARY LEWIS LTD	700 N Saint Marys St Ste 125	San Antonio	TX	78205-3538
KM BEACH, LLC	755 E Mulberry Ave Ste 600	San Antonio	TX	78212-6013
KM LINKS LLC	755 E Mulberry Ave Ste 600	San Antonio	TX	78212-6013
KNIETO PA LLC	700 N Saint Marys St Ste 125	San Antonio	TX	78205-3538
KNOPP GREGORY A & WF CAROL KNOPP	PO Box 1450	Port Aransas	TX	78373-1450
KOONTZ/MCCOMBS 1 LTD	755 E Mulberry Ave Ste 600	San Antonio	TX	78212-6013
KOXLIN TIMOTHY J AND WF, LISA L KOXLIN	24715 Fairway Spgs	San Antonio	TX	78260-4800
LA CONCHA ESTATES OWNERS' ASSOCIATION INC	14493 S PADRE ISLAND DR	CORPUS CHRISTI	TX	78418
LA COSTA LAND DEVELOPMENT PARTNERS LP	248 Addie Roy Rd	Austin	TX	78746-4140
LABRUZZO DANNY ET UX	JEANNINE	PORT ARANSAS	TX	78373
LAYTON MATTHEW E & WF DEBORAH H	235 AMISTAD ST	CORPUS CHRISTI	TX	78404
LENNOX WILLIAM J JR AND ANNE M LENNOX	10521 Bermuda Isle Dr	Tampa	FL	33647-2721
LIKOVICH JOHN D AND SPSE	236 KING WILLIAM	SAN ANTONIO	TX	78204-1314
LINDNER DOROTHY NORTON	515 HOLIDAY RD	COMFORT	TX	78013-3107
LITTLETON MELVIN ET UX	DELANA	PORT ARANSAS	TX	78373
LOCO OCEAN LLC	PO Box 2290	Fort Worth	TX	76113-2290
MARSHIO BEVERLY AND DR P J MARSHIO	P O BOX 669	FULTON	TX	78358
MARTIN OPERATING PARTNERSHIP LP	% MARTIN MIDSTREAM PARTNERS LP	KILGORE	TX	75662
MAYAN PRINCESS COUNCIL OF CO-OWNERS INC	7537 STATE HIGHWAY 361	PORT ARANSAS	TX	78373
MCALLISTER TADDY JO ELLEN	203 Terrell Rd	San Antonio	TX	78209-5915
MCALLISTER WALTER W III	4940 BROADWAY STE 104	SAN ANTONIO	TX	78209
MCCANN CHERYL SUZANNE	236 Dolphin Ln	Port Aransas	TX	78373-5407
MCCARTY DAN E	117 Rockhill Dr	San Antonio	TX	78209-2219
MCDONNELL HENRY JR AND WF MARY ROGERS MCDONNELL	135 Wildrose Ave	San Antonio	TX	78209-3812
MCDONOUGH JOHN G AND	5025 N Central Expy ,Ste 3012	Dallas	TX	75205-3447
MCGINNIS CAMPBELL/JAYNE WFE	1202 BELMONT PARKWAY	AUSTIN	TX	78703
MDW FINANCIAL LIMITED PARTNERSHIP	28255 Interstate 10 W	Boerne	TX	78006-6508



**Block 25 Addresses of Adjoining Property Owners (from Nueces and San Patricio Counties 2018)**

<b>Owner</b>	<b>Mailing Address</b>	<b>City</b>	<b>State</b>	<b>Zip</b>
MEADOWS GILBERT R AND JAN B MEADOWS	807 CONTOUR DR	SAN ANTONIO	TX	78212
MEYERS WILLIAM D & WF TRACY L AND STEPHEN W FRANK & WF PATRICIA L	28255 Interstate 10 W, Ste 101	Boerne	TX	78006-6508
MHP TEXAS VENTURES LLC	1506 Hawks Mdw	San Antonio	TX	78248-1719
MILLS STEVE	18314 Emerald Oaks Dr	San Antonio	TX	78259-3637
MOKRY NANCY & WESLEY MOKRY	11223 BLOSSOM BELL DR	AUSTIN	TX	78758-4217
MOONEY RICHARD J TRUSTEE OF THE RJM TRUST	PO Box 1586	Frisco	TX	75034-0027
MOORE EDWARD ETUX TRUDY	1248 Austin Hwy 106-218	San Antonio	TX	78209-4867
MOORHOUSE BURTON L AND WF BEVERLY S BOLNER	684 Shoreline Cir	Port Aransas	TX	78373-4129
MUSTANG ISLAND DEVELOPMENT INC	120 Social Cir UNIT 4-101	Port Aransas	TX	78373-5091
MUSTANG ISLAND LLC	5916 Sterling Dr	Colleyville	TX	76034-7631
NEBLETT DUNCAN JR AND GEORGIA WFE	681 SHORELINE CIRCLE	PORT ARANSAS	TX	78373
NELLA GROUP LLC	427 N Broadway Blvd	Joshua	TX	76058-3413
NUECES CO NAVIGATION DIST				00000
NUECES COUNTY	901 LEOPARD ST	CORPUS CHRISTI	TX	78401-3606
OCEANSIDE ADDITION OWNERS	PO Box 236	Port Aransas	TX	78373-0236
PA POINT LTD	4418 OCEAN DRIVE	CORPUS CHRISTI	TX	78412
PA WATERFRONT L P	3455 PEACHTREE RD NE STE 650	ATLANTA	GA	30326
PAISANO PARTNERS LTD	4040 BROADWAY STE 501	SAN ANTONIO	TX	78209
PANOS MANAGEMENT TRUST	3716 Lagood Dr	Austin	TX	78730-3501
PATE RICHIE	1800 Hughes Landing Blvd	Spring	TX	77380-1684
PAYNE DENNIS L & WF, DEBORAH J	5478 County Road 73	Robstown	TX	78380-9003
PERCOCO RICHARD A & THELMA A WFE	1011 Bayridge Rd	La Porte	TX	77571-3520
PHILLIPS BRICE	2004 PHILADELPHIA AVE	OCEAN CITY	MD	21842
PIONEER RV RESORT INC	120 GULF WIND DR	PORT ARANSAS	TX	78373
PITT STEPHEN M AND SARAH J	2929 Wesleyan St	Houston	TX	77027-2007
POMEROY ANNETTE	200 LEGACY DOWNS DR	FORT WORTH	TX	76126-5737
PORPOISE POINT HOMEOWNERS'	ASSOCIATION	PORT ARANSAS	TX	78373
PORT A MANAGEMENT CO	13647 Treasure Trail Dr	San Antonio	TX	78232-3508
PORT A SANDBOX LLC	17067 PO BOX	AUSTIN	TX	78760-7067
PORT ARANSAS MARICULTURE	CENTER - TEXAS A & M			
PORT ARANSAS MARINA ASSN	PO BOX 117	SAINT HEDWIG	TX	78152-0117
PORT ARANSAS RV PARK	907 ACCESS RD 1A	PORT ARANSAS	TX	78373
PORT OF CORPUS CHRISTI AUTH	P O BOX 1541	CORPUS CHRISTI	TX	78403
PORTA CORPORATION	PO Box 460968	San Antonio	TX	78246-0968
POSEIDON REALTY TRUST	C/O ABACUS REALTY	APALACHICOLA	FL	32329-0400
POWER LAND COMPANY LTD	5601 EDMOND STE M	WACO	TX	76710-4321
PRESTON WILLIAM J & MELISSA V PRESTON	PO Box 7520	Spring	TX	77387-7520
R & R ROYALTY LTD	500 N Shoreline Blvd Ste 322	Corpus Christi	TX	78401-0313
RACHAL ED FOUNDATION	555 N Carancahua St Ste 700	Corpus Christi	TX	78401-0861
RANDALL JAMES PRESTON & WF LAURILEE GRACE	10603 Sierra Oaks	Austin	TX	78759-5166
REDDY GEETA	PO Box 272000	Corpus Christi	TX	78427-2000
RHODES SUZANNE S AND ALAN GARY THOMPSON	4511 Ridgehaven Rd	Fort Worth	TX	76116-7315
RIVERS WIL & JULIE V HUMBLE	610 Shoreline Cir	Port Aransas	TX	78373-4129
ROGERS WALLACE III 1992 FAMILY TRUST	305 Geneseo Rd	San Antonio	TX	78209-6124
RUSSELL JOHN	31211 Silver Spur Trl	Boerne	TX	78015-4107

**Block 25 Addresses of Adjoining Property Owners (from Nueces and San Patricio Counties 2018)**

<b>Owner</b>	<b>Mailing Address</b>	<b>City</b>	<b>State</b>	<b>Zip</b>
S & K FAMILY TRUST	24165 W Interstate 10 Ste 217-419	San Antonio	TX	78257-9997
SAND POINT N.U.D OWNER'S ASSOC INC	PO BOX 141	PORT ARANSAS	TX	78373-0141
SCHIRMER ROBERT G SR AND	324 DOLPHIN LN	PORT ARANSAS	TX	78373-5405
SCHOLL JACK W & SCHOLL HOLDINGS LTD	5740 Ocean Dr	Corpus Christi	TX	78412-2848
SCHRADER J ERIC ETUX DENISE A	6601 RIVER BEND DR	FT WORTH	TX	76132
SCHWEPPE HENRY IRVING JR TR	1752 NORTH BOULEVARD	HOUSTON	TX	77098
SCOTT MICHAEL D & WF CONNIE SCOTT	638 Shoreline Cir	Port Aransas	TX	78373-4129
SEA OATS INVESTMENTS II LLC	5009 State Highway 361	Port Aransas	TX	78373-4833
SEAS THE VIEW	PO Box 1627	Kyle	TX	78640-1627
SEUREAU GLENN	3214 INWOOD DR	HOUSTON	TX	77019-3228
SHUTTERS PORTA LLC	203 HUMBLE AVE	SAN ANTONIO	TX	78225
SIGMA OCEAN VIEW PROPERTIES LLC	310 Champion Fls	San Antonio	TX	78258-4876
SILVERCLOUD PROPERTIES LLC	221 E Guenther	San Antonio	TX	78204-1404
SNYDER BLAINE & KELLI SNYDER	673 Shoreline Cir	Port Aransas	TX	78373-4146
SPARR RICHARD A JR & WF JENNIFER	1313 NE LOOP 410 STE 100	SAN ANTONIO	TX	78209
SPEC-TACULAR INC	921 N Chaparral St Ste 103	Corpus Christi	TX	78401-2008
SPMP HOLDINGS LTD	115 Rio Cordillera	Boerne	TX	78006-5891
STAFFORD WESLEY W	AND JANE O STAFFORD WFE	CORPUS CHRISTI	TX	78411
STAHLMAN ALAN R AND SUZANNE MARTIN TRUSTEES OF THE	5691 FM 2722	NEW BRAUNFELS	TX	78132-2018
STATE OF TEXAS	PO Box 12608	Austin	TX	78711-2608
STERETT ROBERT HULINGS AND	409 Coral Pl	Corpus Christi	TX	78411-1530
STOVALL CHARLES WILLIAM AND WF	420 Ocean View Dr	Port Aransas	TX	78373-5711
SUNFLOWER BEACH DEVELOPMENT LTD	2215 Westlake Dr	Austin	TX	78746-2910
SWN LTD ET AL	2121 SAGE RD	HOUSTON	TX	77056-4341
TEMPLES RODGER D &	4701 Winthrop Ave W	Fort Worth	TX	76116-8239
TERRAMAR MI LTD	6315 Bandera Ave	Dallas	TX	75225-3621
TF JORGENSON BUSINESS	MANAGEMENT PARTNSHP LTD	NACOGDOCHES	TX	75961
THE WINAR GROUP LLC	C/O ROBBY ALLEN	JOSHUA	TX	76058
TURNER CHARLES R TRUSTEE	4201 Lomo Alto Dr Apt 109	Dallas	TX	75219-1511
UNITED STATES OF AMERICA	DEPT OF INTERIOR			
UNIVERSITY OF TEXAS	210 W 7th St	Austin	TX	78701-2903
VAGSHENIAN ATHENA	114 CRESTVIEW DR	AUSTIN	TX	78734
VAUGHAN BEN F III TRUSTEE OF THE	PO Box 460968	San Antonio	TX	78246-0968
WALLACE JUDITH LYN	3016 Mid Ln Unit B	Houston	TX	77027-5638
WATSON JOHN DOBREE AND WF	8005 Hidden Creek Ct	Mansfield	TX	76063-2088
WESTPLAN RESIDENTIAL FUND III LP	ONE GLENLAKE PARKWAY STE 1275	ATLANTA	GA	30328
WMI PROPERTIES LLC	605 E Dewey Pl	San Antonio	TX	78212-4012
WMI2 LLC	PO Box 90624	San Antonio	TX	78209-9088
WOLFE RONALD T & WF PAMELA K BURDA-WOLFE	211 COSTA BELLA DR	AUSTIN	TX	78734
YELLOW SHACK INVESTMENTS LLC	302 Dolphin Ln	Port Aransas	TX	78373-5405
ZARS KEITH M	12818 COUNTRY CREST	SAN ANTONIO	TX	78216-0000

## **Appendix A2**

### **Permit Application Modification, June 4, 2019**



## PORTCORPUSCHRISTI

June 4, 2019

Colonel Lars N. Zetterstrom, PE  
Commander, Galveston District  
USACE Galveston District  
P.O. Box 1229  
Galveston, Texas 77553

Attn: Jayson Hudson

**RE: SWG-2019-00067: Port of Corpus Christi Authority Channel Deepening Project - Permit Application Update**

Dear Colonel Zetterstrom:

In follow up to our April 8, 2019 letter and Mr. Heinley's letter dated May 23, 2019, the Port of Corpus Christi Authority is pleased to submit the revised permit application in support of the Channel Deepening Project. The proposed project would construct a channel capable of accommodating fully laden Very Large Crude Carriers (VLCCs) from multiple locations on Harbor Island into the Gulf of Mexico.

Enclosed with this letter is the ENG Form 4345 with supporting information prepared for the deepening and extension of the Corpus Christi Ship Channel and placement of the dredged material generated from the proposed activity. In addition to updating the project terminus from Station 54+00 to Station 110+00, supplement information for the coordination of the MPSRA Section 103 permit has been included in this package. This permit application modification will replace the documents previously provided to you for this permit.

Please contact Mr. Sepulveda by telephone at 713-278-4620 or by email at [carl.sepulveda@aecom.com](mailto:carl.sepulveda@aecom.com) should you require additional information to process the permit application.

Sincerely,

Sarah L. Garza  
Director of Environmental Planning & Compliance

cc: Sean C. Strawbridge, Chief Executive Officer  
Clark Robertson, Chief Operating Officer  
David L. Krams, PE, Director of Engineering Services  
Daniel J. Koesema, PE, CFM, Chief of Channel Development  
Paul D. Carangelo, REM, Coastal Development Planning Manager  
Beatriz Rivera, PE, Environmental Engineer





17. DIRECTIONS TO THE SITE

From the Port of Corpus Christi (222 Power Street, Corpus Christi, Texas), head west on Power Street to North Water Street. Turn right on North Broadway Street and take the ramp on the left on US-181 N. Merge onto US-181 N, continue onto TX-35 N. Take the TX-35 Business exit toward Farm to Market Road 1069/Aransas Pass. Continue onto TX-35 BUS N/W Wheeler Avenue. Slight right onto W. Wheeler Avenue. W Wheeler turns slightly right and becomes Harrison Blvd. Turn left onto W Goodnight Avenue. Continue onto TX-361 S/Redfish Bay Causeway for 5.2 miles.

18. Nature of Activity (Description of project, include all features)

The Port of Corpus Christi Authority (PCCA) proposes to deepen the Corpus Christi Ship Channel (CCSC) from the Gulf of Mexico to Harbor Island. From the offshore end of the federally authorized Entrance Channel at Station -330+00 to Station -72+50 (25,750 feet), the CCSC would be deepened beyond the currently authorized project depth of -56 feet MLLW to a depth of -77 feet MLLW plus two feet of advanced maintenance and two feet of allowable overdredge to a maximum depth of -81 feet MLLW. From Station -72+50 to Station 54+00 (12,650 feet) the CCSC would be deepened from authorized project depths of -56 feet MLLW and -54 feet MLLW to -75 feet MLLW plus two feet of advanced maintenance and two feet of allowable overdredge to a maximum depth of -79 feet MLLW. The PCCA also proposes to dredge a 29,000-foot entrance channel extension from the authorized Entrance Channel (Station -330+00) to a depth of -77 feet MLLW plus two feet of advanced maintenance and two foot of allowable overdredge to a maximum depth of -81 feet MLLW at Station -620+00 in the Gulf of Mexico. The overall length of the proposed project is approximately 13.8 miles. The Entrance Channel extension and increased channel depth would accommodate transit of fully laden Very Large Crude Carriers (VLCCs) expected to draft approximately 70 feet.

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

The purpose of the proposed project is to construct a channel with the capability to accommodate transit of fully laden VLCC from multiple locations on Harbor Island into the Gulf of Mexico. The proposed project would (1) allow for more efficient movement of U.S. produced crude oil to meet current and forecasted demand in support of national energy security and national trade objectives, (2) enhance PCCA's ability to accommodate future growth in energy production, and (3) construct a channel project that the PCCA can readily implement to accommodate industry needs. Currently, crude oil is exported using Aframax and Suezmax vessels. The Suezmax vessels are slight loaded (lightered) due to the depth restrictions in the existing CCSC, and would continue to be light loaded when the current federally-authorized -54-foot MLLW project is completed. Reverse lightering translates into additional vessel trips, cost, manhours, operational risk, and air emissions. (See Attachment A Section 2.0 for more details.)

**USE BLOCKS 20-23 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED**

20. Reason(s) for Discharge

Dredged material generated from construction of the proposed project and 10 years of maintenance material would be placed partially within existing authorized placement facilities, and partially within several areas in proximity to the proposed project for beneficial use. Dredged material judged to be suitable for beneficial use would be used to create several feeder berms in near-shore areas to nourish eroded beach areas, reestablish sand dune areas on San Jose Island that were breached by Hurricane Harvey, restore perimeter portions of placement areas that have experienced erosion, place material in areas adjacent to the interior CCSC that were breached by Hurricane Harvey, and enhance/armor the shoreline along Harbor Island and Harbor Island East in order to absorb/mitigate erosive forces of waves and ship wakes to protect adjacent areas of marsh and submerged aquatic vegetation. Dredged material judged to be unsuitable for beneficial use would be placed in authorized placement areas. (See Attachment A Section 1.2.) Proposed placement options are shown on the attached drawings.

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards:

Type	Type	Type
Amount in Cubic Yards	Amount in Cubic Yards	Amount in Cubic Yards
17.1 Million Cubic Yards of Clay	29.2 Million Cubic Yards of Sand	

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

Acres 1778 acres of open waters to be dredged for proposed channel and turning basin. See Attachment A Section 3.1 for placement details.  
or  
Linear Feet

23. Description of Avoidance, Minimization, and Compensation (see instructions)

See Attachment A Sections 5.0 and 6.0.



# CONSISTENCY WITH THE TEXAS COASTAL MANAGEMENT PROGRAM

**THE APPLICANT SHOULD SIGN THIS STATEMENT AND RETURN WITH APPLICATION PACKET TO:**

COASTAL PERMIT SERVICE CENTER  
602 N. STAPLES STREET, SUITE 240  
CORPUS CHRISTI, TX 78401  
FAX: (361) 888-9305

## FOR USACE USE ONLY:

PERMIT #: \_\_\_\_\_

PROJECT MGR: \_\_\_\_\_

## APPLICANT'S NAME AND ADDRESS (PLEASE PRINT):

Title  First  Last  Suffix

Mailing Address  Home

City  State  Zip Code  Work

Country  Email  Mobile

Fax

The Texas Coastal Management Program (CMP) coordinates state, local, and federal programs for the management of Texas coastal resources. Activities within the CMP boundary must comply with the enforceable policies of the Texas Coastal Management Program and be conducted in a manner consistent with those policies. The boundary definition is contained in the CMP rules (31 TAC §503.1).

• To determine whether your proposed activity lies within the CMP boundary, please contact the Permit Service Center at [permitting.assistance@glo.texas.gov](mailto:permitting.assistance@glo.texas.gov)

## PROJECT DESCRIPTION:

Is the proposed activity at a waterfront site or within coastal, tidal, or navigable waters?  Yes  No

If Yes, name affected coastal, tidal, or navigable waters: \_\_\_\_\_

Is the proposed activity water dependent?  Yes  No (31 TAC §501.3(a)(14))

<http://tinyurl.com/CMPdefinitions>

Please briefly describe the project and all possible effects on coastal resources:

Indicate area of impact: \_\_\_\_\_  acres or  square feet

## ADDITIONAL PERMITS/ AUTHORIZATIONS REQUIRED:

- Coastal Easement - Date application submitted: \_\_\_\_\_
- Coastal Lease - Date application submitted: \_\_\_\_\_
- Stormwater Permit- Date application submitted: \_\_\_\_\_
- Water Quality Certification - Date application submitted: \_\_\_\_\_
- Other state/federal/local permits/authorizations required: \_\_\_\_\_



The proposed activity must not adversely affect coastal natural resource areas (CNRAs).

**PLEASE CHECK ALL COASTAL NATURAL RESOURCE AREAS THAT MAY BE AFFECTED:**

- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Coastal Barriers       | <input type="checkbox"/> Critical Erosion Areas | <input type="checkbox"/> Submerged Lands              |
| <input type="checkbox"/> Coastal Historic Areas | <input type="checkbox"/> Gulf Beaches           | <input type="checkbox"/> Submerged Aquatic Vegetation |
| <input type="checkbox"/> Coastal Preserves      | <input type="checkbox"/> Hard Substrate Reefs   | <input type="checkbox"/> Tidal Sand or Mud Flats      |
| <input type="checkbox"/> Coastal Shore Areas    | <input type="checkbox"/> Oyster Reefs           | <input type="checkbox"/> Waters of Gulf of Mexico     |
| <input type="checkbox"/> Coastal Wetlands       | <input type="checkbox"/> Special Hazard Areas   | <input type="checkbox"/> Waters Under Tidal Influence |
| <input type="checkbox"/> Critical Dune Areas    |   |   |

*The applicant affirms that the proposed activity, its associated facilities, and their probable effects comply with the relevant enforceable policies of the CMP, and that the proposed activity will be conducted in a manner consistent with such policies.*

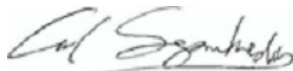
**PLEASE CHECK ALL APPLICABLE ENFORCEABLE POLICIES:**

<http://tinyurl.com/CMPpolicies>

	§501.15 Policy for Major Actions
	§501.16 Policies for Construction of Electric Generating and Transmission Facilities
	§501.17 Policies for Construction, Operation, and Maintenance of Oil and Gas Exploration and Production Facilities
	§501.18 Policies for Discharges of Wastewater and Disposal of Waste from Oil and Gas Exploration and Production Activities
	§501.19 Policies for Construction and Operation of Solid Waste Treatment, Storage, and Disposal Facilities
	§501.20 Policies for Prevention, Response and Remediation of Oil Spills
	§501.21 Policies for Discharge of Municipal and Industrial Wastewater to Coastal Waters
	§501.22 Policies for Nonpoint Source (NPS) Water Pollution
	§501.23 Policies for Development in Critical Areas
	§501.24 Policies for Construction of Waterfront Facilities and Other Structures on Submerged Lands
	§501.25 Policies for Dredging and Dredged Material Disposal and Placement
	§501.26 Policies for Construction in the Beach/Dune System
	§501.27 Policies for Development in Coastal Hazard Areas
	§501.28 Policies for Development Within Coastal Barrier Resource System Units and Otherwise Protected Areas on Coastal Barriers
	§501.29 Policies for Development in State Parks, Wildlife Management Areas or Preserves
	§501.30 Policies for Alteration of Coastal Historic Areas
	§501.31 Policies for Transportation Projects
	§501.32 Policies for Emission of Air Pollutants
	§501.33 Policies for Appropriations of Water
	§501.34 Policies for Levee and Flood Control Projects

Please explain how the proposed project is consistent with the applicable enforceable policies identified above. Please use additional sheets if necessary. *For example: If you are constructing a pier with a covered boathouse, then the applicable enforceable policy is: §501.24 Policies for Construction of Waterfront Facilities and Other Structures on Submerged Lands. The project is consistent because it will not interfere with navigation, natural coastal processes, and avoids/minimizes shading.*

BY SIGNING THIS STATEMENT, THE APPLICANT IS STATING THAT THE PROPOSED ACTIVITY COMPLIES WITH THE TEXAS COASTAL MANAGEMENT PROGRAM AND WILL BE CONDUCTED IN A MANNER CONSISTENT WITH SUCH PROGRAM



Signature of Applicant/Agent

Date

***Any questions regarding the Texas Coastal Management Program should be referred to:***

Jesse Solis  
Texas General Land Office  
602 N. Staples St., Suite 240  
Corpus Christi, Texas 78401  
Phone: (361) 886-1630  
Fax: (361) 888-9305  
[permitting.assistance@glo.texas.gov](mailto:permitting.assistance@glo.texas.gov)

Texas General Land Office  
Coastal Protection Division  
1700 North Congress Avenue, Room 330  
Austin, Texas 78701-1495  
Toll Free: 1-800-998-4GLO  
[federal.consistency@glo.texas.gov](mailto:federal.consistency@glo.texas.gov)

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Attachment A – Project Description

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**PORT OF CORPUS CHRISTI AUTHORITY  
CORPUS CHRISTI SHIP CHANNEL DEEPENING  
NUECES AND ARANSAS COUNTIES, TEXAS**

**Project Description for Corpus Christi Ship Channel Deepening Project**

**Department of the Army Permit Application SWG-2019-00067**

**Applicant: Port of Corpus Christi Authority**

**June 2019**

## Description for Corpus Christi Ship Channel Deepening Project

### 1.0 INTRODUCTION AND SUMMARY OF THE NATURE OF ACTIVITY

The Port of Corpus Christi Authority (PCCA) is requesting permit authorization from the U.S. Army Corps of Engineers (USACE) – Galveston District for the PCCA to conduct dredge and fill activities related to the deepening of a portion of the Corpus Christi Ship Channel (CCSC), hereinafter referred to as “the proposed project.” The proposed project requires dredging in navigable waters of the United States to deepen the portion of the CCSC from Harbor Island into the Gulf of Mexico, an overall distance of approximately 13.8 miles (Station 110+00 to Station -620+00) as shown on Sheet 2 of 23 of the permit drawings. The proposed project also involves the placement of fill (dredged material) in waters of the United States. Both of the proposed activities are regulated by the USACE.

The CCSC is currently authorized by the USACE to project depths of -54 feet and -56 feet mean lower low water (MLLW) from Station 110+00 to Station -330+00 as part of the Corpus Christi Ship Channel Improvement Project (CCSCIP). The current authorized width of the CCSC is 600 feet inside the jetties and 700 feet in the entrance channel. The proposed project would deepen the channel from Station 110+00 to Station -72+50 to a maximum depth of -79 feet MLLW (-75 feet MLLW plus two feet of advanced maintenance and two feet of allowable overdredge), and from Station -72+50 to Station -330+00, the channel would be deepened to a maximum depth of -81 feet MLLW (-77 feet MLLW plus two feet of advanced maintenance and two feet of allowable overdredge). The proposed project includes a 29,000-foot extension of the CCSC from Station -330+00 to Station -620+00 to a maximum depth of -81 MLLW (-77 feet MLLW plus two feet of advanced maintenance and two feet of allowable overdredge) to reach the -80-foot MLLW bathymetric contour in the Gulf of Mexico.

The proposed project is needed to accommodate transit of fully laden very large crude carriers (VLCCs) that draft approximately 70 feet. The deepening activities would be completed within the footprint of the authorized CCSC channel width. The proposed project does not include widening the channel; however, some minor incidental widening of the channel slopes is expected to meet side slope requirements and to maintain the stability of the channel. The proposed project including dredged material placement, is described below.

The following summarizes where information required by USACE Permit Engineering Form 4345 can be found in this attachment:

- Block 21: Type of Discharge – Section 1.1 discusses the amount and type of discharges anticipated to be generated by the channel improvements of the proposed action. Section 4 below provides details on the alternatives screening process, and Table 4.1 summarizes the new work dredge quantities and other attributes involved in the selection process, and of the proposed action.
- Block 22: Surface Area in Acres of Wetlands or Other Waters Filled – Section 3 describes the extent of the proposed affected waters, and summarizes potential impacts of the proposed action, and Table 3.1 summarizes the acreages of waters (associated with bay bottom impacted) proposed for excavation or fill.
- Block 23: Description of Avoidance, Minimization, and Compensation – Sections 4 and 5 describe the various channel and placement alternatives evaluated in the selection of the proposed action, as well as factors of avoidance and minimization of impacts to aquatic

resources where feasible involved in the selection process. Section 6 describes the mitigation or compensation proposed, as well as a summary of the aquatic impacts of the proposed action.

- Section 7 provides a short conclusion.

This project also proposes to use existing authorized Ocean Dredged Material Disposal Sites (ODMDS) regulated under the Marine Protection, Research and Sanctuaries Act (MPRSA) Section 103. Pursuant to the requirements to initiate a public notice listed in 33 CFR 325.3(a)(17), for Section 103 activities, the requisite information can be found in the sections listed below:

- The specific location of the proposed disposal site and its physical boundaries
  - See Section 1.3 Proposed Use of Existing Offshore Placement Sites
- A statement as to whether the proposed disposal site has been designated for use by the Administrator, EPA, pursuant to section 102(c) of the Act
  - See Section 1.3 Proposed Use of Existing Offshore Placement Sites
- A brief description of known dredged material discharges at the proposed disposal site
  - See Section 1.3 Proposed Use of Existing Offshore Placement Sites
- Existence and documented effects of other authorized disposals that have been made in the disposal area (e.g., heavy metal background reading and organic carbon content)
  - See Section 1.3 Proposed Use of Existing Offshore Placement Sites
- An estimate of the length of time during which disposal would continue at the proposed site; and Information on the characteristics and composition of the dredged material
  - See Sections 1.2 Proposed Dredged Material Placement Plan and 1.3 Proposed Use of Existing Offshore Placement Sites

## **1.1 Proposed Project**

To address changing market needs, the PCCA proposes to deepen the portion of the CCSC from Harbor Island (Station 110+00) into the Gulf of Mexico (Station -620+00) beyond the current authorized project depths of -54 feet and -56 feet MLLW to maximum depths of -79 feet and -81 feet MLLW to accommodate transit of fully laden VLCCs with drafts of approximately 70 feet. The overall project length is approximately 13.8 miles. The design depths are based on a detailed review of the dimensions of the VLCCs expected to call at the Port of Corpus Christi's (Port's) existing and proposed crude oil export terminals; the predominant density of crude oil to be exported and associated vessel drafts; environmental effects due to winds, waves and currents; and required under keel clearances, plus two feet of advanced maintenance and two feet of allowable overdredging depth. The proposed project does not include widening the channel, as the deepening activities would be completed within the footprint of the authorized CCSC channel width. However, some minor incidental widening would be expected to meet the side slope requirements of the deepened channel.

The proposed project consists of the following:

- Deepening from the authorized -54 feet MLLW to approximately -75 feet MLLW, with two feet of advanced maintenance and two feet of allowable overdredge, from Station 110+00 into the Gulf of Mexico to Station -72+50.
- Deepening from the authorized -56 feet MLLW to approximately -77 feet MLLW, with two feet of advanced maintenance and two feet of allowable overdredge, from Station -72+50 to Station -620+00 in the Gulf of Mexico.
- The existing Inner Basin at Harbor Island will be expanded as necessary to allow VLCC turning. This modification will also include a flare transition from the CCSC within Aransas Pass to meet the turning basin expansion.

The total length of the CCSC proposed for deepening is approximately 13.8 miles. The proposed project would generate an estimated 46.3 million cubic yards (MCY) of new work material from initial construction, consisting of approximately 36.9% clays (17.1 MCY) and 63.1% sand (29.2 MCY). The clay portion of the new work dredged material located in the offshore reaches (Station -620+00 to -72+50), approximately 13.8 MCY, would be placed at New Work ODMDs (NW ODMDs) located approximately 2.9 miles southeast of the Aransas Pass South Jetty and adjacent to the CCSC. The clay portion of new work dredged material from Stations -72+50 to Station 110+00 would be used beneficially where possible to create perimeter dikes. Proposed placement options for the new work material are described in more detail in Section 0.

## **1.2 Proposed Dredged Material Placement Plan**

The dredged material placement plan selected for this project proposes to place new work material in a series of existing upland Placement Area (PA) and Beneficial Use (BU) sites and proposed new BU sites to beneficially use the new work dredged materials (approximately 46.3 MCY) as much as possible, to expand either existing upland PAs or BU sites, and address shoreline repair needs within Redfish Bay, Corpus Christi Bay, and the Gulf of Mexico in the vicinity of the Preferred Channel Alternative. The plan is shown in Sheet 9 of 23. Detailed views and conceptual cross sections are provided in Sheets 11 through 23 of 23. This plan was a result of the screening and formulation of placement alternatives discussed in Section 5.0. Table 1.1 below summarizes the elements of the placement plan, each representing a singular type of placement. In all but the case of offshore feeder berms B1 through B6, each represents a single site and placement or BU initiative.

The plan predominantly involves (1) use of the approved existing offshore NW ODMDs, (2) other PA or BU expansion at existing sites used by the PCCA and the USACE to maintain the federally authorized CCSCIP to an authorized depth of -54 to -56 feet MLLW, or (3) new habitat restoration sites located in Redfish Bay, Corpus Christi Bay, or nature center that were identified/confirmed by resource agencies as desirable. These sites would be readily available given the use by the Federal project, for which PCCA is the Non-Federal Sponsor (NFS), and the desire to repair Hurricane Harvey damage and long term erosion.

For construction, new work materials would be placed at the NW ODMDs over approximately 10 months. The new work materials will consist of approximately 36.9% (17.1 Million Cubic Yards) of clays and 63.1% (29.2 Million Cubic Yards) of sand.

Currently, the application identifies that ten (10) years of maintenance material would be placed within the existing authorized PAs including the ODMDS No.1 with maintenance events that are expected to occur every two (2) years. Maintenance material is expected to continue to consist predominantly of sands with some silt as the current channel experiences.

One exception to the areas currently used by the Federal project is the dune and shore restoration at San Jose Island (SJI). The site is privately owned by the Bass Family and the planning team is coordinating with their representatives to ultimately gain approval to beneficially restore the extensive damage caused by Hurricane Harvey once additional restoration design detail is developed. Currently, the representatives indicate they view the concept positively and will continue to engage in coordination meetings with the planning team to advance towards acceptance of this BU initiative. Because it provides substantial placement capacity, is nearby, and could make use of the large volumes of sand in the channel new work prism to restore very important barrier island resources, it is retained in the placement plan. Since coordination is ongoing, more capacity was identified than needed to provide flexibility in placement options. Therefore, the bottom of Table 1.1 includes various scenarios for excluding SJI and comparing it to needed new work placement capacity. With SJI removed, there is excess placement capacity available at other BU and PA features in the unlikely scenario that SJI is ultimately excluded from the project.

The total maintenance quantity is estimated at 1.083 MCY per year, which includes an incremental increase of approximately 0.39 MCY due to the channel deepening beyond the limits of CCSCIP. The 10-year proposed action maintenance increment would be approximately 3.9 MCY. Dredged material from maintenance work would be placed in the existing ODMDS No. 1 in the vicinity of the CCSC, proposed offshore feeder berms B-1 through B-9, or existing PA 2, as material suitability allows. A screening of PAs and BU areas is detailed in Section 5.0. Maintenance materials for the CCSC are currently placed or are planned to be placed in the existing PAs and are routinely rotated between sites. ODMDS No. 1 and the proposed feeder berms B1-B9 are dispersive sites, and would be able to accommodate the project's relatively small incremental amount.



**Table 1.1: Selected New Work Placement Plan (See Sheet 9 of 23)**

Placement Option	Description	Placement Capacity (CY)	Proposed Restoration
M3	Estuarine/aquatic habitat creation adjacent to Pelican Island	3,798,000	This option will convert featureless bay bottom to approximately 300 acres of estuarine/aquatic habitat.
M4	Restoring historic land and marsh loss at Dagger Island	867,000	This option will restore eroding marsh habitat for native shorebirds and coastal wildlife. Design of project elements will be coordinated to support TPWD's existing permitted project.
PA9-S	Upland Placement Site Expansion behind PA9	9,000,000	This option does not restore aquatic habitat, it will convert featureless bay bottom to upland.
M10	Estuarine/aquatic habitat creation adjacent to PA10	10,933,600	This option will convert featureless bay bottom to approximately 770 acres of estuarine/aquatic habitat.
PA6	5 foot levee raise and fill	1,796,400	This option does not create any environmental benefit.
SS1	Restoring eroded and washed out shoreline	4,800,000	This option restores an eroded shoreline landmass and provides protection to Harbor Island Seagrass area.
SS2	Restore shoreline washouts along Port Aransas Nature Preserve as a result of Hurricane Harvey	669,700	Shoreline restoration that fills in the washouts caused by Hurricane Harvey that protects Piping Plover critical sand flat habitat.
PA4	Reestablish eroded shoreline and land loss in front of PA4	3,020,000	This option provides protection to Harbor Island Seagrass area.
HI-E	Bluff and Shoreline restoration with site fill	1,825,000	This option restores an eroding bluff and shoreline to its historic profile.
SJI	Dune and beach restoration San Jose Island	4,000,000	This option restores several miles of beach profile that was washed away as a result of Hurricane Harvey.
NW ODMDS	Place on New Work ODMDS (Homeport)	13,800,000	This option does not create any environmental benefit.
B1-B9	Feeder berms offshore of SJI and Mustang Island	8,100,000	This option will nourish beach shoreline by natural sediment transport processes.
MI	Beach Nourishment for Gulf side of Mustang Island	2,000,000	This option will nourish beach shoreline by direct sediment placement.
Scenarios for new work placement capacity provided and needed.		64,609,700	Total Capacity Provided
		60,609,700	Total capacity less SJI (should that option become unavailable)
		46,283,590	Total NW placement capacity required for Channel Preferred Alternative – Base Option
		14,326,110	Additional Capacity less SJI (should that option become unavailable)

### 1.3 Proposed Use of Existing Offshore Placement Sites

As discussed in Section 1.2, PCCA proposes the use of the existing approved NW ODMDs for new work dredged material generated from the proposed project and the ODMDs No. 1 for maintenance of the deepened channel. Both sites have been designated for use by EPA, pursuant to section 102(c) of the Act.<sup>1</sup> The following summarizes information on their location, prior designation and approval, and known material placement amounts and characterization. Information was obtained from the 2008 and 2017 Site Management and Monitoring Plans for the ODMDs sites.<sup>2,3</sup>

The CCSC ODMDs No.1 received the administrator’s final designation pursuant to section 102(c) on July 11, 1989. It is located approximately 1.5 miles offshore and about 1,000 feet southwest of the centerline of the Outer Bar Channel. The site is rectangular in shape with corner coordinates located at:

27°49'11.0994"N, 97°01'09.9546"W;  
 27°48'43.1022"N, 97°00'21.9522 "W;  
 27°48'07.1064"N, 97°00'48.9528"W;  
 27°48'34.1136"N, 97°01'36.9654"W.

The CCSC NW ODMDs is located approximately 3.4 miles offshore and about 6,200 feet southwest of the centerline of the Outer Bar Channel, occupying an area of approximately 1.36 square nautical miles. Water depths range from 46 to 53 feet. The site is rectangular in shape with corner coordinates at:

27°47'43.1052"N, 97°0'12.9522"W;  
 27°47'16.1052"N, 96°59'25.9512"W;  
 27°46'18.1086"N, 97°1'12.9512"W;  
 27°45'50.1084"N, 97°0'25.9488"W.

Historically, since 1969, the dredging frequency for this navigation project is approximately 2.1 years, with an average of about 1,377,887 CY of material excavated per dredging contract. Table 1.2 summarizes the known placement during this period.

**Table 1.2: ODMDs No. 1 Maintenance Placement History 1969-2007**

<b>Maintenance Dredging History</b>		
<b>Started</b>	<b>Completed</b>	<b>Quantity Dredged (Cubic Yards)</b>
May 12, 1969	July 3, 1969	898,568
June 8, 1970	July 19, 1970	570,010
May 19, 1971	September 25, 1971	4,846,577
July 3, 1972	June 30, 1973	1,749,500
March 5, 1973	March 26, 1973	123,036
July 1, 1973	November 6, 1973	1,586,547

<sup>1</sup> U.S. Environmental Protection Agency (USEPA) and U.S. Army Corps of Engineers (USACE) Galveston District. 2017. Corpus Christi, Nueces County, Texas Maintenance And New Work Ocean Dredged Material Disposal Sites Site Management And Monitoring Plan As Required By Section 102 Of The Marine Protection, Research, And Sanctuaries Act

<sup>2</sup> USEPA and USACE Galveston District. 2008. Corpus Christi Ship Channel, Texas Site Management Plan For The Maintenance Dredging Ocean Dredged Material Disposal Site As Required By Section 102 Of The Marine Protection, Research And Sanctuaries Act.

<sup>3</sup> USEPA and USACE Galveston District. 2017. Corpus Christi, Nueces County, Texas Maintenance And New Work Ocean Dredged Material Disposal Sites Site Management And Monitoring Plan As Required By Section 102 Of The Marine Protection, Research, And Sanctuaries Act

<b>Maintenance Dredging History</b>		
<b>Started</b>	<b>Completed</b>	<b>Quantity Dredged (Cubic Yards)</b>
September 23, 1976	October 27, 1976	1,026,053
April 20, 1977	May 31, 1977	671,622
April 14, 1978	August 2, 1978	337,704
August 14, 1980	March 1, 1981	4,205,334
August 10, 1982	September 30, 1982	969,500
August 22, 1984	October 12, 1984	1,865,930
September 4, 1992	December 6, 1992	1,774,816
August 9, 1995	September 18, 1995	724,339
June 11, 1999	July 11, 1999	1,417,492
April 9, 2003	July 7, 2003	930,657
July 21, 2006	August 10, 2006	149,706
February 24, 2007	May 23, 2007	954,566
<b>Total</b>		<b>24,801,957</b>
<b>Average</b>		<b>1,377,887</b>

Since the final designation of the ODMDS No.1 in 1989, however, the average quantity of material dredged and deposited offshore decreased to approximately 991,929 CY, while the dredging interval increased to about 2.5 years. Following the authorization of the Federal CCSCIP, quantities for the use of this site for Jetty and Entrance Channels, and Entrance Channel Extension were expected to double, resulting in a use of the site every two years. USACE also planned to use the site for other CCSIP segments less frequently for future suitable material. Table 1.3 summarizes the currently planned Federal maintenance frequency. The ODMDS No. 1 sediments can be characterized as predominantly sand (93.6%) with a small fraction of silt (0.5%) and clay (1.4%). The proposed excavated maintenance channel sediments can also be characterized as predominantly sand with some silt and clay.

**Table 1.3: ODMDS No. 1 Maintenance Placement Frequency at Present**

<b>Channel Segments</b>	<b>Dredge Area Stations</b>	<b>Estimated Volume per Contract (CY)</b>	<b>Dredging Rate (years)</b>
Entrance Channel	-210+00 to 36+00	1,000,000	2.0
Inner Basin to La Quinta	36+00 to 500+00	800,000	5.0
La Quinta to Beacon 82	500+00 to 1090+00	1,000,000	2.0
Beacon 82 to Viola TB (Inner Harbor)	1100+00 to 1587+00	1,500,000	4.0
La Quinta	0+00 to 382+00	500,000	3.0
Rincon	0+00 to 150+00	400,000	7.0

For the NW ODMDS, the site, originally designated for use for the U.S. Navy Homeport Project, has not been used; that project was not implemented. The Federally-authorized CCSCIP has planned to place 2.5 MCY of new work material from the Entrance Channel, which is a segment proposed for further deepening under this permit application.

On September 24, 1992, a Regional Implementation Agreement (RIA) was executed between EPA Region 6, and the Galveston District. This RIA was updated on November 3, 2003, and describes protocols for evaluating the quality of the dredged material and implementation of the Green Book, Inland Testing Manual.<sup>4</sup> These protocols describe chemical parameters to be analyzed, required detection limits, how toxicity testing and bioaccumulation assessments are to be conducted, and test organisms to be used. Since that time, all sediment evaluations have been conducted in accordance with the RIA. Since the mid-1970s, before the development of the RIA, dredged material from the CCSC Project was evaluated numerous times to determine suitability for offshore placement. This testing was performed to determine levels of metals and organic constituents, as well as toxicity and bioaccumulation assessments. Testing performed for this project is summarized in the following table:

**Table 1.4: Summary of Testing for Dredged Material to be placed in ODMS No.1 and New Work ODMS**

<b>Date</b>	<b>Type of Testing</b>
<b>Maintenance Sediment Testing History</b>	
September 17, 1975	Pre-dredging Bulk Analyses
October 6, 1975	During-dredging Bulk Analyses
December 2, 1975	After-dredging Bulk Analyses
April 1978	Toxicity and Bioaccumulation Assessment
October 1978	Toxicity and Bioaccumulation Assessment
July 1980	Toxicity and Bioaccumulation Assessment
January 14, 1982	Pre-dredging Bulk Analyses
February 22, 1983	Pre-dredging Bulk Analyses
July 3, 1984	Pre-dredging Bulk Analyses
April 1985	Toxicity and Bioaccumulation Assessment
May 15, 1985	Pre-dredging Bulk Analyses
March 28, 1986	Pre-dredging Bulk Analyses
March 18, 1987	Pre-dredging Bulk Analyses
March 15, 1988	Pre-dredging Bulk Analyses
April 7, 1989	Pre-dredging Bulk Analyses
March/April 1990	Pre-dredging Bulk Analyses
July 20, 1993	Pre-dredging Bulk Analyses
September 1995	Toxicity and Bioaccumulation Assessment
January 28, 1999	Pre-dredging Bulk Analyses
November 2000	Pre-dredging Bulk Analyses
August 2002	Toxicity and Bioaccumulation Assessment
July 2009	Toxicity and Bioaccumulation Assessment
January 2015	Toxicity and Bioaccumulation Assessment
<b>New Work (Virgin Sediment) Testing History</b>	
December 2016/January 2017	Toxicity and Bioaccumulation Assessment

<sup>4</sup> U.S. Environmental Protection Agency/U.S. Army Corps of Engineers (USEPA/USACE). 1991. Evaluation of Dredged Material Proposed for Ocean Disposal - Testing Manual. EPA-503/891/001. U.S. Environmental Protection Agency and U.S. Army Corps of Engineers, Washington, D.C.

The above testing indicated that the material was suitable for offshore placement without special management conditions.

Prior to initiation of construction of the first segment of the CCSCIP, the previous testing and most recent testing (conducted in 2016/2017) were reviewed to determine the suitability of the new work material for the placement in the NW ODMDS. Below is a synopsis of conclusions in the assessment report to approve new work material use under Section 103;<sup>5</sup>

- Surface Water and Elutriate: No concerns for the Entrance Channel for testing conducted from 1984 through 2014;
- New work sediment: Slightly elevated levels of copper and lead were found in entrance channel sediments in 1984. Sampling reports as recent as 2009 and 2015 indicate no exceedances in sediment samples when compared to the Effects Range-Low (ERL) standards (NOAA SQiRTs, Buchman, 1999);
- Bioassays using maintenance material: Acute toxicity to water column organisms was not of concern for the Entrance Channel/eastern portions of the Lower Bay reach under consideration in this sampling and analysis effort. Testing in 2015 determined that there is low potential for undesirable effects due to bioaccumulation because of the presence of individual chemicals or of the solid phase of the dredged material.
- For the most recent new work testing, new work sediment and site surface water was sampled to analyze bulk sediment and elutriate for chemistry, suspended particulate phase (SPP) bioassay, direct toxicity bioassay, and bioaccumulation bioassays for both reference and new work sediments. Constituents analyzed included a wide suite of analytes including volatile organic compounds (VOC), semi-volatile VOCs (SVOC), Polyaromatic Hydrocarbons (PAH), Metals, Mercury, Pesticides, Polychlorinated Biphenyls (PCB), Total Petroleum Hydrocarbon (TPH), Total and Dissolved Organic Carbon (TOC, DOC), Selenium, and Ammonia.
- A lines of evidence analysis using results of sampling, testing and evaluation for offshore disposal in 2018 of the of the CCSC Entrance Channel and Extension sediment, site water, and elutriate, as well as toxicity and bioaccumulation testing, concluded that no adverse environmental effects would be expected from dredging or placement of the sediment from the project area into the NW ODMDS. The sediments from the project area met the Limiting Permissible Concentration (LPC) and were suitable for open water ocean placement.

New construction sediments are not expected to adversely impact human health or the environment, and the evaluation supported by this sampling and analysis effort included site surface water, sediment, elutriates, suspended particulate phase (SPP) bioassay, direct toxicity bioassay, and bioaccumulation bioassays for both reference and new work sediments.

The proposed further extension outward of the CCSC Entrance Channel and Extension would not be expected to be subject to impacts different from the CCSC Entrance Channel and Extension as it is undredged, existing Gulf of Mexico sea bottom. However, a Sampling and Analysis Plan has been prepared to confirm this and supports the approval to use the ODMDS sites under Section 103 MPRSA.

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<sup>5</sup> Montgomery C.R., and Bourne, E.M. 2018. Sampling, Chemical Analysis, and Bioassessment in Accordance with MPSRA Section 103, Corpus Christi Ship Channel (CCSC) Improvement Project, Entrance Channel and Extension Corpus Christi, TX. USACE Engineer Research and Development Center, Environmental Laboratory, Vicksburg, MS

## **2.0 PURPOSE AND NEED FOR PROJECT**

The purpose of the proposed project is to construct a channel with the capability to accommodate transit of fully laden Very Large Crude Carriers (VLCCs) from multiple locations on Harbor Island into the Gulf of Mexico. Factors influencing the Applicant's need for the project include:

- Allow for more efficient movement of U.S. produced crude oil to meet current and forecasted demand in support of national energy security and national trade objectives,
- Enhance the PCCA's ability to accommodate future growth in energy production, and
- Construct a channel project that the PCCA can readily implement to accommodate industry needs.

Currently, crude oil is exported using Aframax and Suezmax vessels. The Suezmax vessels are sometimes light loaded (lightered) due to depth restrictions in the existing CCSC, and would continue to be light loaded when the current federally-authorized CCSC deepening project is completed. Reverse lightering translates into additional vessel trips, cost, man hours, operational risk, and air emissions. To efficiently and cost effectively move crude oil cargo, oil exporters are increasingly using fully loaded vessels, including VLCCs. Non-liquid commodity movements are also trending toward larger, more efficient vessels. In order to fulfill its mission of leveraging commerce to drive prosperity in support of national priorities, the PCCA must keep pace with the global marketplace.

The need for the proposed project is driven by the considerations below, which are explained in the following paragraphs:

- Pipelines from Eagle Ford and Permian Basins are being constructed to the Port of Corpus Christi and to Harbor Island. Crude oil terminals are also being planned at Harbor Island using the Federally-authorized -54-foot deep channel that limits the ability to fully load VLCCs, decreasing efficiency by requiring reverse lightering of these vessels.
- Bolstering national energy security through the growth of U.S. crude exports.
- Protecting national economic interests by decreasing the national trade deficit.
- Supporting national commerce by keeping pace with existing and expanded infrastructure being modified or already under development to export crude oil resulting from the large growth in the Permian and Eagle Ford oil field development, which has helped the U.S. recently become the top oil-producing nation in the world.
- Improve safety and efficiency of water-borne freight movements.

The infrastructure and proximity to the major Texas shale plays makes the Port an attractive location for efficiently exporting crude oil by VLCC vessels. The PCCA has received interest from new and existing customers for developing crude oil export terminals and facilities. Production and export of crude oil and natural gas have greatly increased over the years and are providing an economic boom to the Port and the region.

Investments at the PCCA that are directly aimed at product from the Eagle Ford Shale are over \$100 million. In the latter part of July 2018, the PCCA sold more than \$216 million in bonds to fund energy export products. A portion of this money will be used for the authorized deepening of the CCSC, but

also will help fund other improvements, including a crude oil export terminal under design at Harbor Island. The new oil export terminals being planned at the Port will have loading arms, handling equipment, storage tanks, and other related facilities for larger ships including VLCCs. Similar crude export facilities are being planned by multiple other entities at Harbor Island.

More efficient transport of crude in greater volumes is the impetus for the PCCA to deepen the channel to accommodate fully loaded VLCCs. Presently, the existing channel depth requires that current crude carriers, whether VLCCs or other vessels, not depart fully loaded from the Port, or that VLCCs remain offshore while smaller tankers transfer their cargo to the larger VLCCs, a process known as reverse lightering. The inefficiency of this process is compounded by some of these smaller vessels not being able to be fully loaded while moving through the Port.

Production from the Permian and Eagle Ford basins continues to increase, and several of the major midstream companies are currently undergoing major expansions to facilitate the export of greater volumes of crude. As these exports increase, the number of lightering vessels and product carriers will also increase, adding to shipping delays and congestion inside and outside of the Port. These delays and congestion will increase the cost of transportation, which in turn will increase the cost of crude oil with the ultimate consequence of making U.S. crude less competitive in the global market.

### **3.0 SITE ANALYSIS**

The proposed project is located in the Gulf of Mexico, the southern portion of Corpus Christi Bay, and Redfish Bay near Port Aransas as shown in Sheet 1 of 23. The Port is located in Corpus Christi Bay on the south-central portion of the Texas coast, approximately 200 miles southwest of Galveston and approximately 150 miles north of the mouth of the Rio Grande. The CCSC provides deep water access from the Gulf of Mexico to the Port via Port Aransas, through Corpus Christi Bay. The CCSC extends from deep water in the Gulf of Mexico approximately 4.3 miles offshore through the Port Aransas jettied entrance, then continues for 21 miles westward to the Inner Harbor. The proposed project would be constructed within the limits of the CCSC from the Gulf of Mexico to Harbor Island, which comprises the Entrance Channel segment and approximately 2,000 linear feet of the Lower Bay segment of the CCSC. The Entrance Channel segment of the CCSC is currently maintained to a depth of -49 feet MLLW, and the Lower Bay segment to a depth of -47 feet MLLW. The CCSC has been federally authorized to a depth of -56 feet MLLW from the Gulf of Mexico to the end of the jetties in the Entrance Channel segment, and to -54.0 feet MLLW in the Lower Bay segment. Dredging work to reach the authorized depths is scheduled to begin in mid-2019.

#### **Affected Waters**

The proposed improvements to the CCSC would take place in the open water marine environment of the Gulf of Mexico and Corpus Christi Bay. Waters in the project area are navigable waters of the United States (WOUS) regulated by the USACE under Section 10 of the Rivers and Harbors Act of 1899. The areas of proposed channel deepening are unvegetated. Deepening of the CCSC would take place in WOUS, and the proposed improvements were detailed in Section 1.1 above, and were shown in Sheets 2 through 8 of 23. The estimated amounts of new work dredging and maintenance dredging were also listed in Sections 1.1 and 1.2. Similarly, waters occurring in the areas of proposed dredged material placement, whether for upland placement or for BU, are also navigable waters of the United States (i.e. subject to the ebb and flow of the tide) regulated by the USACE. The channel amounts were determined using Computer Aided Design (CAD) and Geographical Information System (GIS) analysis with proposed channel widths and projected daylight lines (where channel template meets existing bathymetry) using the most current bathymetric data available from the USACE and surveyed for this project. The estimated amount of WOUS was 1,664 acres between the projected side slopes of the

deepened channel. Of that, a very small patch of seagrass is mapped in the Aransas Pass within the jetties. Approximately two acres of upland at the southwest corner of San Jose Island falls within the daylight of the projected side slope of the turning basin expansion. The expansion footprint was based on empirical design criteria in Engineer Manual (EM) 1110-2-1613 *Hydraulic Design of Deep Draft Navigation Projects*, and without consideration of the potential use of sheet piling to reduce the side slope required. Additional ship simulation will be conducted in 2019 to determine if the required turning basin diameter can be reduced. A summary of potential impacts of the channel WOUS including wetlands is summarized in Table 3.1.

For placement impacts, GIS features based on the proposed template extent using existing National Oceanic and Atmospheric Administration (NOAA) bathymetry and CAD analysis were used in conjunction with existing seagrass and oyster habitat mapping downloaded from NOAA, Texas General Land Office (TGLO) and Texas Parks & Wildlife Department (TPWD). The National Wetland Inventory (NWI) data was used to identify potential mapped wetland habitat. Open water acreage was derived using a land, shoreline and water data set sourced from ESRI and Texas Department of Transportation (TXDOT), which was found to match aerial imagery well. Habitat features were clipped using the placement footprints and review of the mapped habitat was conducted using a current ESRI aerial (2018) to verify the nature of mapped features. A summary of potential impacts of the placement plan to WOUS including wetlands, and other special aquatic sites is provided in Table 3.2. The comments in the table show individually the results of aerial review in examining the nature of the mapped habitat. In several cases, the NWI identified ponded features early in the life of an active PA that have since been filled. In others, the feature had eroded away. In various cases, the BU feature is a shoreline restoration that would protect resources in the interior of the BU feature, such as M4, and not impact all the interior mapped acreage. Reductions of these acreages from being counted as adverse impacts are shown in the adjustment column, and the net result is shown as the estimated adverse impact. The bottom of the table summarizes the acreage that after considering the aerial review would likely be adversely impacted. For each impact at each site, measures that could minimize or replace the impacted habitat are identified

The PCCA's environmental precepts include a) wildlife habitat development, improvements, and replacement when modification to existing habitat is necessary and b) environmental sustainability in the development of PCCA facilities and in ongoing port operations. The PCCA's goal is to execute projects in a manner that restores resources impacted by a project, and to contribute to resource restoration as a result of project actions even if the project impacts are minimal. The PCCA's practice is to consider and incorporate BU activities where practicable in managing dredged material generated by channel projects.



Table 3.1: Channel Impacts to Gulf and Estuarine Bottom (See Sheet 2 through 4 of 23)

Channel Impacts to Waters of the U.S.		Channel Acres			Channel Impact		
Segment	Impact	Toe to Toe	Total Including Side Slope	Side Slope Acreage	Upland Acreage	Seagrass Acreage	WOUS (Deepwater)
New Entrance Channel Extension	Deepening from natural depth (varies -62 ft to -81 ft MLLW) to -77 ft MLLW + 2 ft adv. maint.+ 2 ft overdredge <b>(-81 ft MLLW)</b>	455.4	588.8	133.4	-	-	588.8
54-foot Authorized Entrance Channel Extension	Deepening from -56 ft MLLW to -77 ft MLLW + 2 ft adv. maint + 2 ft overdredge <b>(-81 ft MLLW)</b>	146.9	260	113.1	-	-	260
Existing Channel	Deepening from -56 ft MLLW to -77 ft MLLW +2 ft adv. maint +2 ft overdredge (-81 ft MLLW) and from -54 ft MLLW to -75 ft MLLW +2 ft adv. maint +2 ft overdredge <b>(-79 ft MLLW)</b>	518.9	734.8	215.9	2.00	0.11	732.69
Turning Basin (area outside of the existing basin footprint) and Flare	Deepen portions of the Lydia Ann Channel from between -54 ft MLLW to <b>-75 ft MLLW</b>	56.68	82.42	25.74	-	-	82.42
<b>TOTAL</b>		1,178	1,666	488	2.00	0.11	1,664

Table 3.2: Impacts to Mapped Aquatic Habitat (See Sheet 9 of 23)

Placement Option	Total Site Acres	Mapped Habitat									Open Water WOUS (ac.)
		Wetland					Seagrass				
		Acres	Predominant Type	Comment	Impact Review Adjustment	Est. Adverse Impact	Acres	Comment	Impact Review Adjustment	Est. Adverse Impact	
B1	80.0	-	-	-	-	-	-	-	-	-	80.0
B2	80.5	-	-	-	-	-	-	-	-	-	80.5
B3	83.8	-	-	-	-	-	-	-	-	-	83.8
B4	83.8	-	-	-	-	-	-	-	-	-	83.8
B5	83.8	-	-	-	-	-	-	-	-	-	83.8
B6	83.8	-	-	-	-	-	-	-	-	-	83.8
B7	124.0	-	-	-	-	-	-	-	-	-	124.0
B8	124.0	-	-	-	-	-	-	-	-	-	124.0
B9	124.0	-	-	-	-	-	-	-	-	-	124.0
HI-E	138.7	36.2	Estuarine and Marine Wetland	Features appear to have eroded away	-7.7	28.6	0.0	-	0.0	0.0	3.3
M3	332.6	-	-	-	-	-	17.1	Restoration of larger area to create marsh. Elevation could be suitable for seagrass establishment too.	-9.5	7.6	332.6
M4	702.6	68.9	Estuarine and Marine Wetland	Interior wetlands that would be avoided, and exterior would be integrated with through placement	-68.9	0.0	571.5	Interior acreage would not be impacted except at fringes. BU feature would protect this from further loss.	-571.5	0.0	546.3
PA9-S	329.3	-	-	-	-	-	3.1	Restoration of larger area to create uplands. In recent years aerials do not show evidence of Seagrass stands. If in existence seagrass is sparse and tenuous, most likely because of focused wave energy in the area.	-3.1	0.0	308.8
M10	769.9	-	-	-	-	-	2.5	Restoration of larger area to create marsh. Elevation could be suitable for seagrass establishment too. In recent years aerials do not show evidence of Seagrass stands. If in existence seagrass is sparse and tenuous, most likely because of focused wave energy in the area.	-2.5	0.0	752.9

Placement Option	Total Site Acres	Mapped Habitat									Open Water WOUS (ac.)
		Wetland					Seagrass				
		Acres	Predominant Type	Comment	Impact Review Adjustment	Est. Adverse Impact	Acres	Comment	Impact Review Adjustment	Est. Adverse Impact	
MI	362.2	211.7	Estuarine and Marine Wetland	Consists of entirely of unconsolidated shoreline to be restored	-211.7	0.0	-	-	-	-	262.1
NW_ODMDS	1180.4	-	-	-	-	-	-	-	-	-	1180.4
PA4	163.1	51.5	Freshwater Emergent Wetland	Identified within active PA or Feature appear to have eroded away	-51.5	0.0	0.0	Minor fringe impact. BU would protect much larger seagrass area from future losses.	0.0	0.0	3.3
PA6	269.8	143.0	Lake	Identified within active PA. Feature appears associated with earlier filling of this PA and is no longer apparent in current aerials.	-143.0	0.0	-	-	-	-	0.8
SJI	593.0	279.4	Estuarine and Marine Wetland	Consists of entirely of shoreline to be restored	-279.4	0.0	-	-	-	-	334.3
SS1	307.6	157.3	Estuarine and Marine Wetland	Would be replaced by created upland to protect seagrass area behind it from future loss	0.0	157.3	94.1	Restoration of shoreline to bolster against future erosion of much larger area of seagrass behind feature. Due to shifting uplands and erosion over recent years much of the seagrass no longer appears to be visible within aerials.	-43.3	50.8	81.4
SS2	94.8	36.5	Estuarine and Marine Wetland	Unconsolidated shoreline that eroded away during Harvey. Placement would restore protective shoreline for interior sand flats.	-36.5	0.0	-	-	-	-	-
<b>TOTALS</b>	<b>6111.7</b>	<b>984.5</b>				<b>185.9</b>	<b>688.3</b>			<b>58.5</b>	<b>4,673.9</b>
									<b>Sum of all Habitat Acreage</b>		6,346.7
									Estimated Adverse Impacts (Seagrass & Wetlands)		All Habitat
									<b>Sum of all Impacted Mapped Habitat Acreage</b>		4,918.2

### 3.1 Threatened and Endangered Species

The U.S. Fish and Wildlife Services (USFWS) Information for Planning Conservation (IPaC) report identified 16 federally listed or proposed to be listed species that have the potential to occur within Nueces and Aransas Counties. According to TPWD, there are 39 state listed species that have the potential to occur within Nueces and Aransas Counties. The National Marine Fisheries Service (NMFS) lists 15 marine species with the potential to occur along the Texas Gulf Coast. Table 3.3 summarizes species that are listed as endangered, threatened, or candidate by USFWS, TPWD, or NMFS.

Of the federally-listed species, the following species are expected to have the relevant type of habitat present in the waters and aquatic habitat of Corpus Christi and Redfish Bays, and along the barrier islands of Mustang Island and San Jose Island, in the vicinity of the proposed project: Piping Plover (*Charadrius melodus*), Red Knot (*Calidris canutus rufa*), West Indian Manatee (*Trichechus manatus*) Green sea turtle (*Chelonia mydas*) Hawksbill sea turtle (*Eretmochelys imbricate*), Kemp's Ridley sea turtle (*Lepidochelys kempii*), Leatherback sea turtle (*Dermochelys coriacea*), and Loggerhead sea turtle (*Caretta caretta*)

In addition to the federally-protected species, the TPWD maintains separate county-specific lists of threatened and endangered species that may potentially occur as resident or migrant species in the project area. The TPWD protected species are listed in the following table. All species listed in the following table were compiled from USFWS and TPWD county-specific lists for Nueces and Aransas Counties. State-listed species with “rare” designation were not considered due to their non-regulatory status under the Endangered Species Act.

**Table 3.3: Listed Threatened, Endangered, and Candidate Species for Nueces and Aransas Counties, TX**

Common Name	Scientific Name	Listing Status		
		USFWS IPaC List	TPWD	NMFS
<b>Amphibians</b>				
Black-spotted newt	<i>Notophthalmus meridionalis</i>	NL	T	NL
Sheep frog	<i>Hypopachus variolosus</i>	NL	T	NL
South Texas siren (large form)	Siren sp 1	NL	T	NL
<b>Birds</b>				
Attwater's greater prairie-chicken	<i>Tympanuchus cupido attwateri</i>	E	E	NL
Bald Eagle	<i>Haliaeetus leucocephalus</i>	DL	T	NL
Black rail	<i>Laterallus jamaicensis</i>	PT	NL	NL
Botteri's sparrow	<i>Peucaea botterii</i>	NL	T	NL
Golden-cheeked warbler	<i>Setophaga chrysoparia</i>	E	E	NL
Northern Aplomando				NL
Falcon	<i>Falco femoralis septentrionalis</i>	E	E	
Piping Plover	<i>Charadrius melodus</i>	T	T	NL
Red Knot	<i>Calidris canutus rufa</i>	T	NL	NL
Reddish Egret	<i>Egretta rufescens</i>	NL	T	NL
Rose-throated becard	<i>Pachyramphus aglaiae</i>	NL	T	NL
Sooty Tern	<i>Onychoprion fuscatus</i>	NL	T	NL
Swallow-tailed kite	<i>Elanoides forficatus</i>	NL	T	NL
Texas Botteri's Sparrow	<i>Peucaea botterii texana</i>	NL	T	NL
Tropical parula	<i>Setophaga pitiayumi</i>	NL	T	NL

Common Name	Scientific Name	Listing Status		
		USFWS IPaC List	TPWD	NMFS
White-faced Ibis	<i>Plegadis chihi</i>	NL	T	NL
White-tailed hawk	<i>Buteo albicaudatus</i>	NL	T	NL
Whooping Crane	<i>Grus americana</i>	E	E	NL
Wood stork	<i>Mycteria americana</i>	NL	T	NL
<b>Fishes</b>				
Opossum pipefish	<i>Microphis brachyurus</i>	NL	T	NL
Oceanic whitetip shark	<i>Carcharhinus longimanus</i>	NL	NL	T
Giant manta ray	<i>Manta birostris</i>	NL	NL	T
<b>Mammals</b>				
Gulf Coast Jaguarundi	<i>Herpailurus yagouaroundi cacomitli</i>	E	E	NL
Ocelot	<i>Leopardus pardalis</i>	E	E	NL
Humpback whale	<i>Megaptera novaeangliae</i>	E	E	E
Southern yellow bat	<i>Dasypterus ega</i>	NL	T	NL
West Indian Manatee	<i>Trichechus manatus</i>	T	E	NL
White-nosed coati	<i>Nasua narica</i>	NL	T	NL
Fin whale	<i>Balaenoptera physalus</i>	NL	NL	E
Sei whale	<i>Balaenoptera borealis</i>	NL	NL	E
Sperm whale	<i>Physeter macrocephalus</i>	NL	NL	E
Gulf of Mexico Bryde's whale	<i>Balaenoptera edeni – subspecies</i>	NL	NL	C
<b>Corals</b>				
Lobed star coral	<i>Orbicella annularis</i>	NL	NL	T
Mountainous star coral	<i>Orbicella faveolata</i>	NL	NL	T
Boulder star coral	<i>Orbicella franksi</i>	NL	NL	T
Elkhorn coral	<i>Acropora palmata</i>	NL	NL	T
<b>Clams/Mollusks</b>				
Golden Orb	<i>Quadrula aurea</i>	C	T	NL
<b>Reptiles</b>				
Green sea turtle	<i>Chelonia mydas</i>	T	T	T
Hawksbill sea turtle	<i>Eretmochelys imbricata</i>	E	E	E
Kemp's Ridley sea turtle	<i>Lepidochelys kempii</i>	E	E	E
Leatherback sea turtle	<i>Dermochelys coriacea</i>	E	E	E
Loggerhead sea turtle	<i>Caretta caretta</i>	T	T	T
Texas horned lizard	<i>Phrynosoma cornutum</i>	NL	T	NL
Texas indigo snake	<i>Drymarchon melanurus erebennus</i>	NL	T	NL
Texas scarlet snake	<i>Cemophora coccinea lineri</i>	NL	T	NL
Texas tortoise	<i>Gopherus berlandieri</i>	NL	T	NL
<b>Plants</b>				
Black lace cactus	<i>Echinocereus reichenbachii var. albertii</i>	E	E	NL
Slender Rush-pea	<i>Hoffmannseggia tenella</i>	E	E	NL
South Texas Ambrosia	<i>Ambrosia cheiranthifolia</i>	E	E	NL

E = Endangered, T = Threatened, C = Candidate, DL - Delisted, NL = Not Listed

Of the five turtle species that are listed by the NMFS and USFWS, only the Kemp's Ridley, green, and loggerhead sea turtles are likely to occur in bay waters in the vicinity of the proposed project area. The

hawksbill and leatherback sea turtles are not likely to be found within the project area due to a lack of suitable habitats. Hawksbill sea turtles are unlikely to occur in the project study area, as they prefer clear offshore waters where coral reef formations are present. Leatherback sea turtles are unlikely to occur in the project study area, as they primarily inhabit the upper reaches of the ocean, and also frequently descend into deep waters from 650 to 1,650 feet in depth.

Critical habitat in the proposed project footprint is shown in Figure 3.2. Critical habitat for the loggerhead sea turtle (Sargassum habitat) was designated in 2014 for the offshore waters of the Gulf of Mexico (LOGG-S-2 Gulf of Mexico Sargassum) that includes an existing NW ODMDs and 10.57 nautical miles of the outer channel and approach channel dredging segments. LOGG-S-2 Gulf of Mexico Sargassum critical habitat contains developmental and foraging habitat for young turtles where surface waters form accumulations of floating material, especially Sargassum.

Dredging operations for the proposed project would be conducted primarily using hydraulic cutterhead dredges, which move at slow enough speeds that turtles would be able to move out of the way of the hydraulic cutterhead. Non-hopper dredges are not known to take sea turtles.<sup>6</sup> It is anticipated that hydraulic dredging for the project would not cause adverse impacts to sea turtles.

Hopper dredging may be used for channel segments where material and placement is more suitable for hopper dredging. In those cases, material would be transported and placed by hopper dredge. The impact of hopper dredging is being determined in the Biological Assessment (BA) but is expected that impacts would not adversely affect loggerhead sea turtles that use critical habitat when Sargassum is present, following recent clarification to the 2007 Gulf of Mexico Regional Biological Opinion (GRBO) on hopper dredging.<sup>7</sup> The best management practices (BMPs) recommended in the GRBO would be employed when hopper dredging. Therefore, dredging associated with the proposed project is unlikely to have long-term negative effects on this species other than temporary displacement of individuals from the channel area, which would also be expected during regular maintenance dredging of the channel.

The proposed NW ODMDs may impact this critical habitat during the placement of dredged material; however, this ODMDs is already approved for use, and a 2016 NMFS memo clarified that any temporary turbidity plumes generated by dredged material placement would be unlikely to cause lasting impacts to Sargassum habitat or juvenile sea turtles that may be foraging in the area.<sup>8</sup>

Critical habitat for wintering piping plovers on the Texas Gulf Coast was designated by the USFWS in 2001 and was expanded to its current extent in 2009. Numerous factors determine critical habitat placement, including consistent winter occupancy, wetlands inventory data, habitat fragmentation, and availability of foraging, feeding, and roosting areas. Proposed PA SJI located on San Jose Island and SS2 located within Corpus Christi Bay (along the southern toe of the CCSC and adjacent to the Port Aransas Nature Preserve) would impact designated final critical habitat. Both these proposed PAs experienced a significant amount of coastal erosion during Hurricane Harvey in 2017, and have been

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<sup>6</sup> NMFS. 2003. Endangered Species Act - Section 7 Consultation Biological Opinion – Dredging of Gulf of Mexico Navigation Channels and Sand Mining ("Borrow") Areas Using Hopper Dredges by COE Galveston, New Orleans, Mobile, and Jacksonville Districts (Consultation Number F/SER/2000/01287). National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, Protected Resources Division St. Petersburg, Florida

<sup>7</sup> NMFS. 2016. Roy E. Crabtree/NOAA Fisheries March 4, 2016 Memorandum to Alvin B. Lee, SES/USACE, South Atlantic Division, Subject: Continued Operations of Maintenance Dredging and Beach Sand Placement Actions under the 2007 Gulf of Mexico Regional Biological Opinion (GRBO)(I/SER/2015/17543).

<sup>8</sup> NMFS. 2016. Roy E. Crabtree/NOAA Fisheries March 4, 2016 Memorandum to Alvin B. Lee, SES/USACE, South Atlantic Division, Subject: Continued Operations of Maintenance Dredging and Beach Sand Placement Actions under the 2007 Gulf of Mexico Regional Biological Opinion (GRBO)(I/SER/2015/17543)

targeted for beach nourishment and BU with this project.<sup>9</sup> Barrier island and beach erosion can be accelerated in the aftermath of large storm events<sup>10</sup>; therefore, preservation of this critical habitat is paramount in a time of increasing development and industrialization along the Texas Gulf Coast.

PA SJI is located almost entirely within critical habitat unit TX-15, designated as an essential feeding and foraging sparsely vegetated dune complex. Immediately behind and adjacent to PA SJI and TX-15 is a separate critical habitat unit, TX-16. TX-16 is composed primarily of tidal flats utilized by the piping plover for feeding and foraging. Although portions of the eroded foredunes within TX-15 may now operate as tidal flats, this habitat type is amply available within unit TX-16, which remained relatively intact despite the effects of Hurricane Harvey on other habitats along the coast. Restoring TX-15 to its former appearance and functionality will protect not only San Jose Island, but the function and durability of TX-16 as well.

PA SS2 along the southern toe of the CCSC and adjacent to the Port Aransas Nature Preserve would restore an eroded berm originally composed of dredged material placed along the channel to combat vessel wake generated erosion. Hurricane Harvey and vessel wake from normal channel traffic have caused inflow into this tidal area at two locations, and placement of dredged material to shore up this berm would restore the channel shoreline to its former appearance and functionality. The U.S. Geological Survey (USGS) suggests that coastal areas that have demonstrated erosion after large storm events are more susceptible to erosion from normal tidal processes.<sup>11</sup> Fall or winter construction within PAs SJI and SS2 may temporarily displace wintering plovers from the area; however, the benefit of long-term habitat preservation of these areas accomplished by dredged material placement outweighs any negative short-term impacts that may result from construction.

As shown on the Figure 3.2, dredged material from maintenance work would be placed in the existing ODMDS No. 1 near the CCSC, proposed offshore feeder berms B-1 through B-6, or existing PA 2, as material suitability allows.

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<sup>9</sup> Goff, J., Swartz, J.M., and S.P.S Gulick. 2017. An Outflow Event on the Left Side of Harvey: Erosion of Barrier Sand and Seaward Transport Through Aransas Pass. American Geophysical Union, Fall Meeting 2017. Available at: <http://adsabs.harvard.edu/abs/2017AGUFMNH34B..01G>

<sup>10</sup> Houser, C., Hapke, C., and S. Hamilton. 2007. Controls on coastal dune morphology, shoreline erosion, and barrier island response to extreme storms. *Geomorphology*. Vol 100:3-4. 18pp.

<sup>11</sup> *ibid*

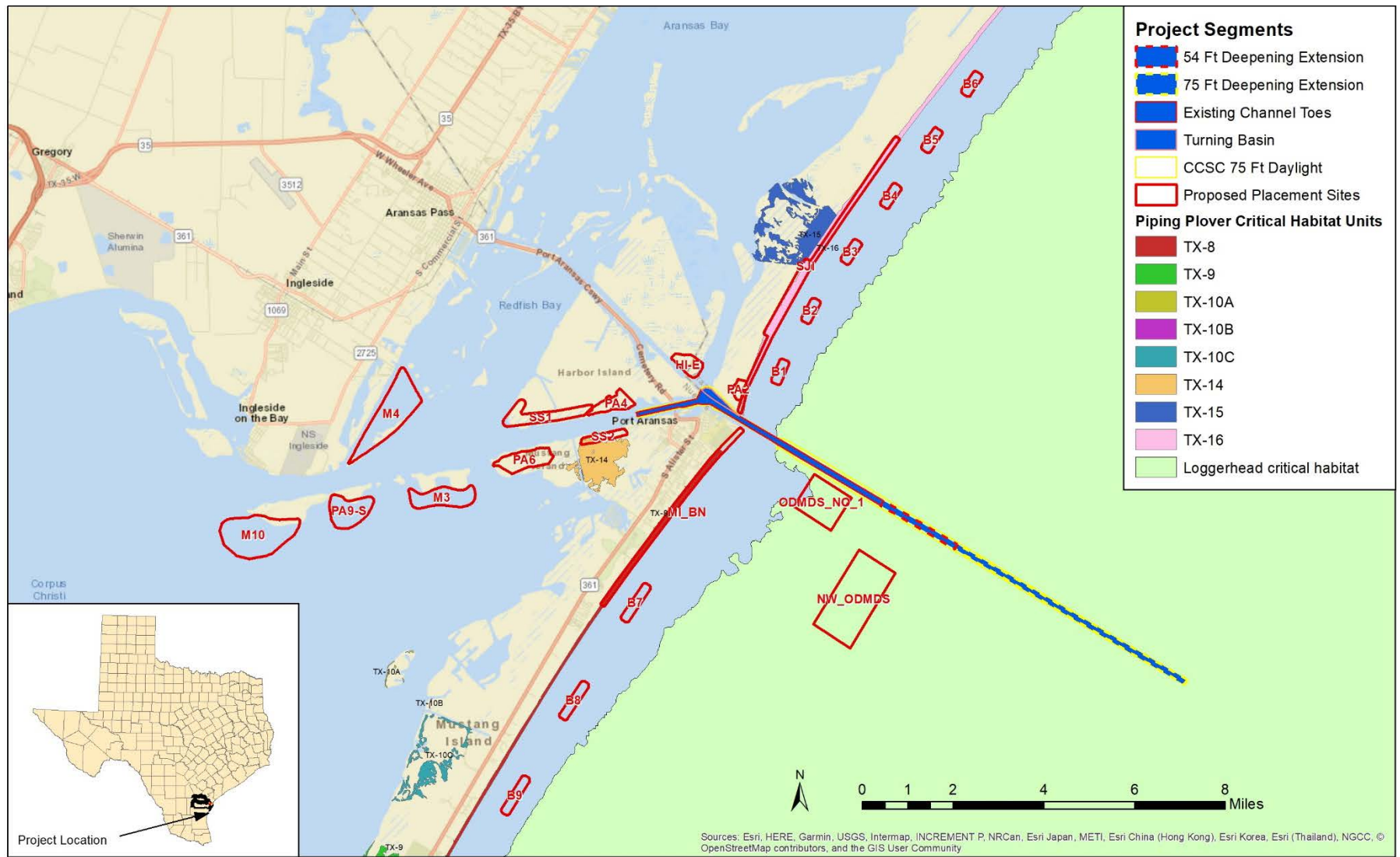


Figure 3.2: Critical Habitat within the Proposed Channel and Placement Areas



### **3.2 Cultural Resources**

The majority of the proposed channel deepening project is within the footprint of the currently authorized channel bottom and side slopes. The exception is the extension of the entrance channel into the Gulf of Mexico to meet deeper Gulf contours. Some minor incidental widening of the channel slopes is expected to meet side slope requirements of the deepened channel. Previous cultural resources investigations conducted for the channel deepening project authorized in 2003 would apply to the proposed project.

A 2018 review of the Texas Archeological Sites Atlas (TASA) maintained by the Texas Historical Commission (THC), and the online National Register of Historic Places (NRHP) database maintained by the National Park Service revealed that multiple cultural resources have been documented within one mile of the proposed project. Of the 42 recorded archeological sites within the one-mile review area, only two sites were identified within the proposed project area. One site was determined to be ineligible for listing in the NRHP, and the other site was assessed as being not significant. No structures greater than 50 years in age, no cemeteries, and no historical markers were identified within the boundaries of the proposed project.

Seventy-two shipwrecks that have not been assigned archeological site numbers were identified within the project review area. Twelve of the identified shipwrecks were located within the boundaries of the proposed channel deepening and PAs; however, only two located east of Aransas Pass are classified as State Archeological Landmarks, which suggests that these two resources may be eligible for listing in the NRHP. Sixty-eight previously completed cultural resources investigations were identified within the project review area. Fourteen of the investigations overlapped portions of the proposed project, with most of these being marine archeological surveys that examined portions of the CCSC and/or Aransas Pass. Only minor portions of some of the dredged material PAs were included in the surveys.

## **4.0 PROJECT ALTERNATIVES FOR CHANNEL IMPROVEMENTS**

### **4.1 Evaluation Criteria**

Preliminary criteria were developed to evaluate how well initial alternatives fulfilled the purpose and need of the proposed project. The initial alternatives were screened using the following general criteria:

- 1) Increase Export Efficiency – Key factors that affected the ability to fully load vessels with crude oil due to constraints of the existing channel and authorized channel were considered. This included draft limitations along the CCSC segments between the Entrance Channel and Harbor Island. This criterion considered whether the alternative allowed a VLCC to move more fully loaded and whether it eliminated or reduced lightering. Lightering would be eliminated for vessels using Harbor Island and lightering would be reduced for vessels using docks at other locations within the CCSC system.

Due to recent exponential growth in crude oil export, the Port of Corpus Christi has seen an increase in vessel tonnage. Several stakeholders' forecasts indicate that this trend will continue for a foreseeable future and beyond. As a result of PCCA's past investments in marine infrastructure and available capacity, PCCA has been capable of accommodating the recent historical shift in oil traffic from import to export. This trend is expected to continue as long as the Port's infrastructure allows it. There are concerns about future limitation to U.S. oil exports due to lack of or insufficient infrastructure capable of handling the export volumes. Lack of adequate infrastructure at U.S. ports including the Port Corpus Christi may lead to inefficient

shipping and ensuing crude price increase which may weaken the U.S.'s competitive edge (EIA 2018).

- 2) **Ability to Serve Multiple Tenants** – Part of the PCCA's mission is to meet the demand of commerce in the Coastal Bend region and throughout the world. To that end, PCCA plans its infrastructure to accommodate the needs of different stakeholders. PCCA has the ability to plan, fund, build and maintain marine infrastructures for common use such as navigation channels and dock infrastructure. PCCA owns and operates several public oil docks and bulk docks that are leased and used by different tenants. The ship channel is a common use infrastructure that is designed and operated to accommodate the different types of vessels used by PCCA's tenants. As cargo volume and vessel traffic increase, larger vessels are being used to improve shipping efficiency and reduce costs. To keep up with these trends, PCCA has undertaken several channel improvement programs. One is the dredging of the CCSC to a depth of 54-foot MLLW for which construction is imminent and will serve tenants all the way to the Inner Harbor. The other is this study to evaluate deepening up to the full depth required to accommodate fully loaded VLCCs. The terminal being planned by the PCCA at Harbor Island could be operated as a facility open for use to several users or companies, and the ability of a common use navigation channel can provide access for separate, multiple users. This criterion evaluates to what degree the alternative can benefit multiple tenants.
- 3) **Flexibility to Accommodate Future Growth/ Expansion** – This criterion considers the flexibility the alternative provides in being able to accommodate future growth in crude oil export tonnage and future growth in other sectors as well. Crude oil exports have exponentially increased in the last two years and are on pace to exceed the growth rate in 2018. Various long term projections predict much larger export tonnage if export infrastructure and the present bottlenecks in the supply chain end are improved. To that end, the ability to accommodate delivery from new crude export terminals or add capacity for exporting crude oil is important. In addition to crude oil, PCCA seeks to anticipate and be ready to accommodate all other future cargo needs and long term growth.
- 4) **Minimize Environmental Impacts** – All alternatives considered are located in the open waters of Corpus Christi Bay and the Gulf of Mexico. Therefore, environmental impacts would be limited to open water marine habitat and would primarily not involve terrestrial, wetland, or near-shore (tidal flats, beach, dunes etc.) impacts. Potential impacts to the marine environment are discussed below:

*Impact to Marine Habitats:* Existing marine habitat mapping information including seagrasses, tidal wetlands, and oyster reef from TPWD, NOAA and TGLO were obtained and used to gauge the potential for impacts. As environmental marine field surveys were reviewed, preliminary site-specific habitat locations were identified. Because the channel will be constructed within the footprint of an existing channel, no new impact to undisturbed habitat would occur within that footprint. The incremental widening that may be required to maintain the recommended design slope would be minimal and would limit undisturbed habitat impacts.

*Other environmental impacts:* Other environmental aspects that are considered for this criteria include potential impact of oil spills and air emissions from vessels and fuel transfer operations as described below. In conjunction with considerations of risk in criteria #5 below, potential impacts to environmental resources considers the location of major habitat resources (coastal shore, seagrass etc.), climatic (e.g. prevailing wind), and spill response factors. Impacts on air emissions considers how the alternative reduces transit and loading emissions from what would occur during lightered crude oil transfer operations.

- 5) Risk, Safety and Security – Safety and security are primary concerns for all vessels operating at the Port of Corpus Christi. Safety and security concerns include risk and challenges associated with oil spills and ensuing responses, fire and fire suppression activities as well as worker safety as they relate to offshore and onshore operations. Security also considers vulnerability to challenges to physical and operational security such as sabotage, and vandalism. Vulnerability to weather related events including wave height, winds and hurricanes is considered as well.
- 6) Ability to Contribute to Beneficial Uses – PCCA’s environmental precepts include a) wildlife habitat development, improvements, and replacement when modification to existing habitat is necessary, and b) environmental sustainability in the development of port facilities and in ongoing port operations. Although this is normally in the context of executing projects in a manner that restores resources from the impacts of a project, the ability to contribute to resource restoration as a result of project actions regardless of project impact can be considered also. Continuing the practice of considering and incorporating BU where practicable in managing dredged material of its channel projects, as was done in the currently authorized -54-foot project, is desirable. The ability to do this under a given alternative is considered for this criterion.

#### **4.2 Initial Alternatives Considered**

The existing channel dimensions and the authorized channel dimensions are summarized as follows. As of July 2018, the CCSC has a dredged depth of -47 feet MLLW and plans are currently underway to dredge the channel to the authorized -54-foot MLLW depth, which would constitute the “No-Action” condition for the proposed channel deepening project. The CCSC is also planned to be extended into the Gulf of Mexico by 1.4 miles to the -56-foot MLLW contour as part of the federally-authorized project. The width of the channel varies as follows: from the current outer limit of the dredged channel (in the Gulf) to the Port Aransas jetties, the CCSC Entrance Channel is -47 feet MLLW deep with a width of 700 feet, and is authorized to -54 feet MLLW with a width of 700 feet. From the jetties to Harbor Island, the CCSC Entrance Channel is 600-feet wide. The remainder of channel to the La Quinta Junction has a width of 500 feet and is authorized to a width of 530 feet. It was against the limitation of the existing and authorized channel dimensions that initial alternative concepts were developed.

Initial alternatives considered to meet the project purpose included deepening the existing channel and offshore options that pump crude oil from onshore storage to offshore loading facilities. There are two basic types of such facilities: the simpler offshore single point mooring (SPM) buoy system, and the larger, more complex offshore platform or terminal system. An SPM system consists of onshore storage tanks (i.e. above ground storage tank farm) and pumps connected to pipelines leading offshore and terminating at an offshore buoy. The buoy is anchored to the seafloor that has floating loading hoses and mooring lines for the VLCC to hook up to and conduct loading operations. An SPM-based system can be built to provide loading abilities to a few vessels by adding SPMs, but would potentially require multiple pipelines depending on pipeline size and onshore pump capacity. An offshore platform or terminal system similarly uses onshore storage and pumps like the SPM, but the pipeline terminates into a pile-driven platform with conventional manifolds, loading arms and pipe racks, often with berths for several vessels. It is more complex and expensive than SPMs but typically provides more loading capacity. For both these options, the SPM or platform would have to be located in sufficiently deep offshore waters to account for draft, under keel and sea state. This would be between 13 or more miles offshore of Corpus Christi Bay at minimum considering the design depth. The following were the initial alternatives considered:

- **Alternative A – No Action.** No channel improvements and maintaining the channel at its existing depth. This option is equivalent to continuing with lightering and reverses lightering operations to offload and top off large vessels including VLCC's.
- **Alternative B – Channel Deepening.** This alternative consists of deepening the CCSC to -81 feet MLLW from the Gulf of Mexico to station 110+00, including the approximate 10 mile-extension to the Entrance Channel necessary to reach sufficiently deep waters. As a result of one-way transit assumed for VLCCs, the planned widths for the -54-foot MLLW currently authorized project are nominally sufficient. Therefore, no widening other than the minor incidental widening to keep these bottom widths and existing channel slopes at the proposed deeper depths, would occur. Deepening would take place largely within the footprint of the currently authorized -54-foot MLLW channel. As discussed in the purpose and need in Section 2.0, multiple entities including the PCCA are planning and permitting development of crude export terminals at Harbor Island. These terminals are being planned independently of this proposed deepening project. Therefore, they would be used to accommodate partially loaded VLCCs even if the deepening project were not implemented. It is assumed 2 to 3 berths would be built at PCCA's Harbor Island terminal, and two other facilities being planned, would be expected to provide between three and four more berths. Existing VLCC berth plans at Ingleside would provide three berths. Under this alternative, light-loaded VLCCs at Ingleside would top off at Harbor Island rather than lightering.
- **Alternative C – Offshore Single Point Mooring (SPM) Facility.** This alternative is an SPM-based system consisting of constructing onshore storage facilities, shore-to-SPM pipelines, and a series of SPMs to load several vessels simultaneously. Conceptually, the onshore storage could be those that would be installed in any one of the marine terminal facilities at Harbor Island or Ingleside if they were converted to offshore delivery, or it could be a new location on other undeveloped property. For purposes of the initial screening, it is assumed 3 to 4 SPMs, and the requisite onshore storage, pumps, and pipelines would be built to load 3 to 4 VLCCs. This number is in the range of facilities built in past offshore terminal projects such as the Louisiana Offshore Oil Platform (LOOP), Iraq's Al Basra Oil Terminal (ABOT), and Bulgarian/Greek Burgas-Alexandroupolis SPM facilities (Trans-Balkan Pipeline B.V.). This alternative would be located somewhere between 13 to 15 miles offshore.
- **Alternative D – Offshore Platform.** This alternative would be similar to Alternative C, except it would be constructed as an offshore platform or terminal. With a more complex system of pile-driven structures and loading arms, it is assumed that pipelines, arms, and berths to service a minimum of 4 vessels simultaneously would be constructed. A four-berth terminal was the constructed capacity of the ABOT. Similar to Alternative C, this alternative would be located in the 13 to 15 miles offshore band, and conceptually could rely on pumping from existing/planned storage either at Harbor Island or Ingleside, or a new location.

### 4.3 Performance of Alternatives

Alternative A (No Action) would not meet the purpose of the project, as it would neither provide for the short term need to more efficiently export crude oil, or provide the Port the capacity to respond to long term changes and future economic growth. However, it is retained only for NEPA purposes to compare action alternatives.

Alternative B (Channel Deepening) does respond to both the short term and long term aspects of the purpose. It most directly addresses the purpose by providing a channel capable of accommodating transit of fully laden VLCCs from multiple locations on Harbor Island, providing full vessel draft access

to export facilities already being planned there. It improves the efficiency of crude transport by enabling full loading of VLCCs and eliminating or reducing lightering, and provides a deeper channel that could accommodate vessels for other commodities should tenants, cargo, and shipping needs change. The existing or planned terminals would provide more loading berths than the typical size of multiple point/berth offshore options, although offshore options that match the onshore berth numbers could be built at greater cost. The capacity to accommodate growth in crude is more flexible as new tenants or terminals can be developed on remaining water frontage near the channel. Onshore loading (as would be used in Alternative B) is generally faster due to the greater flow rates of loading arms achievable at onshore berths compared to pumping 13 or more miles to SPM loading hoses under Alternative C. Pumping and loading arms under Alternative D, offshore platform can be made to provide high capacity loading. Dredging approximately 46.3 MCY would be required for Alternative B within the existing channel and proposed extension. Most of the impact would occur in already deepened channel, and approximately 588.8 acres of undredged Gulf bottom would be dredged to provide the entrance extension. Benthic impacts would be temporary and benthic communities would be expected to recover within 1-2 years. No oyster reef or wetland and very minimal seagrass (0.11 acres) would be impacted. This option would provide ample material to beneficially use in the many seagrass, and shoreline, habitat sites impacted by Hurricane Harvey and long term erosion. The option could potentially reduce more than 485,000 metric tons (MT) of CO<sub>2</sub> emissions by eliminating or reducing reverse lightering when annual export rate averages additional 3.5 MMBPD. This option could reduce between approximately 38 and 112 tons of oxides of nitrogen (NO<sub>x</sub>), and between 2,200 and 9,270 tons of volatile organic compounds (VOC), both USEPA criteria pollutants, depending on whether elimination of lightering at current (approximately 1.5 VLCCs/week serviced) or potential future export rates (4 to 8 VLCCs per week) is assumed.

Offshore Alternatives C (SPM) and D (Offshore Platform) do respond to the short term need of the purpose by enabling full loading of VLCCs and partially eliminating or reducing lightering. However, they are limited in responding to the longer term needs of future economic growth and changes in port tenants and shipping needs, because they are less flexible in accommodating different grades of crude due to pump distances and flushing that could be required to switch grades. The capacity to accommodate growth in crude would require building not only more onshore storage and pumps, but new pipelines and SPMs or platforms, which would tend to be more costly and difficult to add. These options could similarly reduce CO<sub>2</sub>, NO<sub>x</sub> and VOC emissions through lightering elimination or reduction, as Alternative B. However, more vessel hoteling and pumping emissions would be produced due to the offshore location. In contrast to Alternative B, for Alternatives C and D, offshore operations in the Gulf would present more safety and spill risk challenges. The main concern are proximity of these operations to sensitive receptors and coastal habitats such as the Padre Island National Seashore, San Jose Island, and the associated Kemp's ridley turtle nesting grounds and Piping plover critical habitat, and greater exposure to wind and wave climate of the open Gulf, which would make spill containment more difficult. These options would also be in a location where response times would be greater, and access by unauthorized personnel would be greater, again due to distance from the onshore location, further increasing the national security risk.

A summary of the initial screening of alternatives is provided in Table 4.1.

#### **4.4 Screening and Selection of Channel Alternatives**

The project alternatives were assessed using the screening criteria of increasing export efficiency, serving multiple tenants, accommodating future growth and expansion, and minimizing environmental impacts. The alternatives were compared with respect to their ability to meet the project need and purpose. Following the screening of possible action alternatives, the PCCA identified the No Action and the proposed channel deepening to Harbor Island as the alternatives to be evaluated for this project. The channel deepening project alternative would be completed primarily within the footprint of the existing CCSC, maintaining the same channel bottom width and necessitating only minor incidental

widening to maintain the required side slopes. The proposed channel deepening alternative would meet the purpose and need of the project compared to the No Action alternative, as described below.

**No Action Alternative:** No channel improvements would be constructed and the existing channel would be maintained at its width and depth following the completion of the ongoing -54-foot deepening project. This alternative would not meet the need and purpose of the proposed project, as it would neither provide for the short-term need to more efficiently export crude oil, or provide the PCCA the capacity to respond to long-term changes and future economic growth. The No Action alternative is retained for comparison against the proposed action alternative.

**Channel Deepening to Harbor Island:** The action alternative would be the deepening of the CCSC to a depth of -81 feet MLLW (-77 feet MLLW plus two feet of advanced maintenance and two foot of allowable overdredge) from the Gulf of Mexico to Harbor Island. This alternative would meet the project need and purpose by providing a channel with the capability to accommodate transit of fully laden VLCCs from multiple locations on Harbor Island, supporting the efficient export of crude products from the Port through the elimination or reduction of reverse lightering operations. The channel deepening is proposed to be constructed primarily within the footprint of the existing CCSC. The incremental widening expected to be required to maintain the recommended design slope would be minor, and impacts to undisturbed habitat in the Gulf of Mexico would be limited.

**Table 4.1: Alternative Performance**

Screening Criteria	OPTIONS			
	Alternative A No Action	Alternative B Channel Deepening Project	Alternative C Offshore SPM Facility	Alternative D Offshore Platform
<b>1) Increase Export Efficiency</b>	<ul style="list-style-type: none"> <li>No increase in export efficiency. Inefficient lightering process, involving more vessel calls, transit, and longer VLCC loading process will still occur</li> <li>Would involve light-loaded VLCC transit on lower 3<sup>rd</sup> of CCSC</li> <li>Increase in congestion with future growth from more lightering vessels</li> </ul>	<ul style="list-style-type: none"> <li>Lightering can be eliminated or reduced, decreasing vessel traffic and shortening the duration of VLCC loading process</li> <li>Would still require VLCC transit on lower 3<sup>rd</sup> of CCSC, but elimination or reduction of lightering transit would free up channel availability for future growth.</li> <li>Multiple tenant accommodation discussed below would allow more fully loaded VLCC participation, increasing efficiency for more exporters</li> </ul>	<ul style="list-style-type: none"> <li>Lightering can be eliminated or reduced, thereby reducing vessels involved and shorten VLCC loading process</li> <li>Would eliminate VLCC transit.</li> <li>Exporting participants would be more limited than channel option, and exporting nonparticipants who couldn't fully load VLCCs would resort to smaller vessels or lightered VLCCs, leaving this congestion component in place as growth occurs. See multiple tenant and future growth discussion below.</li> </ul>	<ul style="list-style-type: none"> <li>Same as SPM for all attributes except where noted</li> </ul>
<b>2) Ability to Serve Multiple Tenants</b>	<ul style="list-style-type: none"> <li>No Change</li> </ul>	<ul style="list-style-type: none"> <li>Port can operate VLCC berths as public docks, servicing multiple tenants and shipping lines, encouraging healthy competition and raising revenue for the Port and local communities.</li> <li>Centralized and integrated land use planning of developable land assets at Harbor Island.</li> <li>Loading of different grades from onshore terminals would be easier compared to offshore options</li> </ul>	<ul style="list-style-type: none"> <li>Difficult to plan multiple offshore SPMs connected individually to individual tank farms.</li> <li>Accommodating different grades from different customers would be more cumbersome, requiring flushing of longer lengths of line to switch grades, compared to onshore terminals.</li> </ul>	<ul style="list-style-type: none"> <li>Same as SPM for all attributes except where noted</li> </ul>
<b>3) Ability to Accommodate Future</b>	<ul style="list-style-type: none"> <li>No accommodation of future growth</li> <li>Vessel draft limitations</li> </ul>	<ul style="list-style-type: none"> <li>Local and regional economy is enhanced as revenues are collected for ships calling at</li> </ul>	<ul style="list-style-type: none"> <li>Multiple single SPMs may need to be planned by the industry. Multiple permits</li> </ul>	<ul style="list-style-type: none"> <li>Same as SPM for all attributes except where noted</li> <li>Expansion of platform to add</li> </ul>

Screening Criteria	OPTIONS			
	Alternative A No Action	Alternative B Channel Deepening Project	Alternative C Offshore SPM Facility	Alternative D Offshore Platform
<b>Growth/Expansion</b>	<ul style="list-style-type: none"> <li>Increased vessel traffic due to large increase in reverse lightening</li> </ul>	<p>and products moving through the PCCA.</p> <ul style="list-style-type: none"> <li>Efficient use of capital to achieve growth and meet overall crude export forecast for the nation</li> <li>Allows for future growth within the PCCA under a single permitting process for deepening the channel</li> </ul>	<p>required for each individual project.</p> <ul style="list-style-type: none"> <li>Future expansion of offshore SPM facility more difficult to accommodate new users. Limited users can access the facility at any one time due to complex financing and project development challenges.</li> </ul>	<p>more users even more difficult and costly than SPM</p>
<b>4) Environmental Impact</b>	<ul style="list-style-type: none"> <li>No habitat impact</li> <li>Increase in air emissions due to increase from reverse lightening activities.</li> <li>CO<sub>2</sub> emissions would be greater than other options due to continuing lightening activities</li> </ul>	<ul style="list-style-type: none"> <li>Construction largely being undertaken within existing channel limits.</li> <li>New entrance channel extension would temporarily disturb 770.3 acres of 60-ft deep Gulf bottom, convert it to deeper bottom, but benthos would recolonize within a year, and water column would remain. Amount of conversion to deeper bottom would be insignificant compared to available Gulf Habitat.</li> <li>Dredged material will be evaluated for beneficial use and building resilient community.</li> <li>Potential to reduce more than 485,000 MT of CO<sub>2</sub> emissions by eliminating or reducing reverse lightening when annual export rate averages additional 3.5 MMBPD.</li> </ul>	<ul style="list-style-type: none"> <li>Puts active loading facility and new pipelines in previously undisturbed part of Gulf of Mexico.</li> <li>Permanent but negligible size (compared to available Gulf Habitat) of conversion of Gulf bottom and water column to SPM platform</li> <li>No potential beneficial use of dredged material</li> <li>Similar potential to reduce CO<sub>2</sub>, NO<sub>x</sub>, and VOC from eliminating or reducing lightening vessel emissions.</li> <li>Spillages are more likely to happen and not as easily confined or cleaned up.</li> <li>Potential for higher vapor emissions and higher CO<sub>2</sub> emissions from vessels hoteling due to reduced loading rates.</li> <li>Tugs needed for hose tending and VLCC</li> </ul>	<ul style="list-style-type: none"> <li>Same as SPM for all attributes except where noted</li> <li>Permanent but negligible size of conversion of Gulf bottom and water column to SPM platform – larger than SPM, but still negligible</li> </ul>



Screening Criteria	OPTIONS			
	Alternative A No Action	Alternative B Channel Deepening Project	Alternative C Offshore SPM Facility	Alternative D Offshore Platform
		<ul style="list-style-type: none"> <li>• Potential to eliminate 38-112 tons annual NOx and 2,200- 9,270 tons of VOC from elimination of some lightering activity</li> <li>• Enables faster loading rates than SPM, reducing CO<sub>2</sub> emissions from hoteling vessels.</li> <li>• Ability to provide vapor recovery system and shore power to operate vessel systems for reduced emissions.</li> </ul>	<p>positioning during loading will have to transit over 30 miles (assuming support facilities are home based at Port Aransas) from the CCSC to service the platform increasing air emissions generated.</p> <ul style="list-style-type: none"> <li>• No technically feasible method for providing vapor recovery of vapour combustion systems for reducing emissions.</li> </ul>	
<b>5) Risk, Safety and Security</b>	<ul style="list-style-type: none"> <li>• More vessels in Harbor will make monitoring harder</li> </ul>	<ul style="list-style-type: none"> <li>• Severity of accidental spills would be reduced compared to offshore options as facilities and vessels are in a more controlled Port environment.</li> <li>• Environmental accidents better controlled at onshore facilities in protected waters.</li> <li>• Comprehensive spill response would be quicker than offshore options due to proximity to response resources</li> <li>• Incidents at onshore terminal can be more easily contained to avoid affecting other users.</li> <li>• Risk of in-channel vessel incident or allision present, but would be reduced greatly by slow vessel speed, multiple tug assist, and one way transit when bringing VLCCs in the</li> </ul>	<ul style="list-style-type: none"> <li>• Damage to subsea pipelines or the platform will render the facility unusable until repaired.</li> <li>• Environmental conditions such as high winds, high waves, and strong currents can be designed for, however potential is there for conditions that could restrict use of the facility.</li> <li>• Avoids potential for in-channel vessel incident, but trades it for more risk of pipeline failures due to miles of multiple necessary pipelines.</li> <li>• Comprehensive spill response times to address environmental accidents longer compared to onshore terminals</li> </ul>	<ul style="list-style-type: none"> <li>• Same as SPM for all attributes except where noted</li> </ul>

Screening Criteria	OPTIONS			
	Alternative A No Action	Alternative B Channel Deepening Project	Alternative C Offshore SPM Facility	Alternative D Offshore Platform
		<p>Port.</p> <ul style="list-style-type: none"> <li>• Loading spill incident would be closer to Redfish Bay seagrass and marsh areas, but would not significantly expose National Seashore or San Jose Island beaches to impact <ul style="list-style-type: none"> <li>- Prevailing SE winds directed towards terminal shore which would help containment</li> <li>- Tidal transport may vary however</li> </ul> </li> <li>• Strong security presence within the port environment to protect against deliberate damage and sabotage.</li> </ul>	<ul style="list-style-type: none"> <li>• Loading spill incident would not significantly expose Redfish Bay seagrass and marsh areas to impact, but an offshore facility may be potentially expose National Seashore or San Jose Island beaches to impact depending on the location <ul style="list-style-type: none"> <li>- Prevailing SE winds directed towards beaches which would hamper containment</li> </ul> </li> <li>• More accessible by non-authorized persons; can lead to accidental damage, deliberate damage and sabotage.</li> <li>• Higher risk to human safety with offshore operations.</li> <li>• Response time to the facility by emergency services will be greater and more costly due to offshore location.</li> </ul>	
<b>6) Ability to Contribute to BU</b>	<ul style="list-style-type: none"> <li>• Beneficial use occurring under the -54 foot project would continue. As before, since there would be no change in dredging or other actions that could contribute.</li> </ul>	<ul style="list-style-type: none"> <li>• New work dredging would provide 46.3 MCY of varying sandy, clayey and some silty material some of which could be used for ecological or construction BU. Channel maintenance material could also be used long term for future BU such as restoring subsided or submerged marsh.</li> </ul>	<ul style="list-style-type: none"> <li>• Would require virtually no dredging, and therefore would not provide material that could be used to construct BU features.</li> </ul>	<ul style="list-style-type: none"> <li>• Would require virtually no dredging, and therefore would not provide material that could be used to construct BU features.</li> </ul>

## **5.0 ATTEMPTS TO AVOID JURISDICTIONAL AREAS AND MINIMIZE WATER QUALITY IMPACTS**

The proposed project would require the dredging of earthen material from the existing CCSC and from the bottom of the Gulf of Mexico to create a channel of sufficient depth to allow for the operation of VLCCs. Because the purpose of the proposed project is to deepen the current CCSC to reduce navigation inefficiencies associated with the current channel, the proposed channel improvements must occur in navigable waters of the U.S. Alternatives to achieve the need and purpose of the proposed project that would avoid jurisdictional waters of the U.S. are not available.

The proposed channel deepening activities represent the minimum impact to the Gulf of Mexico and Corpus Christi Bay to achieve the proposed project objective of increasing navigational efficiency of the CCSC. The proposed project alternative is the least environmentally damaging practicable alternative. This alternative meets the proposed project need and purpose with the least impact to the Gulf of Mexico and Corpus Christi Bay environments. The proposed depth and channel dimensions were optimized by taking several factors into consideration. First, world fleet registry data from IHS Fairplay was used to analyze and identify the appropriate target vessel dimensions (including draft) from the variation in size among the VLCC fleet to identify the majority of vessels expected rather than the maximum possible. Second, the fully loaded draft for the design vessel was calculated assuming the American Petroleum Institute gravity for West Texas Intermediate (WTI) crude oil, which will be the predominant controlling grade of crude oil exported from the Port of Corpus Christi. This was done in lieu of assuming the largest VLCC carrying the heaviest crude oil possible for this Port (heavy sour). Appropriate under keel clearance in consideration of sea state and climatic factors and guiding navigation standards (USACE and World Association for Waterborne Transport Infrastructure [PIANC]) was added. Ship simulation was accomplished in December 2018 at the Maritime Institute of Technology and Graduate Studies (MITAGS) to verify the depths and under keel clearances were navigable under a range of conditions. Therefore, the depth of the proposed deepening has been optimized. Another factor that will be considered under 33 U.S.C. Section 408 approval and coordination with USACE Operations is to use the steepest channel side slopes and narrowest bottom width allowable for one way passage. December 2018 ship simulation at MITAGS also examined alternate channel bottom widths for one way VLCC transit. This is also being coordinated with the USACE for acceptability under 33 U.S.C. Section 408 approval. If approved and possible, steeper side slopes and narrower bottom widths will be planned for implementation.

Dredged material generated from the project is proposed to be placed within an ODMS adjacent to the CCSC, and, for material judged by the project engineer to be suitable, would be placed in several locations along the coast and within Corpus Christi and Redfish Bays for BU. The new work and maintenance dredged material from the proposed project would be placed in an environmentally acceptable and economically feasible manner, considering technical and logistical feasibility. The section below describes the process of the identification and evaluation of the dredged material placement alternatives that meet these requirements and represent the least environmentally damaging practicable placement alternative(s).

### **5.1 Initial Placement Alternatives Considered**

To help meet the planning objective of identifying practicable dredged material placement that considered engineering, economics and the environment, initial alternatives ranging from use of existing PAs and surrounding uplands, to potential BU concepts were considered.

### **5.1.1 New Terrestrial Sites**

New terrestrial sites are more constrained by available contiguous land and parcel size, easement and access across roads, properties etc. needed for hydraulic pipelines. Near Harbor Island, surrounding uplands are limited, as they consist of Mustang Island and San Jose Island. Mustang Island has no sizable contiguous tracts within 10 miles that are not developed or are not natural barrier island, State or National refuge/parks, or aquatic habitat. The preponderance of tracts is small waterfront parcels. San Jose Island is a privately owned island that is almost entirely undeveloped natural barrier island and beach. Along with the planned crude terminal, Martin Midstream, and Gulf Copper are located on Harbor Island at the channel entrance which leave no available tracts for placement of dredged material. Therefore, BU and offshore placement in this vicinity was planned.

The next nearest mainland with larger tracts of land is Ingleside, 8 miles farther in, where several crude oil export facilities are being planned on the land nearest water. Flint Hills Resources, OXY Ingleside Energy Center, Kiewit Offshore, Chemours, Oxychem, Ingleside Ethylene, Cheniere, and Voestalpine Texas are existing facilities located along Ingleside. These limit upland placement options, and options to use material beneficially would be cost competitive due to the distance. New upland sites at farther distances would be less cost effective due to farther distances required to reach sizable contiguous tracts of land, could involve impacts to terrestrial wetlands, would require new property purchases, and routing and burial of temporary hydraulic pipelines across existing roads and properties. Depending on land elevation, pumping hydraulic pressure head limitations could be reached, which would force less cost effective transport by truck. These factors would complicate the usability and viability of terrestrial sites.

### **5.1.2 Initial Concepts**

Therefore, initial planning efforts focused on existing PAs and potential BU, as new upland placement opportunities were limited. Initial BU concepts were generated by considering existing agency restoration plans such as TGLO's Texas Coastal Resiliency Master Plan, recent storm damage caused by Hurricane Harvey, and BU features implemented elsewhere on the Gulf Coast. Since the proposed action consists entirely of dredging the CCSC, practical limitations associated with placement of dredged material were a primary constraint. For dredged material placement, distance over which material must be pumped or transported by scow, required water depths for hopper or scow use, and access to stage and route hydraulic pipelines, all constrain where cost effective dredged material placement can be achieved. For hydraulic dredging, most cost effective dredging occurs within 5 miles, requiring one to multiple booster pumps beyond this distance which rapidly diminishes the cost effectiveness. An initial cost effectiveness limit of 10 miles was considered. Use of hoppers and scows can achieve placement over greater distances, but this is primarily in water and requires minimum depths for vessel draft. These technological constraints factored in planning dredged material placement. The major component of dredging driving placement capacity needed is the new work dredging to construct the Proposed Action. Initial planning focused on accommodating projected new work dredging volumes.

To help, further develop dredged material placement that considered environmental impact and BU opportunities, the Applicant conducted an initial agency coordination meeting held in Corpus Christi Texas on September 21, 2018 to obtain the input of Federal, State and local resource agencies including the USACE Galveston District. Representatives from the following agencies participated in the meeting and provided input on the initial planned PA use and preliminary BUs concepts presented during the meeting:

- University of Texas Marine Science Institute (UTMSI)
- UTMSI/Mission-Aransas National Estuarine Research Reserve
- Coastal Bend Bays and Estuaries Program
- Texas Parks and Wildlife Department (TPWD)
- Texas General Land Office
- Natural Resources Conservation Services
- U.S. Army Corps of Engineers (USACE)
- U.S. Environmental Protection Agency (USEPA) Region 6
- U.S. Fish and Wildlife Service (USFWS)
- Texas Department of Transportation

At the time that initial placement alternatives were originally conceived, only the new work quantities generated from the proposed project were considered to devise placement concepts. Figure 5.1, shown below, depicts the initial concepts presented during the agency coordination meeting. These concepts represented general categories of placement alternatives and the general vicinity where they would be located. Agency input generated a few more smaller initiatives, but did not result in major new BU sites being identified. However some concepts were reinforced and better defined based on discussions with agency representatives about site specific information and their knowledge of the ecosystem of Corpus Christi and Redfish Bays. These concepts were then analyzed in consideration of agency feedback, further conceptual development and volumetric analysis, and more research on constraints and impacts. The initial evaluation considered cost, existing technology, and logistics in light of the navigation purpose of the Proposed Action. Inherent in cost and existing technology was consideration of the aforementioned dredging method constraints, and inherent in logistics was consideration of needed placement capacities. The following synthesizes the initial concepts, evaluation, and initial screening.

#### **5.1.2.1 Existing PAs for the Current Federally-authorized CCSCIP**

The Applicant is the Non-Federal Sponsor for the authorized Federal project, and is therefore aware of commitments and long-term capacity of existing upland PAs required for the authorized project. The following uses for existing PAs were considered

- Use of existing capacity – Most of the existing PA capacity is dedicated to accommodating the new work dredging and 50-year maintenance of the Federally-authorized -54 foot project. Due to lack of uncommitted capacity, only two existing PAs were identified for use: PA4 and PA6
- Expansion of existing PA – M3, M9, and M10 expand existing PAs by using dredged material beneficially. M3 would convert featureless bay bottom to approximately 330 acres of estuarine/aquatic habitat behind Pelican Island. M9 and M10 would convert featureless bay bottom to approximately 329 and 770 acres of estuarine/aquatic habitat behind PA9 and PA10, respectively.

#### **5.1.2.2 Existing 54 foot project BU sites**

Existing BU sites were examined for inclusion where possible. According to PCCA, only a handful of sites were available while others lack capacity especially with priority and consideration given to the placement needs for the CCSCIP which is expected to be constructed over the next three years. Therefore, focus was shifted to expanded existing sites by adding adjacent estuarine/aquatic habitat features or dike raisings. Open-water, unconfined BU sites were avoided completely.

### **5.1.2.3 Bird Islands**

Rookery islands or bird islands serve as nesting, breeding, foraging and rearing areas for birds because they are isolated from the mainland and are too small to sustain populations of predators. Dredged material is often used beneficially to construct or restore bird islands.

A recent study identified several existing or new bird islands in Aransas and Nueces counties. However, most were too small in regards to capacity or sited too far (more than 15 miles away) from the project to make construction economically feasible especially with the revised project footprint. The few options that were within the preferred pumping distance were surrounded by seagrass.

### **5.1.2.4 Oyster Pads**

Beneficially using dredged material as the pad to restore or create new for oyster reef was considered during initial planning. As identified in the TGLO's Texas Coastal Resiliency Master Plan, this option would provide vertical relief need for the restoration of oyster reefs. However, agency feedback indicated that the salinity in the area was not optimal for recruiting or supporting oyster growth.

### **5.1.2.5 Marsh Restoration at Mustang Island**

Marsh restoration opportunities along the bayside of Mustang Island were examined during early planning. However, the area is too far away from the project to make construction economically feasible. Additionally, public feedback during open houses held in September 2018 indicated concerns regarding impacts to existing, established marsh habitat during construction.

### **5.1.2.6 13A New BU Site**

Creating a BU feature similar to existing BU 6 was contemplated adjacent to the existing PA13. This became a less favorable option due to distance. It was reconfigured in the second stage of placement plan development as a contingency upland extension to PA13.

### **5.1.2.7 New Work ODMDS**

Use of the portion of this site for new work placement that is not being used by the -54 foot Federal Project was proposed. This site is a dispersive site, and Multiple Dump Fate (MDFATE) modeling was conducted to analyze the capacity for project use.

### **5.1.2.8 San Jose and Mustang Island Feeder Berms or Shoreline Repair**

The project team reviewed recent aerials and LiDAR data on San Jose Island to determine that there was a substantial amount of repair for dune breaches and foreshore erosion. Similarly, the Texas General Land Office (TGLO) identified areas of both Mustang and San Jose Islands that have experienced historical receding at the rate of 2 feet or more per year. The large amount of sand that would be produced by the project could be used to repair or indirectly nourish these islands

## **5.1.3 Screening of Initial Concepts**

Table 5.1 provides a summary of the screening of initial concepts. Some of these placement options have since been eliminated from further evaluation because of a change in project scope. The preferred alternative was determined to be deepening the channel to Harbor Island, a shorter reach, which requires less PAs. As a result some of the concepts identified during the agency coordination

meeting were also eliminated from further consideration. However, some of these were reconceived as different BU initiatives, such as expansion of existing PA and BU sites.

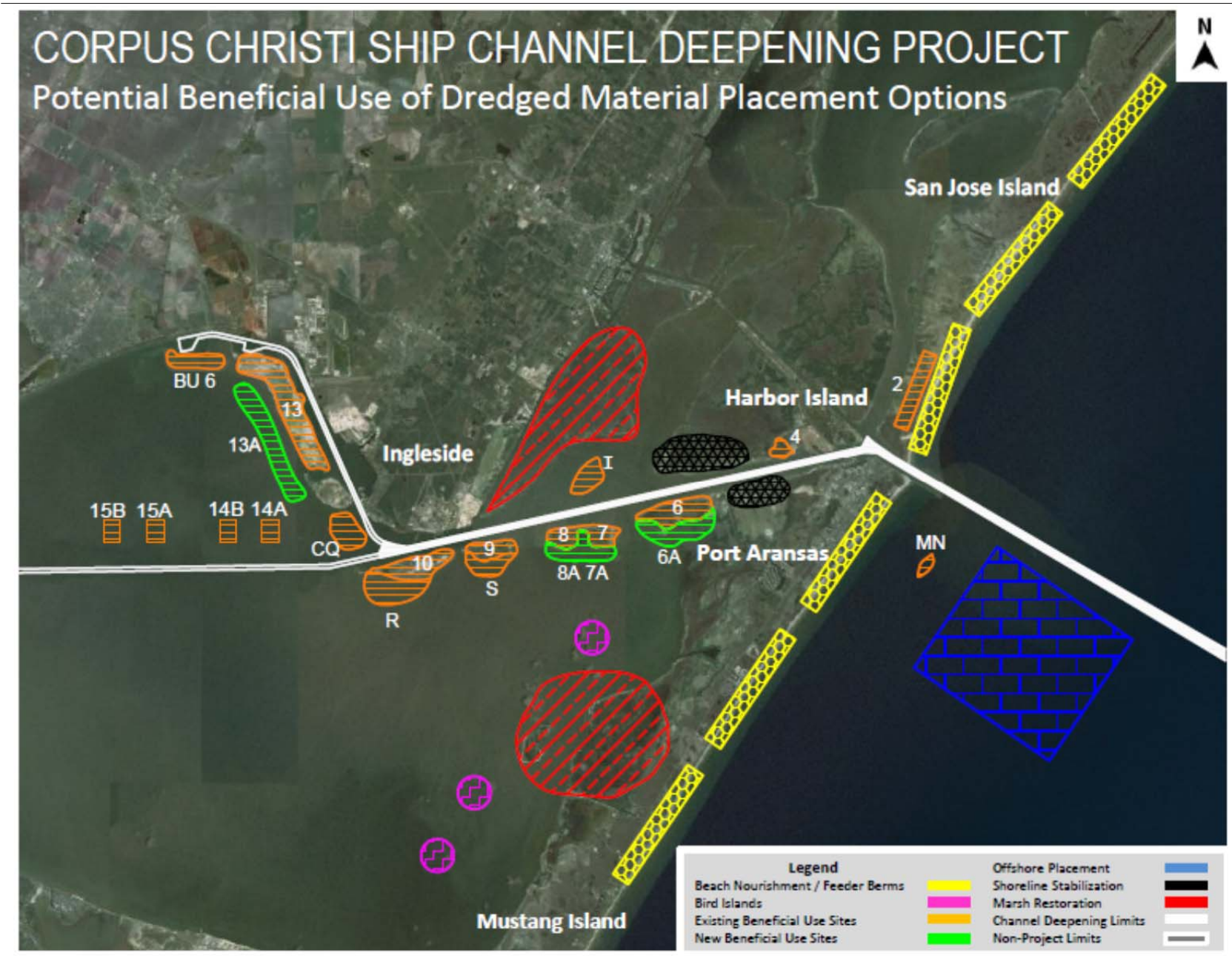


Figure 5.1: Initial Dredged Material Placement Concepts



**Table 5.1: Initial Placement Area Screening**

<b>Concept</b>	<b>Logistics</b>	<b>Technology</b>	<b>Cost</b>	<b>Determination</b>
New Terrestrial Upland Site	Too many issues involving infrastructure, distance, limited parcel size and availability	Pump distance and potential pumping constraints further inland	Logistics factors could make it costly to implement.	Eliminated
Existing PAs for the Current Federally-authorized -54 foot MLLW project	Limited available placement capacity	Feasible	Would be cost effective, but no capacity.	Eliminated for existing, but reconceived for expansion.
Existing 54 foot project BU sites	Limited available placement capacity	Feasible	Would be cost effective, but limited capacity.	Eliminated for existing, but reconceived for expansion.
Bird Islands	12 acre site size criteria limits capacity to place	Feasible	Would likely have higher unit implementation cost due to small size	Eliminated due to distance, and limited capacity
Oyster Pads	Distance from Harbor Island would be far.	Salinity in the area not optimal	Rock for cultch recruitment surface could be a major expense	Eliminated
Marsh Restoration at Mustang Island	Public concerns about impacting existing habitat	Feasible	Could be cost feasible	Eliminated
13A new BU Site	Distance from Harbor Island is far.	Feasible	Distance would make it more costly	Eliminated
NW ODMDS	Channel adjacent. Good option.	Feasible	Near channel. Minimal construction. Would be cost effective	Advanced
San Jose and Mustang Island Feeder Berms and Shoreline Repair	Channel adjacent. Good option.	Feasible	Near channel. Minimal construction. Would be cost effective	Advanced

## 5.2 Placement Alternatives Evaluated Further

The initial alternatives that were advanced or reconceived were refined. Given the large amount of materials that could be beneficially used, especially the large volume of sand in one of the channel segments, and proximity of some of the desirable BU options, it became clear, a mix of existing offshore, expansion of existing BU sites and the Gulf side BU initiatives would be a viable, cost effective approach. Of 13 initiatives further refined, 11 were BU features that aimed to achieve a variety of shoreline restoration, land loss restoration, marsh cell expansion, and Gulf-side shoreline initiatives. The following alternatives were developed.

- M3 – Creation of an estuarine/aquatic habitat extension at Pelican Island. This would bring the elevation of an extension at this BU site to an elevation suitable to restore either marsh or seagrass.
- M4 – Restoring historic land and marsh loss at Dagger Island. This is an ecosystem restoration measure included in USACE’s Coastal Texas study and the TGLO Coastal Resiliency Master Plan. Design of project elements will be coordinated to support TPWD’s existing permit for this project.
- PA9-S – This option will extend the upland placement of dredged material behind PA9. This area was originally identified as Site R in the CCSCIP for the creation of shallow water habitat, but current projections from the PCCA are that there will not be enough material from that project to create that site.
- M10 – Creation of an estuarine/aquatic extension behind PA10. This would bring the elevation of an extension at this BU site to an elevation suitable to restore either marsh or seagrass.
- PA6 – Raising levees on PA6, after the CCSC CIP one time use, by 5 feet and filling it with 4 feet of new work material at the existing PA6 location.
- SS1 – Restoring eroded shoreline to a higher elevation than what was previous to prevent future land breaches as a result of storm events, the restored feature will be armored to protect the very large seagrass area behind Harbor Island.
- SS2 – Restoring shoreline washouts along the Port Aransas Nature Preserve/Charlie’s Pasture as a result of Hurricane Harvey. Piping plover sand flat critical habitat located behind this breach would be protected again. Design of project elements will be coordinated with TGLO’s restoration efforts for this area.
- PA4 – Reestablish eroded shoreline and land loss in front of PA4. The shoreline has undergone major erosion over the last few decades, and if it continues, would eventually expose the Harbor Island seagrass area to erosion and loss.
- SJI – Dune & shore restoration at San Jose Island using new work sands to repair severe damage caused by Hurricane Harvey.
- NW ODMDS – Placement in New Work ODMDS (Homeport).
- B1-B9 – Feeder berms offshore of SJI and Mustang Island that would be located within the active transport zone in front of the depth of closure, and indirectly nourish these barrier islands.
- HI-E – Restore eroded bluff at the junction of the CCSC, Aransas Channel and Lydia Ann Channel and will be armored to prevent future erosion. The bluff will be restored to its historic shape and

new work material will be placed behind the bluff with a levee raise around the site. According to USGS historical topographic maps for Port Aransas, Texas, SE/4 Aransas Pass 15' Quadrangle, this site appears to have been created from Aransas Channel spoils around 1967-1968.

- MI – Mustang Island beach nourishment, this feature is intended to directly place new work sands to enhance the shoreline from the south CCSC jetty five (5) miles along the Gulf side of Mustang Island.

### **5.3 Applicant's Proposed Placement Plan**

All the proposed options would be viable due to proximity, material volume capacity, and need for material to achieve ecological restoration. The large volume of sands indicates that material placement would be better used for BU restoration of important coastal resources that were damaged by Hurricane Harvey and experience continuing erosion. The availability of other new work material such as clays could opportunely be used to stem land losses that would expose sensitive habitats to continual erosion. These materials would be better used in these initiatives than in upland placement that avoids the marine environment and provides no benefit. All options were selected, with M9 and M10 providing extra capacities as a contingency for unavailability of SJI. Therefore, more capacity was identified to provide flexibility in the plan. Table 5.1 lists the selected placement plan elements.

**Table 5.2: Selected New Work Placement Plan (See Sheet 9 of 23)**

Placement Option	Description	Placement Capacity (CY)	Proximity to New Work Dredging Operations	Provides Environmental Benefit
M3	Estuarine/aquatic habitat creation adjacent to Pelican Island	3,798,000	Located approximately 6 miles from Harbor Island	This option will convert featureless bay bottom to approximately 300 acres of estuarine/aquatic habitat.
M4	Restoring historic land and marsh loss at Dagger Island	867,000	Located approximately 7 miles from Harbor Island	This option will restore eroding marsh habitat for native shorebirds and coastal wildlife. Design of project elements will be coordinated to support TPWD's existing permitted project.
PA9-S	Upland Placement Site Expansion behind PA9	9,000,000	Located approximately 8 miles from Harbor Island	This option does not restore aquatic habitat, it will convert featureless bay bottom to upland.
M10	Estuarine/aquatic habitat creation adjacent to PA10	10,933,600	Located approximately 10 miles from Harbor Island	This option will convert featureless bay bottom to approximately 770 acres of estuarine/aquatic habitat.
PA6	5 foot levee raise and fill	1,796,400	Located approximately 4 miles from Harbor Island	This option does not create any environmental benefit.
SS1	Restoring eroded and washed out shoreline	4,800,000	Located approximately 3 miles from Harbor Island	This option restores an eroded shoreline landmass and provides protection to Harbor Island Seagrass area.
SS2	Restore shoreline washouts along Port Aransas Nature Preserve as a result of Hurricane Harvey	669,700	Located approximately 2 miles from Harbor Island	Shoreline restoration that fills in the washouts caused by Hurricane Harvey that protects Piping Plover critical sand flat habitat.
PA4	Reestablish eroded shoreline and land loss in front of PA4	3,020,000	Located approximately 2 miles from Harbor Island	This option provides protection to Harbor Island seagrass area.
HI-E	Bluff and Shoreline restoration with site fill	1,825,000	Located less than 1 mile from Harbor Island	This option restores an eroding bluff and shoreline to its historic profile.
SJI	Dune and beach restoration San Jose Island	4,000,000	Located directly next to Channel Dredging Operations	This option restores several miles of beach profile that was washed away as a result of Hurricane Harvey.
NW ODMDS	Place on New Work ODMDS (Homeport)	13,800,000	Located directly next to Channel Dredging Operations	This option does not create any environmental benefit.
B1-B9	Feeder berms offshore of SJI and Mustang Island	8,100,000	Located less than 10 miles from Channel Dredging Operations	This option will nourish beach shoreline by natural sediment transport processes.
MI	Beach Nourishment for Gulf side of Mustang Island	2,000,000	Located directly next to Channel Dredging Operations	This option will nourish beach shoreline by direct sediment placement.
Scenarios for new work placement capacity provided and needed.		64,609,700	Total Capacity Provided	
		60,609,700	Total capacity less SJI (should that option become unavailable)	
		46,283,590	Total NW placement capacity required for Channel Preferred Alternative – Base Option	
		14,326,110	Additional Capacity less SJI (should that option become unavailable)	

## **6.0 SUMMARY OF PROPOSED PROJECT IMPACTS AND MITIGATION FOR AQUATIC HABITATS**

As shown in Table 5.2, the majority of placement options involves BU to restore aquatic habitat or protect impacted resources, and would overall benefit seagrass, estuarine/aquatic habitats, and coastal habitats. The options that indicate estuarine or aquatic habitat restoration (M3 and M10) would be targeted to restore either tidal marsh or seagrasses, dependent on further agency input and final project impact offset needs. At similar elevation to tidal marsh, portions of the site could be left unvegetated and configured to restore sand or mudflat habitats. The remaining impacts to seagrass or wetlands provided in Table 3.2 would be offset by reconfiguring these sites to be able to host the impacted habitat. Placement would be configured to provide the elevations needed conducive to successful planting or recruitment of either tidal marsh or seagrass vegetation species. As an example, at M3, part of the impacted seagrass could be offset by dedicating part of the created habitat to seagrass colonization, since planned elevations would be conducive to recruitment and establishment. Table 6.1 below provides a summary of the proposed new work placement in terms of the impact and the restoration provided. As shown, the proposed restoration of approximately 1,100 acres of aquatic habitat would exceed the actual adverse impacts of approximately 244 acres of special aquatic sites. PCCA proposes to use this restoration to offset these impacts, with the amount of the proposed acreage required to offset the impacts to be determined in consultation with the USACE. Placement volumes for these features have been initially determined assuming tidal marsh elevation. However, the DMMP has enough flexibility in the placement capacity to allow variation of the needed elevations of M3 and M10 to be configured as either habitat as necessary without constraining the overall needed placement. The table also provides an estimate of the acreage of mapped special aquatic sites that would be directly protected by features proposing to restore or bolster eroding shoreline features. This was estimated using geospatial data, using estimates of the mapped acreage directly behind the restored feature. As shown, large areas behind these features would be subject to more wind, wave, tidal flow, and vessel wake erosion from eroded land and shoreline.

## **7.0 CONCLUSION**

The PCCA understands that discharges into waters of the United States should not occur unless it can be shown that the discharge would not result in an unacceptable adverse impact on the aquatic ecosystem. It is also understood that if there is a practicable alternative to the discharge, the discharge should not occur. A practicable alternative is not available that would meet the proposed project requirements and achieve the project purpose. The proposed project would increase crude oil export efficiency for the Nation, reducing trade deficits, and fostering economic development. The result of the proposed action would be a more efficient channel to export crude oil. The proposed project meets the project purpose and need. The placement alternatives were developed in coordination with resource agencies, and considered public input during open house meetings at the start of the project. The resultant proposed placement alternatives make extensive use of BU to address ecological restoration needs that agencies desire. The volume of material and volume of sands are valuable assets, and the dredging and placement presents a unique and major opportunity to address restoration needs in this estuary and barrier island system.

**Table 6.1: Summary of Project Impacts and Proposed Restoration**

Placement Option	Description	Restoration Action	Acres				Comments
			Proposed Restoration Seagrass or Marsh	Adverse Impacts to Special Aquatic Sites (SAS)	SAS Protected	Conversion of Open Water to Upland	
HI-E	Estuarine/Marine Wetland	Restoring protective uplands and armored bluff for protection of significant seagrass acreage which lies behind	0.0	28.6	264.4	3.3	Predominantly unconsolidated shore impacted Predominantly Estuarine and Marine Wetland protected
M3	Estuarine/aquatic habitat creation adjacent to Pelican Island	Convert featureless bay bottom to approximately 330 acres of estuarine/aquatic habitat.	330.0	7.6			Seagrass impacted
M4	Restoring historic land and marsh loss at Dagger Island	Restore eroding marsh habitat for native shorebirds and coastal wildlife. Design elements will be coordinated to support TPWD's existing permitted project.		0.0	615.4		Predominantly seagrass protected
PA9-S	Upland placement expansion converting 309 acres of bay bottom to upland, adjacent to PA9.	none		0.0		308.8	
M10	Estuarine/aquatic habitat creation adjacent to PA10	Convert featureless bay bottom to approximately 770 acres of estuarine/aquatic habitat.	770.0	0.0			
MI	Mustang Island Beach Nourishment	Nourishment creating 250 ft of aerial beach, utilizing » 2,000,000 CY of sand as storm surge and wave attenuation		0.0			
SS1	Restoring eroded shoreline and armoring to protect Harbor Island seagrass area	Restore eroding shoreline to its historic profile. Protects Harbor Island seagrass area	0.0	208.1	1,552.1		Predominantly unconsolidated shore impacted Predominantly seagrass protected

Placement Option	Description	Restoration Action	Acres				Comments
			Proposed Restoration Seagrass or Marsh	Adverse Impacts to Special Aquatic Sites (SAS)	SAS Protected	Conversion of Open Water to Upland	
SS2	Restore shoreline washout along Port Aransas Nature Preserve as a result of Hurricane Harvey	Restores two washouts of shoreline along the Port Aransas Nature Preserve as a result of Hurricane Harvey.	0.0	0.0	333.0		Predominantly Estuarine and Marine Wetland (sand flats) protected
PA4	Reestablish eroded shoreline and land loss behind PA4	Restores historically eroding shoreline and land protecting Harbor Island seagrass area.	0.0	0.0	750.6	3.3	Predominantly seagrass protected
PA6	Dike raise	none	0.0	0.0			
SJI	Dune & shore restoration San Jose Island	Restore several miles of beach profile washed away as a result of Hurricane Harvey.		0.0			
NW ODMDS	Place on part of New Work ODMDS	none		0.0			
B1-B9	Feeder berms offshore of SJI and Mustang Island	Nourish beach shoreline by natural sediment transport processes.		0.0			
<b>TOTAL</b>			1,100.0	244.3	3,515.6		

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Attachment B – Texas Commission on  
Environmental Quality  
Tier II  
401 Certification Questionnaire  
Alternatives Analysis Checklist

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## TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

### Tier II 401 Certification Questionnaire

The following questions seek to determine how adverse impacts will be avoided during construction or upon completion of the project. If any of the following questions are not applicable to your project, write NA ('not applicable') and continue.

Please include the applicant's name as it appears on the Corps of Engineers' permit application (and permit number, if known) on all material submitted. The material should be sent to:

Texas Commission on Environmental Quality  
Attn: 401 Coordinator (MC-150)  
P.O. Box 13087  
Austin, TX 78711-3087

**Applicant's Name:** Sarah L. Garza, Port of Corpus Christi Authority  
**Assigned Permit Number:** SWG-2019-00067

#### I. Impacts to surface water in the State, including wetlands

- A. What is the area of surface water in the State, including wetlands, that will be disturbed, altered or destroyed by the proposed activity?

*The proposed activity will dredge approximately 588.8 acres of undredged ocean bottom below mean lower low water (MLLW) in the Gulf of Mexico, 329.0 acres of undredged and partially dredged ocean and estuarine bottom and 0.11 acres of seagrass adjacent to the existing and authorized Corpus Christi Ship Channel (CCSC), 665.8 acres of the existing and authorized CCSC channel bottom, 56.7 acres of estuarine bottom in the Lydia Ann Channel, and in Aransas Pass as part of proposed channel improvements.*

*For the proposed dredged material management plan (DMMP), using available Texas Parks and Wildlife Department (TPWD), Texas General Land Office (TGLO), National Oceanic and Atmospheric Administration (NOAA), and U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) data, approximately 4,673.9 acres of surface waters, 688.3 acres of mapped seagrass, and 984.5 acres of mapped wetland were identified as located in the proposed placement features.*

*Of the wetlands, 238.6 acres are features that were mapped within an active Placement Area (PA) or have eroded away based on aerial review (SS2, PA4,6,HI-E), 279.4 acres are San*

*Jose Island shoreline and 211.7 Mustang Island shoreline which are proposed for placement and would directly restore as beach or dune (SJI, MI), 68.9 acres would be avoided or integrated into [Ducks Unlimited and TPWD's] planned Dagger Island shoreline restoration (M4). 28.6 acres of wetland will be impacted by placement at Harbor Island East (HI-E), and 157.3 acres of wetland impacted at restoring an eroded shoreline to protect Harbor Island seagrass (SS1). The 185.9 acres between SS1 and HI-E would be impacted by beneficial use (BU) features proposed to protect large areas of seagrass.*

*Of the seagrass, 571.5 acres would be in the interior of M4 at Dagger Island and would be largely avoided except at the fringes of shoreline restoration which would protect this seagrass from further erosion, and of the 17.1 acres at M3 where proposed BU marsh can be reconfigured to replace impacted seagrass acreage approximately 7.6 acres are visible upon aerial inspection. PA9-S and M10 may have stands of seagrass of 3.1 and 2.5 respectively however it is not visible upon aerial inspection and is most likely sparse and tenuous as a result of focused wave energy. The remaining 50.8 acres would be impacted by shore and land loss restoration at SS1, which will protect a very large seagrass area behind Harbor Island.*

- B. Is compensatory mitigation proposed? If yes, submit a copy of the mitigation plan. If no, explain why not.

*Currently, waters of the U.S. (WOUS) and aquatic habitat within proposed project footprints have been determined using the most current existing geospatial mapping from TPWD, TGLO, NOAA, USFWS, and aerial imagery to identify open water, wetlands and seagrass. A mitigation plan has not been developed yet. Compensatory mitigation will be proposed as required, following field surveys to delineate WOUS and special aquatic sites more specifically, and assessment to determine the functions and services of these resources. The proposed DMMP for this project has been planned to use beneficially as much dredged material as possible to restore beach, shorelines, and aquatic habitat, including the types that would be impacted. Initially, BU aquatic habitat restoration sites have been planned assuming tidal marsh elevation, but the DMMP has enough available material and capacity to have the flexibility to provide the required elevation for tidal marsh, flats, or seagrass. Tables 3.1, 3.2 and 6.1 in Attachment A of the permit application detail and summarize the acreage of mapped habitat in each proposed placement feature, the estimated adverse impacts, and the proposed BU restoration. The proposed aquatic habitat restoration of 1,100 acres exceeds the estimated adverse impacts of 244 acres of mapped special aquatic sites. Except for SS1 and HI-E, the remaining seagrass and wetland impacts of the BU features would be addressed by reconfiguring the BU placement to provide suitable area for the reestablishment of impacted habitat. SSI and HI-E establish protective barriers to larger seagrass areas that would otherwise be very prone to erosion if further shoreline loss is experienced. These and several other features restore shoreline protecting approximately 3,500 acres of seagrass and marsh behind these shorelines from wind, wave, tidal flow, and vessel wake energy. The proposed BU features SJI, MI, and B1 through B9 on the Gulf side of San Jose and Mustang Islands, are all direct or indirect beach and dune nourishment intended to restore those coastal habitats from hurricane-related and long term erosion.*

- C. Please complete the attached Alternatives Analysis Checklist.

*Alternatives Analysis Checklist is attached.*

## II. Disposal of waste materials

- A. Describe the methods for disposing of materials recovered from the removal or destruction of existing structures.

*No removal or destruction of existing structures is expected. Minor removal of debris and unsuitable materials encountered during dredging may be necessary during construction. Minimal disposal will be required. All material that is not re-usable will be disposed of at a properly permitted facility.*

- B. Describe the methods for disposing of sewage generated during construction. If the proposed work establishes a business or a subdivision, describe the method for disposing of sewage after completing the project.

*Sewage generated during construction would be collected on ship-board facilities or in self-contained portable toilets that would be serviced regularly. The proposed activity will be dredging in the marine environment and dredged material placement at existing placement areas (PA), beneficial use (BU) sites or proposed PA or BU sites. No wastewater services currently exist within the project area and none are included in the proposed construction.*

- C. For marinas, describe plans for collecting and disposing of sewage from marine sanitation devices. Also, discuss provisions for the disposing of sewage generated from day-to-day activities.

*N/A*

## III. Water quality impacts

- A. Describe the methods to minimize the short-term and long-term turbidity and suspended solids in the waters being dredged and/or filled. Also, describe the type of sediment (sand, clay, etc.) that will be dredged used for fill.

*The proposed action would generate approximately 46.3 million cubic yards (MCY) of new work dredged material. Based on review of existing borings, approximately 17.1 MCY of the new work material would consist of clay material and 29.2 CY would consist of sand material. Placement and use of these materials is planned as follows, employing standards dredged material placement construction techniques generally described here and in more detail under Item B:*

***Offshore Placement*** – *For construction of the proposed action, the existing and currently approved dispersive offshore placement site (a.k.a. New Work ODMDS) would be used to place new work clay and silty material. Placement would be by scow, hopper, or direct pipeline placement, employing standard scow or hopper operation techniques to achieve controlled deposition.*

***Repair and nourishment of Gulf-side shorelines*** – *For construction of the proposed action, pending owner approval, sandy material would be used to restore dunes in large dune breaches, and restore the eroded foreshore on San Jose Island (SJI) due to damage caused by Hurricane Harvey. Standard construction techniques for beach nourishment used elsewhere on the Texas coast would be employed such as the use of temporary dewatering*

dikes to effect deposition and material retention. Restored dunes would be planted with native stabilizing vegetation to anchor dunes. Sandy and other appropriate new work material would also be used to create a series of offshore feeder berms (B-1 through B-6) that would be located within the active shoreward transport zone to indirectly nourish San Jose and Mustang Islands. According to the Texas General Land Office (TGLO) 2014 Coastwide Erosion Response Plan (CERP) and Bureau of Economic Geology (BEG) Shoreline Change Map, these islands have experienced historical shoreline erosion of approximately 2 or more feet per year. These berms would be constructed using standard submerged placement techniques for either hydraulic placement at sites closer to the point of dredging and potentially by scow for sites more distant from the point of dredging.

**Repair of bay-side shorelines and land loss** – For construction of the proposed action, new work dredged material would be used to repair eroded shorelines at Harbor Island (SS1), Port Aransas Nature Preserve [PANS] (SS2), and Dagger Island (M4) to stem further land, tidal flat and seagrass habitat loss due to damage experienced during Hurricane Harvey and over time. At SS1, containment dikes for dewatering would be used, and would have seeding on dike crowns and interiors, and armoring on the channel side. At SS2, the previous shoreline profile would be restored and would be backfilled behind it to bolster and reestablish the original land barrier to tidal sand flats in the PANS, using armoring where it previously was used in the breaches. At M4, material would be used to construct containment dikes on certain sides of Dagger Island to prevent channel sediment migration and to build/preserve marsh and seagrass elevation behind it, with these areas potentially seeded for initial stabilization and blending in with existing seagrass. M4 would provide material to implement breakwater and land loss restoration measures already permitted by TPWD and included in the USACE Coastal Texas Study and TGLO Coastal Resiliency Master Plan. Suitable new work material would also be used to build containment dikes toward the channel and fill in behind them at the existing PA4 on Harbor Island to restore severe upland losses experienced over the years. This would also help preserve the land buffer between Aransas Pass and the large seagrass habitat area behind Harbor Island to protect the seagrass habitat from future damage. Containment dikes would be seeded on the crowns and interiors, and armored on the channel side.

**Upland Placement** – For construction of the proposed action, new work material would also be used for raising containment dikes on PA 6, and to fill the interior using capacity created by dike raising. Upon the completion of construction, the dikes would be seeded and vegetated to minimize erosion.

**Estuarine/Aquatic Habitat Creation** – M3, M9, and M10 will create estuarine/aquatic habitat by placing material on bay bottom to raise elevation to optimal subtidal and intertidal marsh elevation, likely using erodible containment dike techniques previously employed elsewhere in Texas. These features would ultimately be planted or colonized by appropriate native vegetation.

**Maintenance** – Over the 10-year permit life, approximately 1.08 MCY of maintenance materials would be generated annually from the deepened channel, of which approximately 399,000 CY would be additional material due to the deepened channel. The material is expected to consist of fine grained silts, sands, and clays, and would be dredged and placed in either existing upland placement areas (PA2), ODMDS No. 1, or proposed BU feeder berms B-1 through B-6, as material suitability allows. Use of the existing sites is consistent

*with the current operations and maintenance (O&M) placement of the existing and authorized CCSC managed by the USACE Galveston District.*

*The Port of Corpus Christi Authority (PCCA) would follow the current USACE CCSC procedures used for dredging and dredged material placement during construction dredging and channel maintenance. These include standard dredging techniques to construct submerged and emergent containment dikes, and interior placement of material. These techniques are described further in Item B below.*

- B. Describe measures that would be used to stabilize disturbed soil areas, including: dredge material mounds, new levees or berms, building sites, and construction work areas. The description should address both short-term (construction related) and long-term (normal operation or maintenance) measures. Typical measures might include containment structures, drainage modifications, sediment fences, or vegetative cover. Special construction techniques intended to minimize soil or sediment disruption should also be described.

*Techniques used successfully in Texas, around the U.S., and by USACE to construct stable PA and BU restoration features were described in general above. The following provides more details on these techniques which prevent short and long term erosion and turbidity.*

- ***Beach nourishment temporary dewatering dikes*** – *This would involve the use of in-situ sand to form a series of temporary retention dikes to dewater hydraulically pumped sand, constructed as placement moves along the shoreline.*
- ***In-water placement for submerged berm, in-water dike construction or in-water fill*** – *This would involve one of two potential general methods: 1) the use of diffusers and downspouts at the end of pipelines to slow exit velocities, reduce turbidity, and control material migration, to achieve focused placement to build the intended template, 2) the use of hydraulically loaded scows or hopper dredges to discharge by gravity fall during a controlled release, to minimize sediment migration and achieve focused placement around the scow or hopper.*
- ***Upland dike construction*** – *Material would be hydraulically pumped to create containment dikes. After dike construction riprap, rock, etc. would be added where armoring is indicated and dike side slopes would be seeded and vegetated as soon as practicable with robust and rapidly establishing species to provide long term stability.*
- ***Interior filling*** – *Where practicable for the type of feature, containment dikes with limited weir outlets or spill boxes designed or planned to allow retention and eventually dewatering as features become emergent. For placement on emergent interiors, interior training dikes, ditching and other enhanced dewatering techniques would be employed to further optimize material retention and dewatering.*

- C. Discuss how hydraulically dredged materials will be handled to ensure maximum settling of solids before discharging the decant water. Plans should include a calculation of minimum settling times with supporting data (Reference: Technical Report, DS-7810, Dredge Material Research Program, GUIDELINES FOR DESIGNING, OPERATING, AND MAINTAINING DREDGED MATERIAL CONTAINMENT AREAS). If future maintenance dredging will be required, the disposal site should be designed to accommodate additional dredged materials. If not, please include plans for periodically removing the dried sediments from the disposal area.

*Technical Report, DS-78-10 is a former Waterways Extension Service (WES) publication that has been superseded by newer USACE guidance contained in Engineering Manuals (EM) including EM 1110-2-5025 Dredging and Dredged Material Management, and EM 1110-2-5027 Confined Disposal of Dredged Material, for the design of contained dredged material placement. Where applicable and appropriate, these design criteria would be used during the detailed design phase to configure feature geometry and discharge placement. For other unconfined feature construction (e.g. beach nourishment), use of the above described hydraulic placement techniques would be used.*

*The proposed action is deepening of the existing and authorized Federal channel. Maintenance for the incremental annual amount of 399,000 CY of extra shoaled material would be accomplished as part of the existing channel maintenance cycle using the existing, approved offshore dispersive site ODMDS No. 1, and if suitable material is generated, the existing PA2 on San Jose Island, and the proposed offshore feeder berms B-1 through B-9.*

- D. Describe any methods used to test the sediments for contamination, especially when dredging in an area known or likely to be contaminated, such as downstream of municipal or industrial wastewater discharges.

*The segment of the CCSC to be dredged for the proposed action has two wastewater discharges located directly adjacent to the channels. One is a private domestic wastewater (TCEQ Permit #12731-001) and the other brine discharge (Permit No. WQ0005253000). However, dredged materials from the CCSC to be dredged for the proposed action are not known or likely to be contaminated. The CCSC is tested and maintained in accordance with USACE sediment testing guidelines. No increases in contaminant levels is expected during dredge and fill operations.*

*The potential for contaminants has been evaluated through chemical analyses, grain-size analyses, bioassays, and bioaccumulation tests in the surrounding area as part of the Corpus Christi Ship Channel, Texas Channel Improvement Project for the current authorized Federal channel. These tests spanned a wide variety of volatile, semi-volatile (e.g. PAH), pesticide and persistent organic (e.g. PCB, dioxin) compounds, and metal constituents. The 2003 "Corpus Christi Ship Channel, Texas Channel Improvement Project, Volume I Final Feasibility Report and Final Environmental Impact Statement" concluded that contaminant studies showed that new work and maintenance dredged material from all sections of the channel, with the exception of the Inner Harbor (which is not part of the proposed action), is acceptable for offshore placement, beneficial uses in the bay or ocean, or upland placement.*

*More recent testing conducted in 2018 for the Entrance Channel segment and entrance channel extension of the CCSC for the current authorized Federal channel to support offshore placement for the purposes Marine Protection, Research and Sanctuaries Act (MPRSA) Section 103 included chemical, grain-size, bioassays, and bioaccumulation tests on new work material samples between current depths and the proposed depth of -54 feet MLLW. Testing results indicated no contaminant concerns and supported offshore placement. This recently tested segment comprises the majority of the project segment for the proposed action. The proposed action would dredge new work, in-situ geological material below the recently tested layer (from -54 feet MLLW to -80 feet MLLW), and thus would be less prone to surface human impacts. The proposed action would also dredge existing Gulf of Mexico seafloor materials to extend the entrance channel further to the -80*

*foot MLLW contour. This segment would be as or less prone to impacts than the recently tested extension for the authorized Federal channel. The proposed areas to be dredged have been extensively tested previously and/or are not prone to contamination. Despite the expectation of the extension not being prone to contamination based on the review of past nearby sampling and the environmental setting, a Sampling and Analysis Plan (SAP) has been developed for the extension for this project to confirm this expectation.*



## TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

### Tier II Alternative Analysis Checklist

#### I. Alternatives

- A. How could you satisfy your needs in ways which do not affect surface water in the State?

*Work below mean lower low water (MLLW) of the Gulf of Mexico, Corpus Christi Bay, and Redfish Bays within the proposed project area is necessary to meet the project needs of increasing crude oil export efficiency and safety. Crude oil export efficiency and safety in the Corpus Christi Ship Channel (CCSC) cannot be improved without affecting waters in the State. The existing CCSC would need to be deepened to meet the purpose of the project, which is to construct a channel with the capability to accommodate transit of fully laden Very Large Crude Carriers (VLCC) from multiple locations on Harbor Island into the Gulf of Mexico. Multiple crude export terminals are being planned on Harbor Island to export crude oil using the authorized Federal channel being currently constructed to a depth of -54 feet MLLW, which would still require light loading of VLCCs, and supplemental lightering involving multiple other lightering vessels out in the Gulf of Mexico to fully load VLCCs, decreasing export efficiency and increasing crude transfer activity and associated risks in the Gulf. Dredging activities may affect water quality within the proposed project area by temporarily increasing turbidity and suspended sediment load in the estuarine water column. However, these temporary conditions would not be expected to adversely impact marine mammals, essential fish habitat or other aquatic resources in the study area to a significant degree.*

- B. How could the project be re-designed to fit the site without affecting surface water in the State

*Initial crude oil export alternatives were evaluated and screened including alternatives to deepening the channel, which consisted of offshore loading facility options (See Attachment A of the Permit Application). Offshore options did not meet the purpose and need of the proposed action as well as the channel deepening alternative, and channel deepening performed better in most major criteria including export efficiency, flexibility to accommodate growth, and environmental and safety risk. Deepening the channel improves the access for terminals already being planned to export crude. Offshore options would expose San Jose Island and Mustang Island (with the National Seashore) to a greater risk of oil spills during loading activities compared to channel deepening which brings loading activities in a more controlled environment of Corpus Christi Bay. Both barrier islands which host Piping plover (*Charadrius melodus*) critical habitat and endangered sea turtle nesting beaches. Therefore, channel deepening was selected. The proposed project terminus is Harbor Island, and deepening to accommodate full loading of Very Large Crude Carriers (VLCC) and Suezmax tankers is the only navigation improvement being examined, only one channel extent and alignment was examined. Deepening of the CCSC cannot be done without affecting surface water in the State.*

- C. How could the project be made smaller and still fit your needs?

*The deepening could be done to an optimized depth that serves the majority of the intended design vessel (VLCC) class and likely prevailing crude oil type instead of absolutely maximizing the depth for all versions of the design vessel, carrying the densest crude oil. This has already been examined and incorporated into the channel alternative selected for the proposed action. First, world fleet registry data from IHS Fairplay was used to analyze and identify the appropriate target vessel dimensions (including*



*draft) from the variation in size among the VLCC fleet. A 99<sup>th</sup> percentile set of dimensions was identified, and individual vessel dimensions clustered tightly around the selected dimensions. Second, the fully loaded draft for the design vessel was calculated assuming the American Petroleum Institute gravity for West Texas Intermediate (WTI) crude oil, which will be the predominant controlling grade of crude oil exported from the Port of Corpus Christi. This was done in lieu of assuming the largest VLCC carrying the heaviest crude oil possible for this Port (heavy sour). Appropriate under keel clearance in consideration of sea state and climatic factors and guiding navigation standards (USACE and World Association for Waterborne Transport Infrastructure [PIANC]) was added. Ship simulation was accomplished in December 2018 at the Maritime Institute of Technology and Graduate Studies (MITAGS) to verify the depths and under keel clearances were navigable under a range of conditions. Therefore, the depth of the proposed deepening has been optimized.*

*Another way the project could be made smaller is to use the steepest channel side slopes and narrowest bottom width allowable for one way passage. Geotechnical borings and analyses have been accomplished to determine the steepest stable slopes for the in situ material. Steeper slopes than the existing side slope are being coordinated with the USACE for acceptability under 33 U.S.C. Section 408 approval. December 2018 ship simulation at MITAGS also examined alternate channel bottom widths for one way VLCC transit. This is also being coordinated with the USACE for acceptability under 33 U.S.C. Section 408 approval. If approved and possible, steeper side slopes and narrower bottom widths will be planned for implementation.*

D. What other sites were considered?

*Offshore alternatives that were initially considered, but would be located a minimum of 13 or more miles. For the reasons discussed in Item I.B above, these offshore options were eliminated. Alternative sites for increasing the efficiency of moving crude oil would require new development of terminal facilities and/or dredging completely new navigation channels; both of which are not practical, nor least environmentally damaging, and therefore were not considered. Alternative sites for dredged material placement considered were existing placement areas (PA), offshore disposal, and beneficial use (BU) sites, and a variety of new and expanded PA and BU site initiatives, within the practical distance for hydraulic dredging pipeline or scow placement. New terrestrial sites were considered in general, but were not practical due to distance, existing infrastructure and residential development, and presence of ecologically sensitive habitat and refuges in nearby terrestrial sites (e.g. Mustang Island). Details of the alternatives considered for both channel improvement and placement are in Attachment A of the Permit Application*

1. What geographical areas were searched for alternative sites?

*The proposed deepening must occur within the proposed project area, thereby precluding the consideration of alternative sites. For dredged material placement, initially, existing PA and BU sites used for the current and authorized CCSC stretching from the Gulf of Mexico to Ingleside, initial new BU concepts coordinated with resource agencies located from the Gulf-side of Mustang and San Jose Islands north and south of the CCSC, and throughout Corpus Christi Bay and Redfish Bay, were all considered.*

*As the proposed channel was refined to an extent from the Gulf to Harbor Island, and existing PA capacities ruled out all but a few current PA and BU sites available for use, the initial PA and BU concepts were further developed and focused to the lower Corpus Christi Bay and Gulf of Mexico. Existing sites are located on existing PAs located on Harbor Island (PA4, HI-E), Mustang Island (PA6), offshore waters adjacent near the existing channel (New Work ODMDS) or originally developed in the Bay (PA13). New BU sites located adjacent to existing PAs (M3, PA9-S, and M10) in Corpus Christi Bay, in Redfish Bay (M4), near the Port Aransas Nature Preserve (SS1, SS2), and in nearshore waters along Mustang (MI) and San Jose Islands (B1 through B9) and on San Jose Island (SJI), were considered. Most of these BU sites were associated with restoring habitat and shoreline from Hurricane Harvey damage or long term erosion and land loss. The dredged material placement alternatives were generally limited to within the 10 miles as a*

*practical and cost-feasible radius for hydraulic dredging and dredged material placement or use of scows.*

2. How did you determine whether other non-wetland sites are available for development in the area?

*Aerial imagery, appraisal district data, and distance criteria were used to determine if terrestrial sites without wetlands were likely to be viable. Both existing development, refuge and habitat presence, and property parcel sizes versus needed capacity were used to screen out the viability of terrestrial sites that might be free of wetlands. Once it was determined to use existing and new or expanded PA and BU sites, National Wetland Inventory (NWI), and Texas Parks and Wildlife (TPWD) and National Oceanic and Atmospheric Administration (NOAA) seagrass mapping were used to configure and refine PA concepts to minimize impacts. Very little mapped wetland is present in the BU sites and mapped seagrass directly in the footprint of the proposed placement is limited to natural recruitment at the shallow bathymetric margins of PA dike slopes. The initiatives to use the material beneficially will create more tidal marsh, restore shoreline that protects seagrass habitat, or repair damaged dunes and beaches in sensitive barrier island habitat.*

3. In recent years, have you sold or leased any lands located within the vicinity of the project? If so, why were they unsuitable for the project?

*Yes. Property at Harbor Island adjacent to the project segment of the CCSC has been leased to an operator to implement construction and long term operation of the PCCA's proposed crude oil export terminal. This is not suitable for project placement use at it is one of several properties being developed for crude export at Harbor Island serviced by the proposed deepening. No other property near the channel project have been leased or sold.*

- E. What are the consequences of not building the project?

*The No Action alternative would not increase efficiency of moving crude oil exports from the Port of Corpus Christi in support of national energy security and national trade objectives, which is the proposed project's purpose and would not increase the safety of this movement, which is an underlying need. This would result in a channel depth that forces shippers to light load their vessels, requiring multiple smaller lightering vessels to shuttle oil to deeper waters, increasing the numbers of vessels needed to move crude oil, which would increase shipping costs and volatile organic chemical (VOC) vapor and greenhouse gas emissions. This would substantially affect the ability of the CCSC to efficiently and safely accommodate the projected increase in tanker tonnage to be handled at existing and planned VLLC-capable crude oil terminals at Harbor Island and at Ingleside, as well the larger VLCCs to which industry is moving towards. This would increase costs to shippers and consumers from continued light-loading of tanker vessels. The No Action alternative would not satisfy the PCCA's mission of leveraging commerce to drive prosperity for the region and community.*

## **II. Comparison of alternatives**

- A. How do costs compare for the alternatives considered above?

*No costs were estimated for the initial channel concepts. However, offshore options consisting of Single Point Moorings (SPM) and offshore loading platforms have substantially higher long term operating and maintenance costs due to the distance over which product must be pumped from onshore storage facilities to loading points out in the Gulf of Mexico which could be as far as 13 or more miles. They are also more costly to expand with additional loading points, compared to adding berths along water frontage served by a deepened channel. For this and the aforementioned reasons discussed in I.B. the offshore options were screened out. The preferred channel improvement project is the least cost alternative that increases crude oil export efficiency. For dredged material placement, the proposed placement alternatives considered are*

*cost effective compared to new upland sites, meet the placement capacity needed, and make beneficial use of the dredged material or use of existing PA and BU sites.*

- B. Are there logistical (location, access, transportation, etc.) reasons that limit the alternatives considered?

*The logistical factor that limits the consideration of alternatives is the location of the CCSC and future expected crude terminal developments. Alternative sites would require development in a new area and were not considered. The proposed project is designed to provide the needed increase in crude oil export efficiency while minimizing adverse environmental impacts to the Gulf of Mexico and Corpus Christi Bay. For dredged material placement, distance over which material must be pumped or transported by scow, required water depths for hopper or scow use, and access to stage and route hydraulic pipelines, all constrain where cost effective dredge material placement can be achieved. Terrestrial sites are more constrained by available contiguous land and parcel size, easement and access across roads, properties etc. needed for pipelines. In the vicinity of Harbor Island, there are no sizable contiguous tracts to accommodate an upland PA to contain substantial planned new work volumes on the adjacent islands of Mustang or San Jose that aren't local or national refuges, seagrass habitat, or T&E critical habitat. Along with the planned crude terminal, Martin Midstream, and Gulf Copper are located on Harbor Island at the channel entrance. Therefore, BU and offshore placement in this vicinity were planned. The next nearest mainland with larger tracts of land is Ingleside, 8 miles farther in, where several crude oil export facilities are being planned on the land nearest water. Flint Hills Resources, OXY Ingleside Energy Center, Kiewit Offshore, Chemours, Oxychem, Ingleside Ethylene, Cheniere, and Voestalpine Texas are existing facilities located along Ingleside. These limit upland placement options, and options to use material beneficially would be cost competitive due to the distance.*

- C. Are there technological limitations for the alternatives considered?

*For the channel alternative selected, several technological limitations result in the selected depth, width and side slope ratios. These are the required draft to fully load a VLCC with the intended product (WTI crude), the design criteria from USACE Engineering Manuals and PIANC guidelines to determine required under keel clearances to accommodate dynamic movement due to sea state and climatic conditions, wind and current conditions constraining minimum one-way passage widths, and geotechnical slope stability. For placement, technological limitations mainly involve cost-effective hydraulic pump distances (typically 10 miles), and required draft and cost-effective travel distances for scows and hoppers,*

- D. Are there other reasons certain alternatives are not feasible?

*For channel alternatives, the primary reasons offshore alternatives are not feasible are discussed in II.A above. For placement, new upland sites would be less cost effective due to farther distances required to reach sizable contiguous tracts of land. They could involve impacts to terrestrial wetlands, and would require new property purchases, and routing and burial of temporary hydraulic pipelines across existing roads and properties. Depending on land elevation, pumping hydraulic pressure head limitations could be reached, which would force less cost effective transport by truck. These factors would complicate the usability and viability*

**III. If you have not chosen an alternative which would avoid impacts to surface water in the State, please explain:**

- A. Why your alternative was selected, and

*The preferred channel alternative will deepen a channel that will already be used for crude export facilities already being planned and permitted. The preferred channel alternative would provide a substantial increase in the efficiency of crude oil exports, increase the safety of loading operations, provides more efficient loading and flexibility for future growth than offshore options, and provides material for beneficial use to areas in need of restoration. It meets the overall purpose and needs of the proposed action the best.*

*The selected depth optimizes the necessary draft to address efficient export while minimizing environmental impacts. The proposed dredged material placement alternatives were chosen because they meet a variety of needs for providing sufficient and additional new work and maintenance dredged material placement capacity. Existing placement capacity for the CCSC is limited to take on new work material, new upland sites would likely be more costly and disruptive, and PCCA engaged planning and coordination to identify desirable BU and PA expansion/extension where possible. Attachment A provides the full discussion and justification for selecting the channel and placement alternatives.*

- B. What do you plan to do to minimize adverse effects on the surface water in the State impacted?

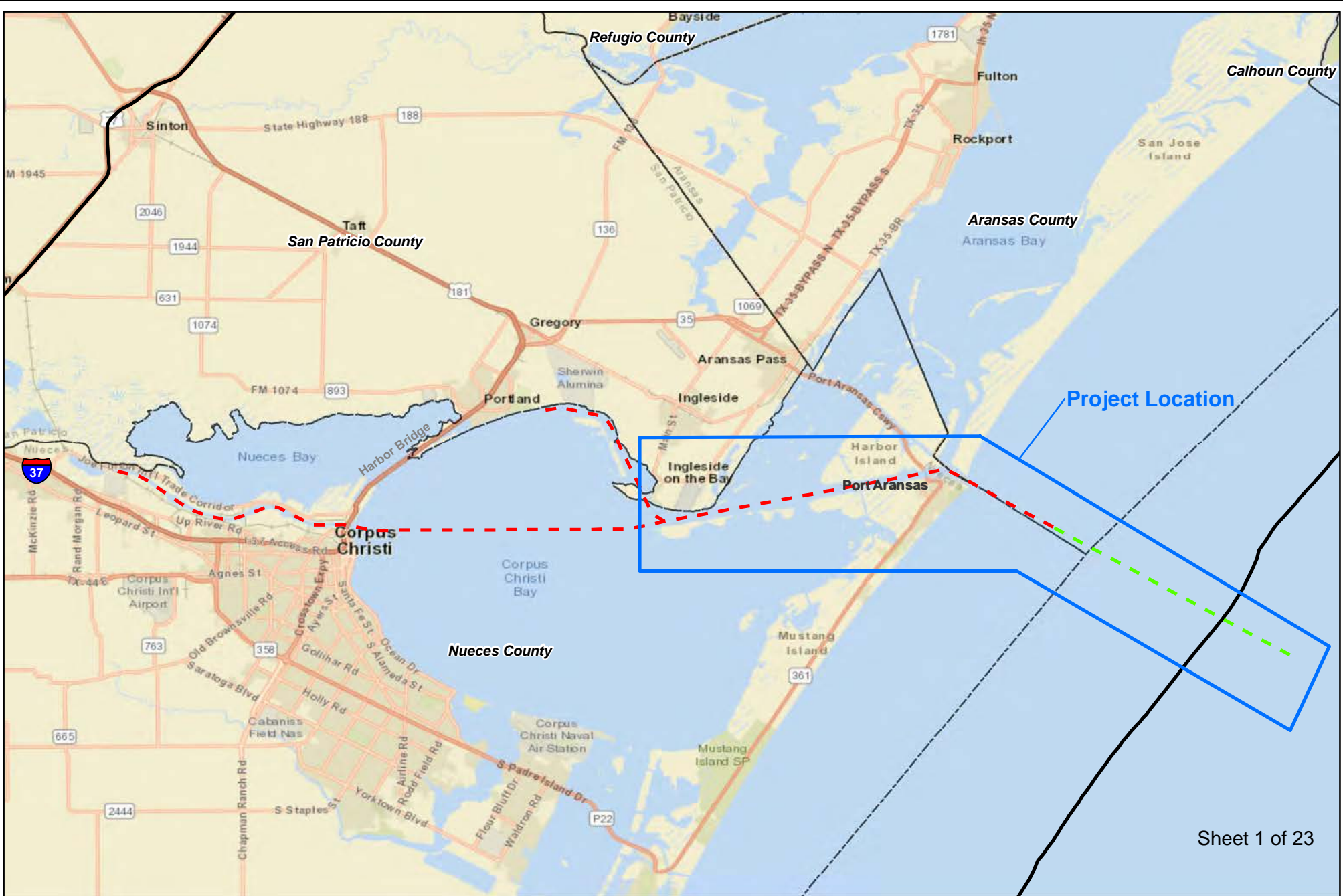
*The construction techniques described in Section III of the Tier II 401 Certification Questionnaire would be employed to minimize migration of placed material. These techniques are standard industry methods of placement employed in USACE and non-Federal projects to construct PAs, and BU sites. In summary, these methods are discharge end measures to slow deposition velocity and control the discharge for hydraulic placement, controlled release from scows or hoppers, diked and contained dewatering methods, and dike erosion control methods including seeding and armoring.*

**IV. Please Provide Comparison of Each Criteria (From Part II) For Each Site Evaluation in The Alternatives Analysis**

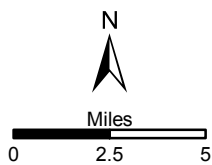
*See Attachment A of the Permit Application for details. The outcome of initial screening of channel alternatives is summarized in the table below.*

Screening Criteria	OPTIONS			
	Alternative A No Action	Alternative B Channel Deepening Project	Alternative C Offshore SPM Facility	Alternative D Offshore Platform
<b>1) Increase Export Efficiency</b>	<ul style="list-style-type: none"> <li>No increase in export efficiency. Inefficient lightering process, involving more vessel calls, transit, and longer VLCC loading process will still occur</li> <li>Would involve light-loaded VLCC transit on lower 3<sup>rd</sup> of CCSC</li> <li>Increase in congestion with future growth from more lightering vessels</li> </ul>	<ul style="list-style-type: none"> <li>Lightering can be eliminated or reduced, decreasing vessel traffic and shortening the duration of VLCC loading process</li> <li>Would still require VLCC transit on lower 3<sup>rd</sup> of CCSC, but elimination or reduction of lightering transit would free up channel availability for future growth.</li> <li>Multiple tenant accommodation discussed below would allow more fully loaded VLCC participation, increasing efficiency for more exporters</li> </ul>	<ul style="list-style-type: none"> <li>Lightering can be eliminated or reduced, thereby reducing vessels involved and shorten VLCC loading process</li> <li>Would eliminate VLCC transit.</li> <li>Exporting participants would be more limited than channel option, and exporting nonparticipants who couldn't fully load VLCCs would resort to smaller vessels or lightered VLCCs, leaving this congestion component in place as growth occurs. See multiple tenant and future growth discussion below.</li> </ul>	<ul style="list-style-type: none"> <li>Same as SPM for all attributes except where noted</li> </ul>
<b>2) Ability to Serve Multiple Tenants</b>	<ul style="list-style-type: none"> <li>No Change</li> </ul>	<ul style="list-style-type: none"> <li>Port can operate VLCC berths as public docks, servicing multiple tenants and shipping lines, encouraging healthy competition and raising revenue for the Port and local communities.</li> <li>Centralized and integrated land use planning of developable land assets at Harbor Island.</li> <li>Loading of different grades from onshore terminals would be easier compared to offshore options</li> </ul>	<ul style="list-style-type: none"> <li>Difficult to plan multiple offshore SPMs connected individually to individual tank farms.</li> <li>Accommodating different grades from different customers would be more cumbersome, requiring flushing of longer lengths of line to switch grades, compared to onshore terminals.</li> </ul>	<ul style="list-style-type: none"> <li>Same as SPM for all attributes except where noted</li> </ul>
<b>3) Ability to Accommodate Future Growth/Expansion</b>	<ul style="list-style-type: none"> <li>No accommodation of future growth</li> <li>Vessel draft limitations</li> <li>Increased vessel traffic due to large increase in reverse lightening</li> </ul>	<ul style="list-style-type: none"> <li>Local and regional economy is enhanced as revenues are collected for ships calling at and products moving through the PCCA.</li> <li>Efficient use of capital to achieve growth and meet overall crude export forecast for the nation</li> <li>Allows for future growth within the PCCA under a single permitting process for deepening the channel.</li> </ul>	<ul style="list-style-type: none"> <li>Multiple single SPMs may need to be planned by the industry. Multiple permits required for each individual project.</li> <li>Future expansion of offshore SPM facility more difficult to accommodate new users. Limited users can access the facility at any one time due to complex financing and project development challenges.</li> </ul>	<ul style="list-style-type: none"> <li>Same as SPM for all attributes except where noted</li> <li>Expansion of platform to add more users even more difficult and costly than SPM</li> </ul>
<b>4) Environmental Impact</b>	<ul style="list-style-type: none"> <li>No habitat impact</li> <li>Increase in air emissions due to increase from reverse lightering activities.</li> <li>CO<sub>2</sub> emissions would be greater than other options due to continuing lightering activities</li> </ul>	<ul style="list-style-type: none"> <li>Construction largely being undertaken within existing channel limits.</li> <li>New entrance channel extension would temporarily disturb 770.3 acres of 60-ft deep Gulf bottom, convert it to deeper bottom, but benthos would recolonize within a year, and water column would remain. Amount of conversion to deeper bottom would be insignificant compared to available Gulf Habitat.</li> <li>Dredged material will be evaluated for beneficial use and building resilient community.</li> <li>Potential to reduce more than 485,000 MT of CO<sub>2</sub> emissions by eliminating or reducing reverse lightering when annual export rate averages additional 3.5 MMBPD.</li> <li>Potential to eliminate 38-112 tons annual NOx and 2,200- 9,270 tons of VOC from elimination</li> </ul>	<ul style="list-style-type: none"> <li>Puts active loading facility and new pipelines in previously undisturbed part of Gulf of Mexico.</li> <li>Permanent but negligible size (compared to available Gulf Habitat) of conversion of Gulf bottom and water column to SPM platform</li> <li>No potential beneficial use of dredged material</li> <li>Similar potential to reduce CO<sub>2</sub>, NOx, and VOC from eliminating or reducing lightering vessel emissions.</li> <li>Spillages are more likely to happen and not as easily confined or cleaned up.</li> <li>Potential for higher vapour emissions and higher CO<sub>2</sub> emissions from vessels hoteling due to reduced loading rates.</li> <li>Tugs needed for hose tending and VLCC positioning during loading will have to transit over 30 miles (assuming support facilities are</li> </ul>	<ul style="list-style-type: none"> <li>Same as SPM for all attributes except where noted</li> <li>Permanent but negligible size of conversion of Gulf bottom and water column to SPM platform – larger than SPM, but still negligible</li> </ul>

Screening Criteria	OPTIONS			
	Alternative A No Action	Alternative B Channel Deepening Project	Alternative C Offshore SPM Facility	Alternative D Offshore Platform
		<ul style="list-style-type: none"> <li>of some lightering activity</li> <li>Enables faster loading rates than SPM, reducing CO<sub>2</sub> emissions from hoteling vessels.</li> <li>Ability to provide vapour recovery system and shore power to operate vessel systems for reduced emissions.</li> </ul>	<ul style="list-style-type: none"> <li>home based at Port Aransas) from the CCSC to service the platform increasing air emissions generated.</li> <li>No technically feasible method for providing vapour recovery of vapour combustion systems for reducing emissions.</li> </ul>	
<b>5) Risk, Safety and Security</b>	<ul style="list-style-type: none"> <li>More vessels in Harbor will make monitoring harder</li> </ul>	<ul style="list-style-type: none"> <li>Severity of accidental spills would be reduced compared to offshore options as facilities and vessels are in a more controlled Port environment.</li> <li>Environmental accidents better controlled at onshore facilities in protected waters.</li> <li>Comprehensive spill response would be quicker than offshore options due to proximity to response resources</li> <li>Incidents at onshore terminal can be more easily contained to avoid affecting other users.</li> <li>Risk of in-channel vessel incident or allision present, but would be reduced greatly by slow vessel speed, multiple tug assist, and one way transit when bringing VLCCs in the Port.</li> <li>Loading spill incident would be closer to Redfish Bay seagrass and marsh areas, but would not significantly expose National Seashore or San Jose Island beaches to impact <ul style="list-style-type: none"> <li>Prevailing SE winds directed towards terminal shore which would help containment</li> <li>Tidal transport may vary however</li> </ul> </li> <li>Strong security presence within the port environment to protect against deliberate damage and sabotage.</li> </ul>	<ul style="list-style-type: none"> <li>Damage to subsea pipelines or the platform will render the facility unusable until repaired.</li> <li>Environmental conditions such as high winds, high waves, and strong currents can be designed for, however potential is there for conditions that could restrict use of the facility.</li> <li>Avoids potential for in-channel vessel incident, but trades it for more risk of pipeline failures due to miles of multiple necessary pipelines.</li> <li>Comprehensive spill response times to address environmental accidents longer compared to onshore terminals</li> <li>Loading spill incident would not significantly expose Redfish Bay seagrass and marsh areas to impact, but an offshore facility may be potentially expose National Seashore or San Jose Island beaches to impact depending on the location <ul style="list-style-type: none"> <li>Prevailing SE winds directed towards beaches which would hamper containment</li> </ul> </li> <li>More accessible by non-authorized persons; can lead to accidental damage, deliberate damage and sabotage.</li> <li>Higher risk to human safety with offshore operations.</li> <li>Response time to the facility by emergency services will be greater and more costly due to offshore location.</li> </ul>	<ul style="list-style-type: none"> <li>Same as SPM for all attributes except where noted</li> </ul>
<b>6) Ability to Contribute to BU</b>	<ul style="list-style-type: none"> <li>Beneficial use occurring under the - 54 foot project would continue. As before, since there would be no change in dredging or other actions that could contribute.</li> </ul>	<ul style="list-style-type: none"> <li>New work dredging would provide 38 MCY of varying sandy, clayey and some silty material some of which could be used for ecological or construction BU. Channel maintenance material could also be used long term for future BU such as restoring subsided or submerged marsh.</li> </ul>	<ul style="list-style-type: none"> <li>Would require virtually no dredging, and therefore would not provide material that could be used to construct BU features.</li> </ul>	<ul style="list-style-type: none"> <li>Would require virtually no dredging, and therefore would not provide material that could be used to construct BU features.</li> </ul>



Sheet 1 of 23



**Legend**

- - - Corpus Christi Ship Channel
- - - CCSC Deepening Extension
- Project Location
- Texas Coastal Boundary
- County Boundary



<b>Vicinity Map</b>			
Title:		<b>Corpus Christi Ship Channel Deepening Project</b>	
Project:		<b>Port of Corpus Christi Authority</b>	
Client:			
Drawn By:	Date:	Project No.:	
DS	5/28/2019	60578532	



### DREDGING PLAN

SCALE: 1" = 8000'

SEGMENT	STATIONING (@ CHANNEL CL)		*DEPTH (FT BELOW MLLW)	DESCRIPTION	PLAN VIEW LEGEND
	FROM	TO			
1	STA -620+00	STA -330+00	-77.0	Outer Channel	
2	STA -330+00	STA -72+50	-77.0	Approach Channel	
3	STA -72+50	STA -15+08.24	-75.0	Jetties to Harbor Island Transition Flare	
4	STA -15+08.24	STA 19+48.10	-75.0	Harbor Island Transition Flare	
5	STA 19+48.10	STA 38+16.42	-75.0	Harbor Island Junction	
6	STA 38+16.42	STA 110+00	-75.0	Corpus Christi Channel	

\* DESIGN DEPTH SHOWN. DOES NOT INCLUDE 2.0 FT ADVANCED MAINTENANCE DREDGING OR 2.0 FT ALLOWABLE OVER DREDGE.

Sheet 2 of 23

Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-2019-00067

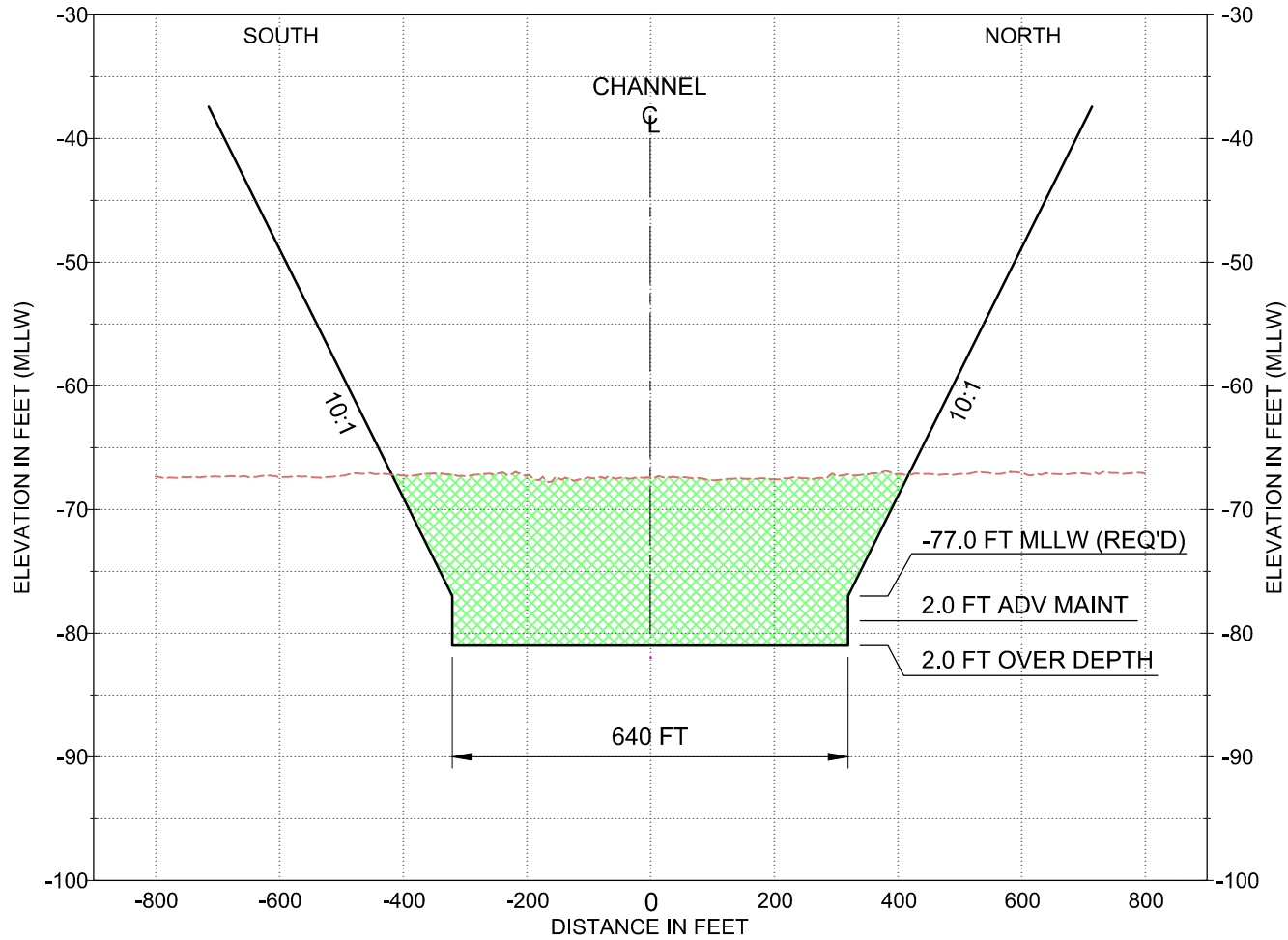
### Preferred Channel Alternative

County: Aransas and Nueces  
Application By: Port of Corpus Christi Authority

State: Texas  
Date: May 2019



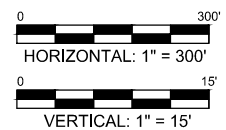
CROSS SECTION A-A (TYPICAL SECTION)  
-450+00.00



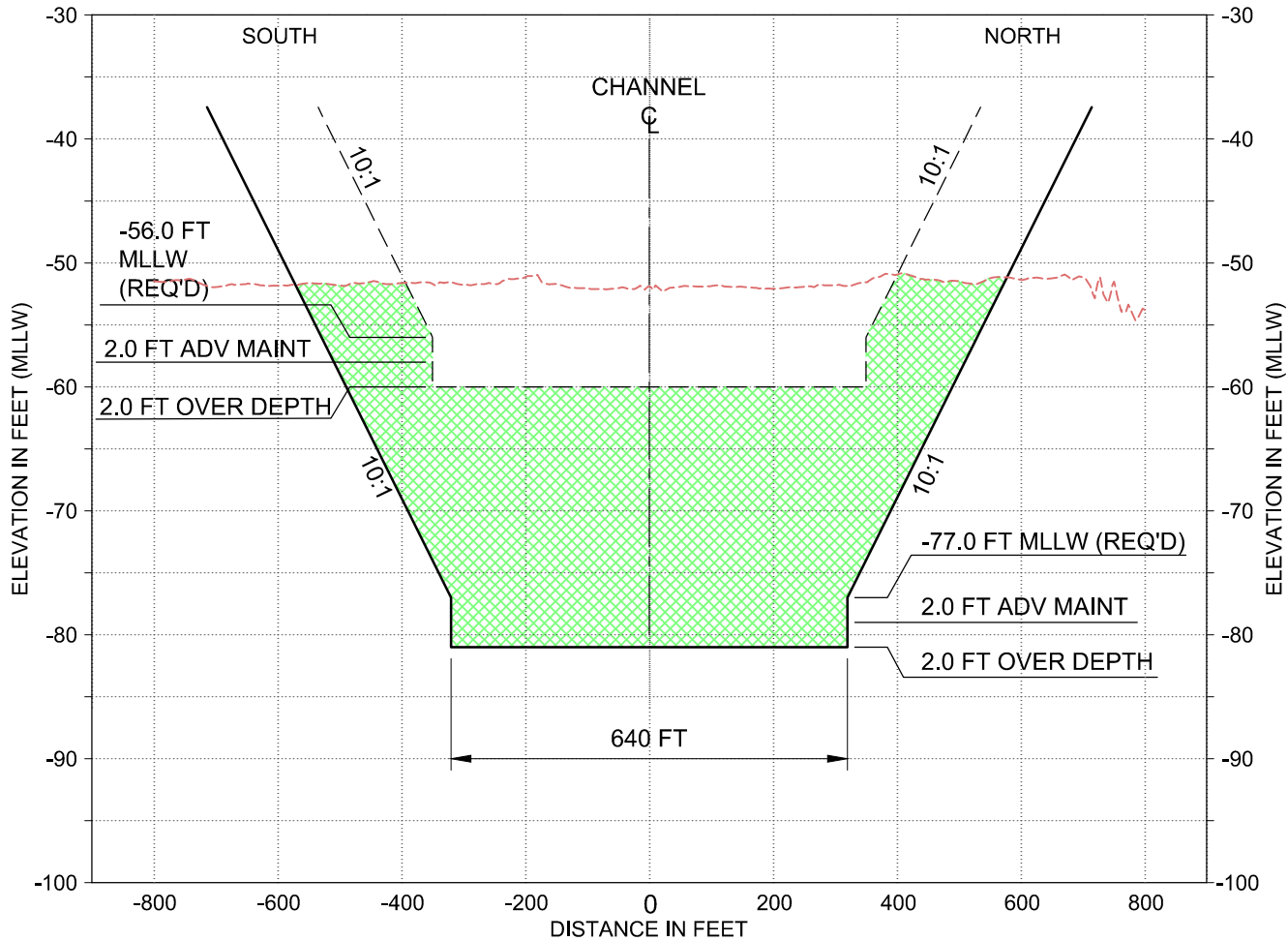
CROSS SECTION LEGEND:

- - - EXISTING BOTTOM
- - - EXISTING CHANNEL DREDGE TEMPLATE
- PROPOSED CHANNEL
- PROPOSED AREA TO BE DREDGED

CROSS SECTION GRAPHIC SCALES:



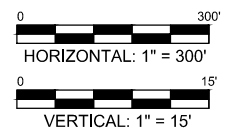
**CROSS SECTION B-B (TYPICAL SECTION)  
-250+00.00**



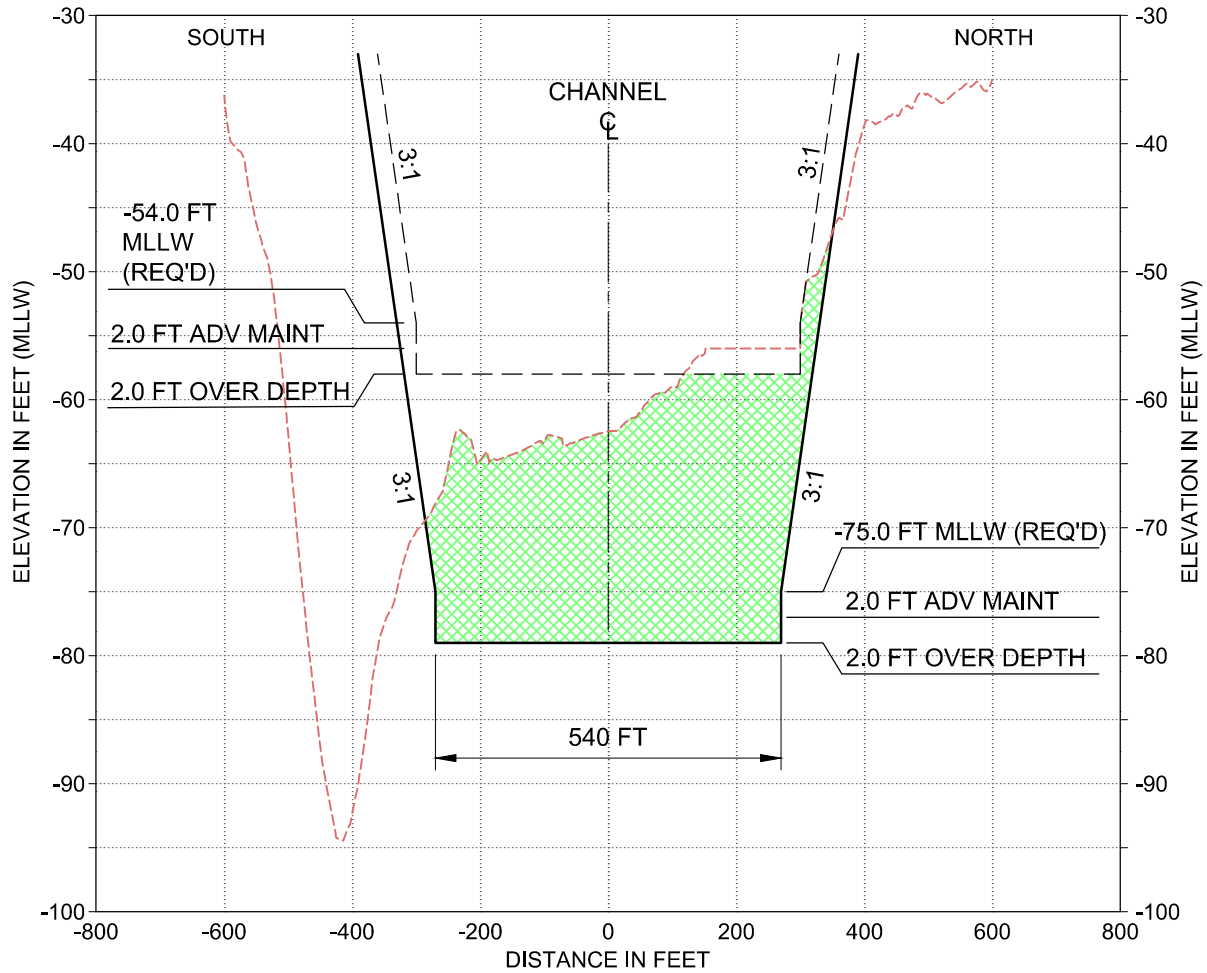
**CROSS SECTION LEGEND:**

- - - EXISTING BOTTOM
- - - EXISTING CHANNEL DREDGE TEMPLATE
- PROPOSED CHANNEL
- PROPOSED AREA TO BE DREDGED

**CROSS SECTION GRAPHIC SCALES:**



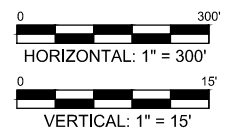
CROSS SECTION C-C (TYPICAL SECTION)  
-50+00.00



CROSS SECTION LEGEND:

- - - EXISTING BOTTOM
- - - EXISTING CHANNEL DREDGE TEMPLATE
- PROPOSED CHANNEL
- PROPOSED AREA TO BE DREDGED

CROSS SECTION GRAPHIC SCALES:



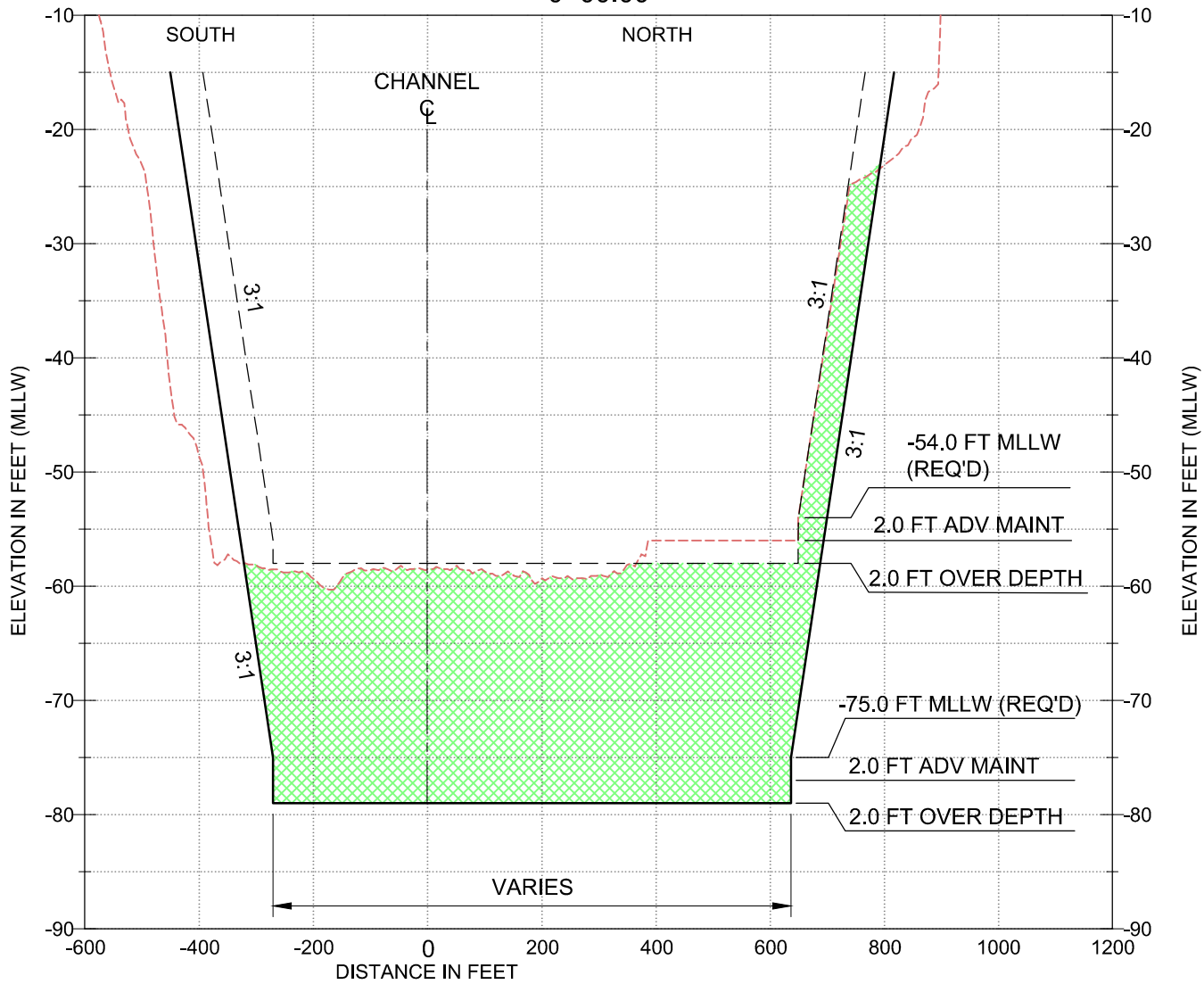
Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-2019-00067

**Preferred Channel Alternative  
Dredging Cross Section C-C  
STA -50+00.00**

County: Aransas and Nueces  
Application By: Port of Corpus Christi Authority

State: Texas  
Date: May 2019

**CROSS SECTION D-D (TYPICAL SECTION)**  
0+00.00

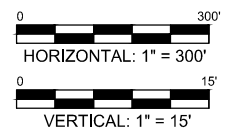


Sheet 6 of 23

**CROSS SECTION LEGEND:**

- - - - EXISTING BOTTOM
- - - - EXISTING CHANNEL DREDGE TEMPLATE
- PROPOSED CHANNEL
- PROPOSED AREA TO BE DREDGED

**CROSS SECTION GRAPHIC SCALES:**



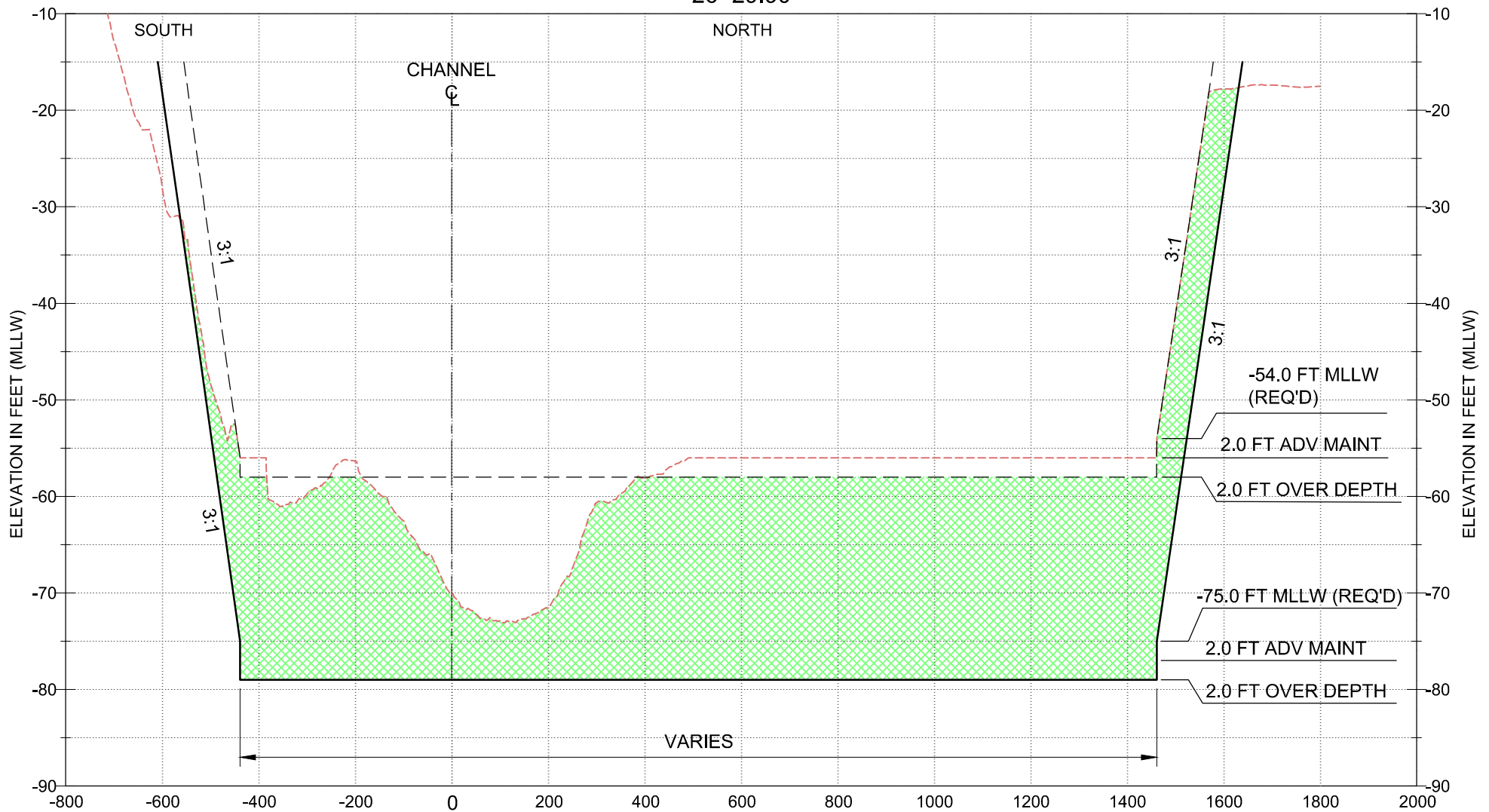
Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-2019-00067

**Preferred Channel Alternative**  
**Dredging Cross Section D-D**  
**STA 0+00.00**

County: Aransas and Nueces  
Application By: Port of Corpus Christi Authority

State: Texas  
Date: May 2019

**CROSS SECTION E-E (SECTION @ CENTER OF TURNING BASIN)  
26+29.90**

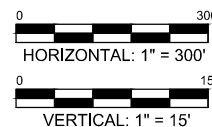


Sheet 7 of 23

**CROSS SECTION LEGEND:**

- - - - EXISTING BOTTOM
- - - - EXISTING CHANNEL DREDGE TEMPLATE
- PROPOSED CHANNEL
- PROPOSED AREA TO BE DREDGED

**CROSS SECTION GRAPHIC SCALES:**



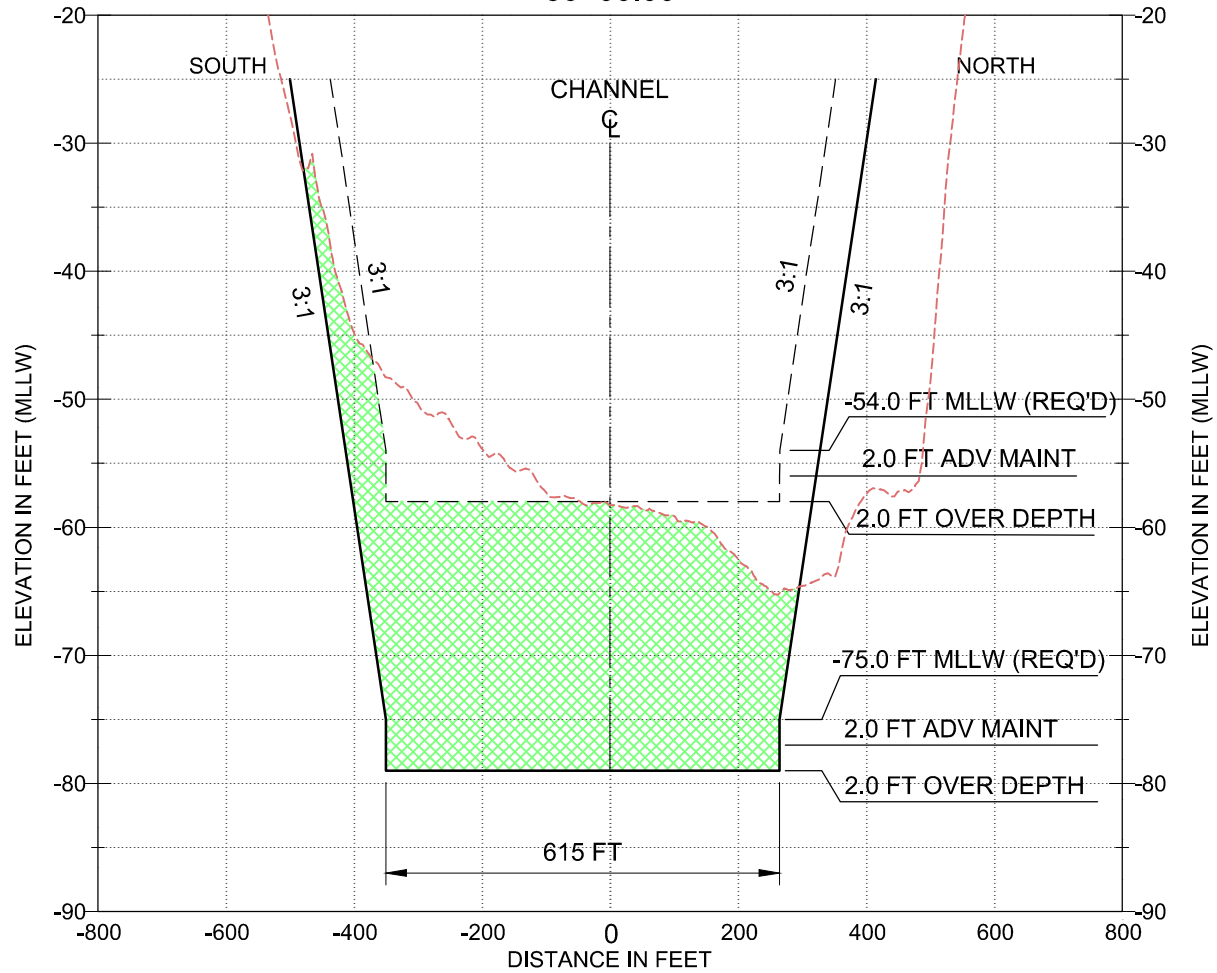
Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-2019-00067

**Preferred Channel Alternative  
Dredging Cross Section E-E  
STA 26+29.90**

County: Aransas and Nueces  
Application By: Port of Corpus Christi Authority

State: Texas  
Date: May 2019

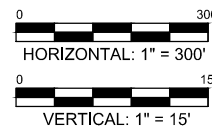
**CROSS SECTION F-F (TYPICAL SECTION)  
50+00.00**



**CROSS SECTION LEGEND:**

- - - - EXISTING BOTTOM
- - - - EXISTING CHANNEL DREDGE TEMPLATE
- PROPOSED CHANNEL
- ▨ PROPOSED AREA TO BE DREDGED

**CROSS SECTION GRAPHIC SCALES:**





**LEGEND**

- — — DEEPENING IMPROVEMENTS (-75' / -77' MLLW)
- ■ ■ DREDGE MATERIAL PLACEMENT AREA
- EXIST OFFSHORE PLACEMENT AREA
- EXIST SEAGRASS (RETRIEVED FROM NOAA CSC, 2007)
- EXIST OYSTER REEFS (RETRIEVED FROM TPWD, 2004)
- EXIST PIPELINES (SEE NOTE 4)

**GENERAL NOTES**

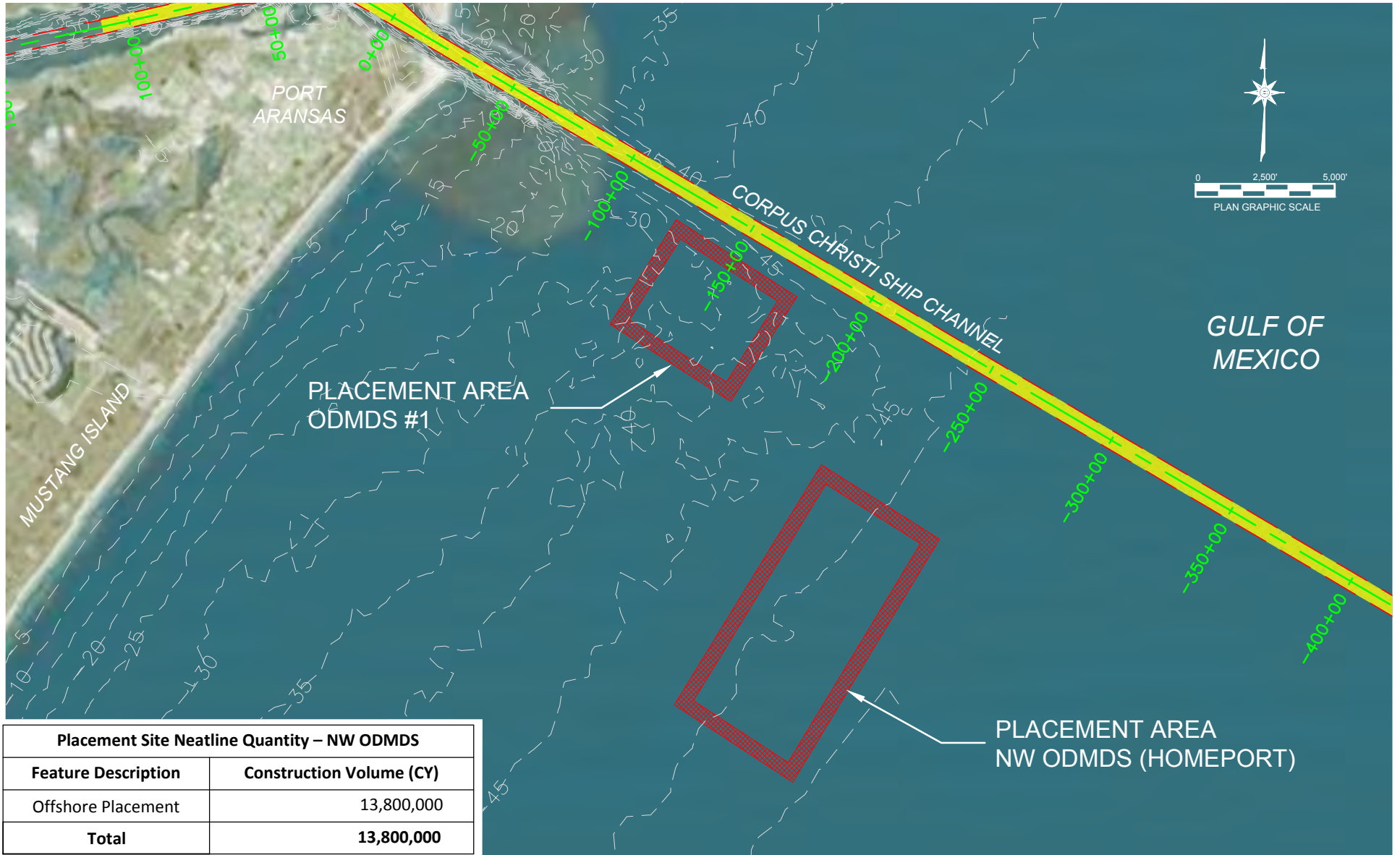
1. BASE MAPPING SHOWN IS ESRI WORLD IMAGERY, RETRIEVED FROM ARCGIS TO AUTOCAD IN MAY 2019 - LAST UPDATED IN SEPTEMBER 2018.
2. HORIZONTAL COORDINATE SYSTEM IS NAD83 TEXAS STATE PLANE, SOUTH ZONE, US FOOT.
3. VERTICAL DATUM IS REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
4. PIPELINE DATA FOR ARANSAS AND NUECES COUNTIES RETRIEVED FROM RAILROAD COMMISSION OF TEXAS ON NOVEMBER 19, 2018.

Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-2019-00067

**OVERALL DREDGE MATERIAL PLACEMENT PLAN**

County: Aransas and Nueces  
Application By: Port of Corpus Christi Authority

State: Texas  
Date: May 2019






Placement Site Neatline Quantity – NW ODMDS	
Feature Description	Construction Volume (CY)
Offshore Placement	13,800,000
<b>Total</b>	<b>13,800,000</b>

**GENERAL NOTES**

1. BASE MAPPING SHOWN IS ESRI WORLD IMAGERY, RETRIEVED FROM ARCGIS TO AUTOCAD IN MAY 2019 - LAST UPDATED IN SEPTEMBER 2018.
2. HORIZONTAL COORDINATE SYSTEM IS NAD83 TEXAS STATE PLANE, SOUTH ZONE, US FOOT.
3. VERTICAL DATUM IS REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
4. PIPELINE DATA FOR ARANSAS AND NUECES COUNTIES RETRIEVED FROM RAILROAD COMMISSION OF TEXAS ON NOVEMBER 19, 2018.

**LEGEND**

-  DEEPENING IMPROVEMENTS (-75' / -77' MLLW)
-  EXIST OFFSHORE PLACEMENT AREA
-  EXIST CONTOURS

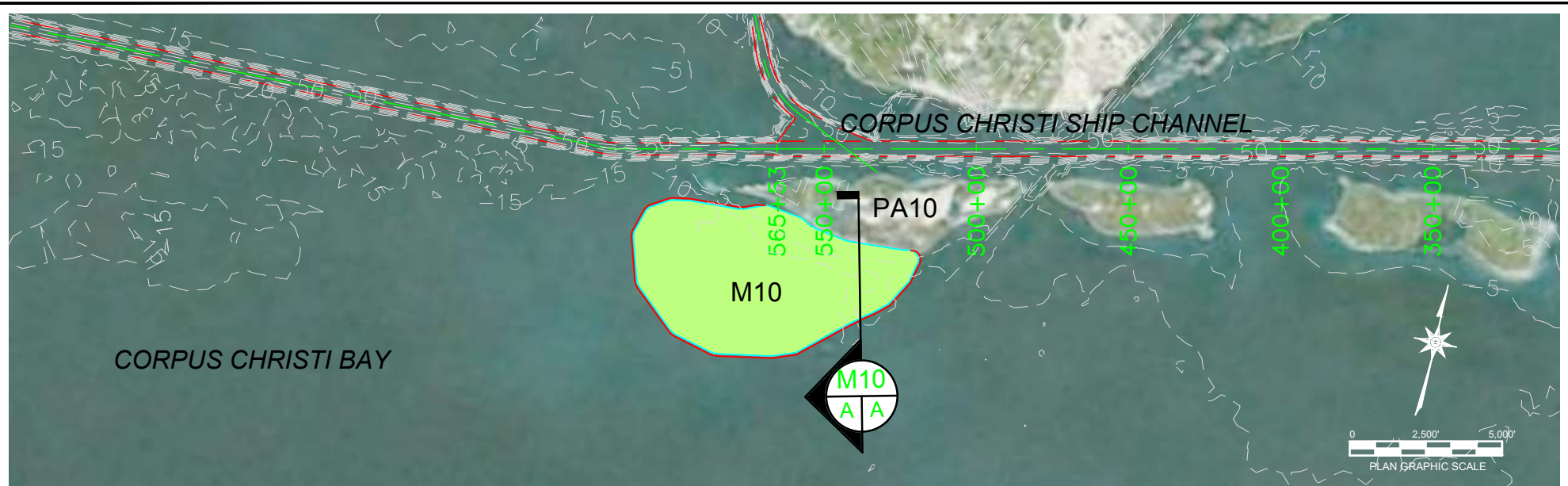
Sheet 10 of 23

Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-2019-00067

**OFFSHORE DREDGE  
MATERIAL PLACEMENT  
NW ODMDS (HOMEPORT)**

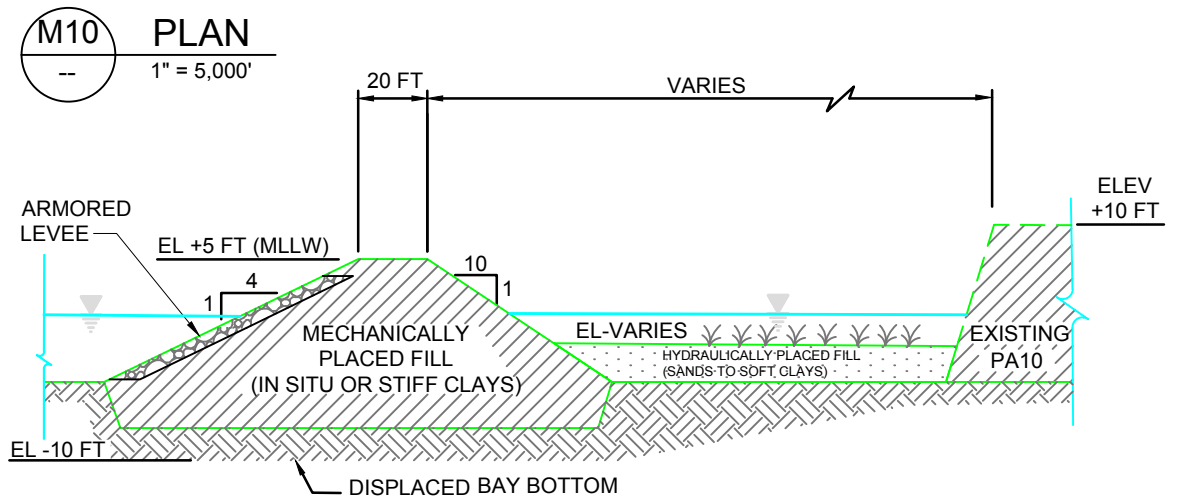
County: Aransas and Nueces      State: Texas  
Application By: Port of Corpus Christi Authority      Date: May 2019





Placement Site Neatline Quantity – Site M10	
Feature Description	Construction Volume (CY)
Armoring*	10,667
Levee Creation	997,300
770 Acre Estuarine / Aquatic Habitat	9,936,300
<b>Total</b>	<b>10,933,600</b>

\*Note: Quantity not included in CY total



### LEGEND

- EXISTING SHIP CHANNEL
- DREDGE MATERIAL PLACEMENT
- EXIST CONTOURS

### GENERAL NOTES

1. BASE MAPPING SHOWN IS ESRI WORLD IMAGERY, RETRIEVED FROM ARCGIS TO AUTOCAD IN MAY 2019 - LAST UPDATED IN SEPT 2018.
2. HORIZONTAL COORDINATE SYSTEM IS NAD83 TEXAS STATE PLANE, SOUTH ZONE, US FOOT.
3. VERTICAL DATUM IS REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
4. PIPELINE DATA FOR ARANSAS AND NUECES COUNTIES RETRIEVED FROM RAILROAD COMMISSION OF TEXAS ON NOVEMBER 19, 2018.

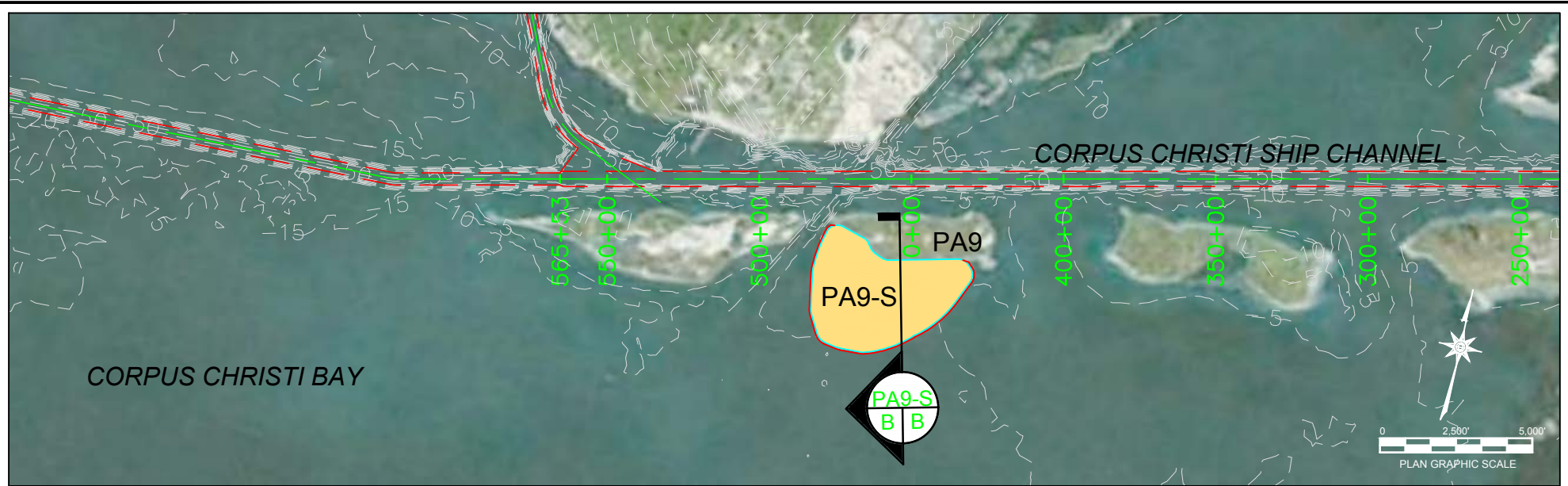
### M10 SECTION NOT TO SCALE

Sheet 11 of 23

Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-2019-00067  
**BENEFICIAL USE SITE  
AND SECTION VIEW - M10  
770 ACRE ESTUARINE / AQUATIC HABITAT**

County: Aransas and Nueces  
Application By: Port of Corpus Christi Authority

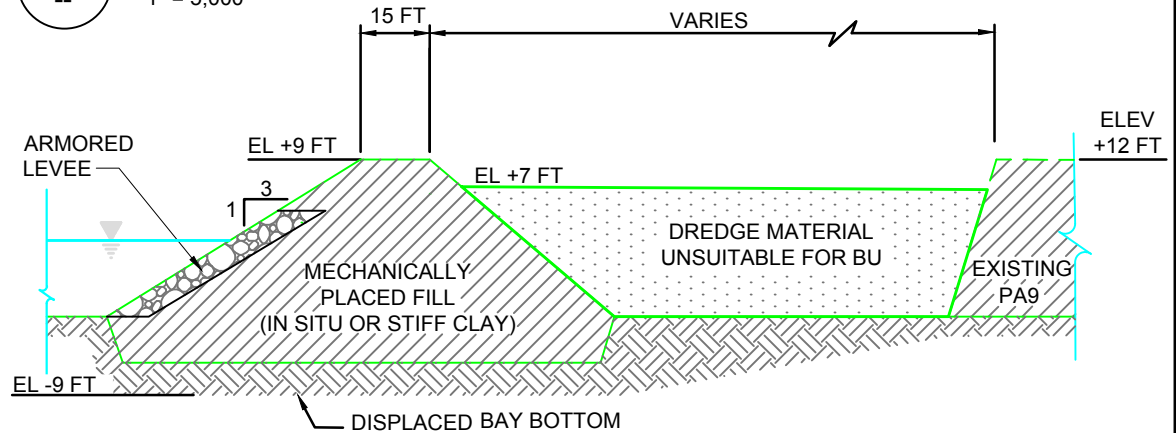
State: Texas  
Date: May 2019



Placement Site Neatline Quantity – Site PA9-S	
Feature Description	Construction Volume (CY)
Armoring*	26,400
Levee Creation	500,000
Upland Placement	8,500,000
<b>Total</b>	<b>9,000,000</b>

\*Note: Quantity not included in CY total

PA9-S  
--  
PLAN  
1" = 5,000'



PA9-S  
B B  
SECTION  
NOT TO SCALE

### LEGEND

- EXISTING SHIP CHANNEL
- DREDGE MATERIAL PLACEMENT
- EXIST CONTOURS

### GENERAL NOTES

1. BASE MAPPING SHOWN IS ESRI WORLD IMAGERY, RETRIEVED FROM ARCGIS TO AUTOCAD IN MAY 2019 - LAST UPDATED IN SEPT 2018.
2. HORIZONTAL COORDINATE SYSTEM IS NAD83 TEXAS STATE PLANE, SOUTH ZONE, US FOOT.
3. VERTICAL DATUM IS REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
4. PIPELINE DATA FOR ARANSAS AND NUECES COUNTIES RETRIEVED FROM RAILROAD COMMISSION OF TEXAS ON NOVEMBER 19, 2018.

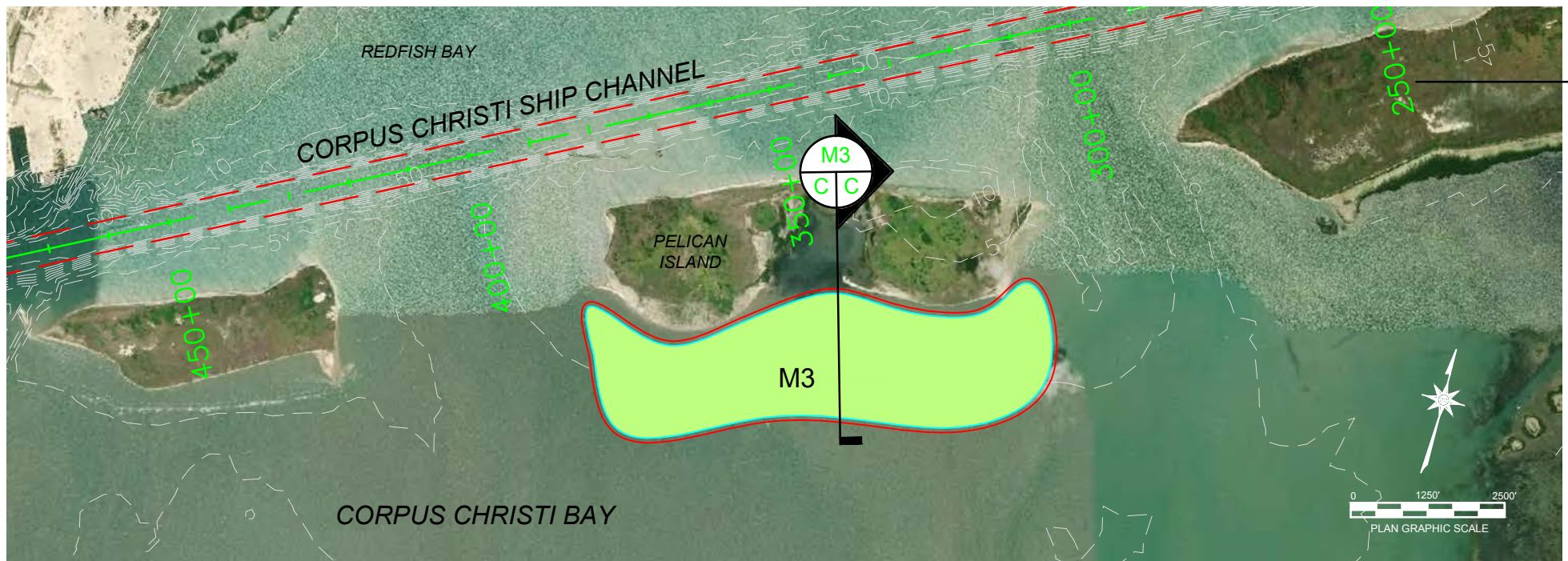
Sheet 12 of 23

Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-2019-00067

SITE AND SECTION VIEW PA9-S  
PA9 UPLAND SITE EXPANSION

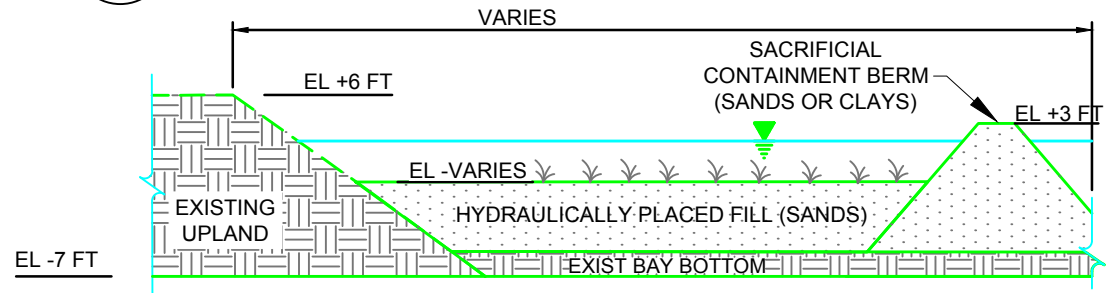
County: Aransas and Nueces  
Application By: Port of Corpus Christi Authority

State: Texas  
Date: May 2019



**M3 PLAN**  
1" = 2,500'

Placement Site Neatline Quantity – Site M3	
Feature Description	Construction Volume (CY)
300-Acre Estuarine / Aquatic Habitat	3,798,000
<b>Total</b>	<b>3,798,000</b>



**M3 SECTION**  
NOT TO SCALE

**LEGEND**

- EXISTING SHIP CHANNEL
- DREDGE MATERIAL PLACEMENT
- EXIST CONTOURS

**GENERAL NOTES**

1. BASE MAPPING SHOWN IS ESRI WORLD IMAGERY, RETRIEVED FROM ARCGIS TO AUTOCAD IN MAY 2019 - LAST UPDATED IN SEPT 2018.
2. HORIZONTAL COORDINATE SYSTEM IS NAD83 TEXAS STATE PLANE, SOUTH ZONE, US FOOT.
3. VERTICAL DATUM IS REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
4. PIPELINE DATA FOR ARANSAS AND NUECES COUNTIES RETRIEVED FROM RAILROAD COMMISSION OF TEXAS ON NOVEMBER 19, 2018.

Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-2019-00067

**BENEFICIAL USE SITE  
AND SECTION VIEW - M3**

**300 ACRE ESTUARINE / AQUATIC HABITAT**

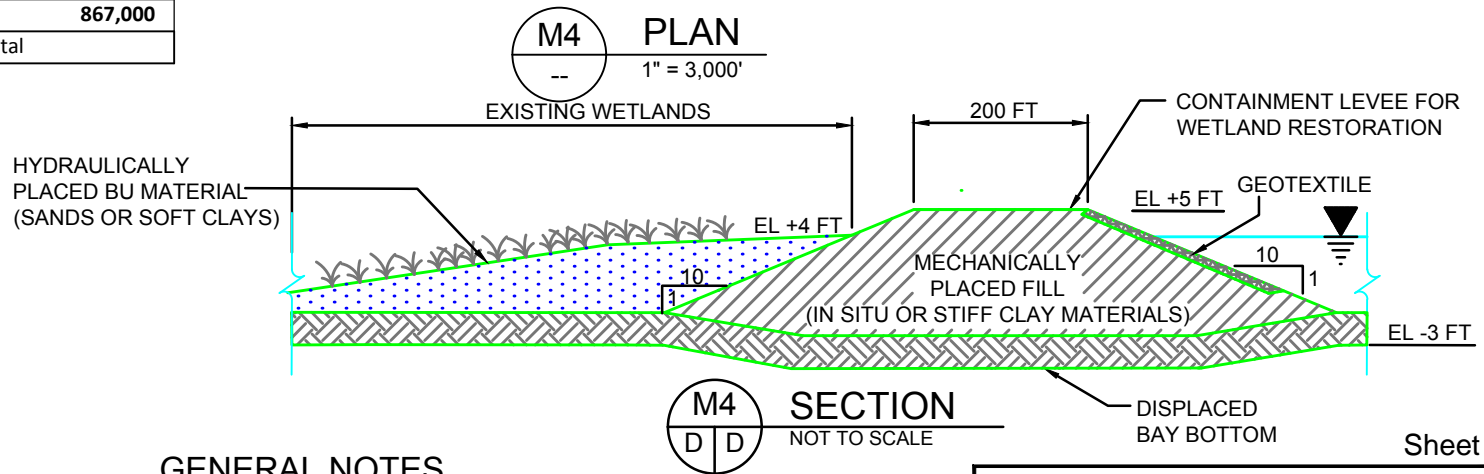
County: Aransas and Nueces      State: Texas  
Application By: Port of Corpus Christi Authority      Date: May 2019



Placement Site Neatline Quantity – Site M4	
Feature Description	Construction Volume (CY)
Armoring*	6,667
Levee Creation	867,000
<b>Total</b>	<b>867,000</b>

\*Note: Quantity not included in CY total

NOTE: UPDATES  
BASED ON EXIST  
TPWD PERMIT



**LEGEND**

- EXISTING SHIP CHANNEL
- DREDGE MATERIAL PLACEMENT
- POTENTIAL WETLAND RESTORATION
- EXIST CONTOURS

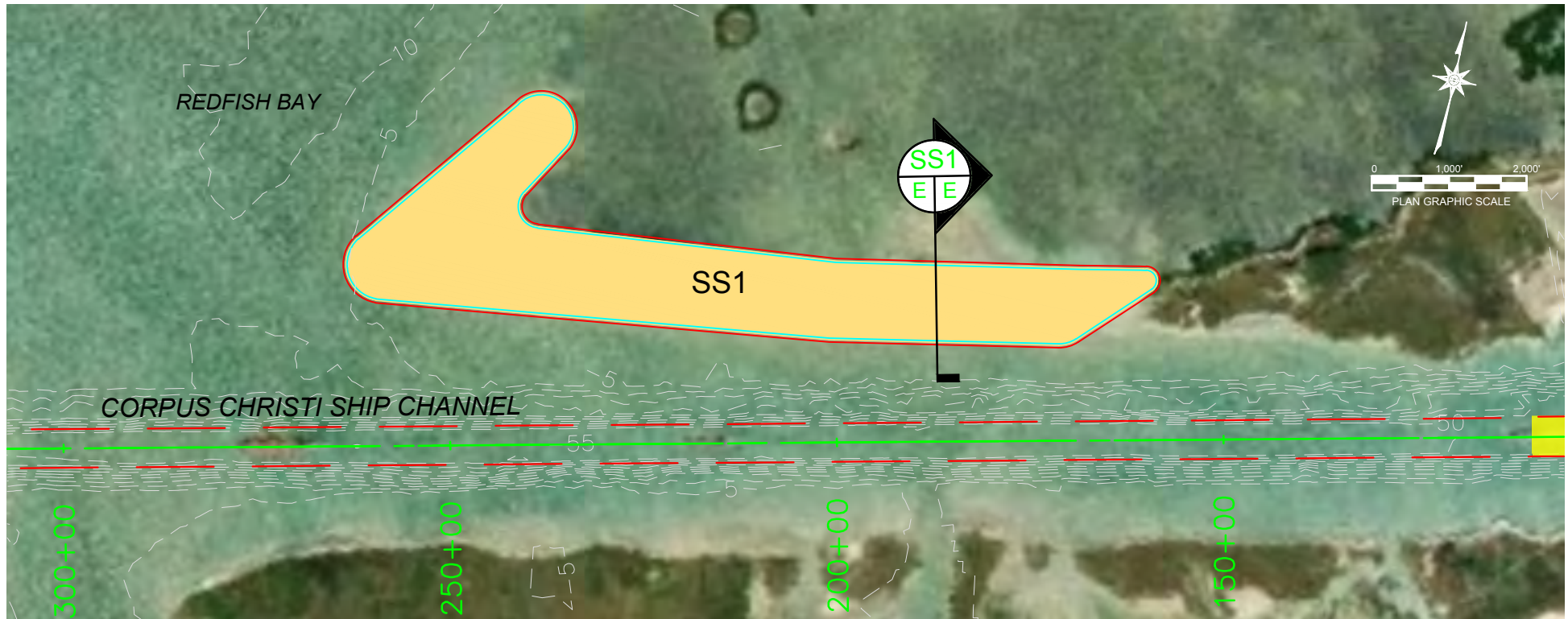
**GENERAL NOTES**

1. BASE MAPPING SHOWN IS ESRI WORLD IMAGERY, RETRIEVED FROM ARCGIS TO AUTOCAD IN MAY 2019 - LAST UPDATED IN SEPT 2018.
2. HORIZONTAL COORDINATE SYSTEM IS NAD83 TEXAS STATE PLANE, SOUTH ZONE, US FOOT.
3. VERTICAL DATUM IS REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
4. PIPELINE DATA FOR ARANSAS AND NUECES COUNTIES RETRIEVED FROM RAILROAD COMMISSION OF TEXAS ON NOVEMBER 19, 2018.

Sheet 14 of 23

**BENEFICIAL USE SITE AND SECTION VIEW - M4  
DAGGER ISLAND LEVEE CREATION**

County: Aransas and Nueces      State: Texas  
Application By: Port of Corpus Christi Authority      Date: May 2019

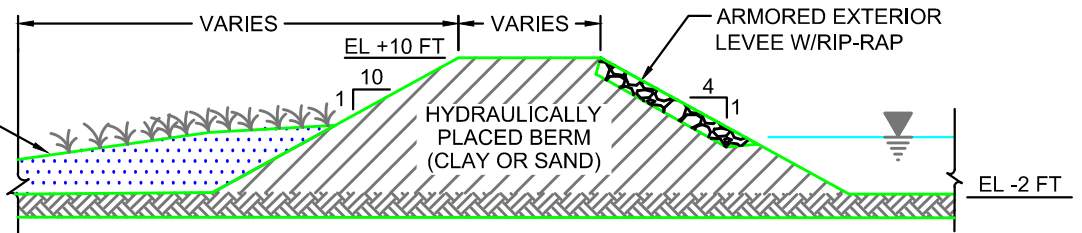


Placement Site Neatline Quantity – Site SS1	
Feature Description	Construction Volume (CY)
Armoring*	38,500
Berm Fill	4,800,000
<b>Total</b>	<b>4,800,000</b>

\*Note: Quantity not included in CY total

SS1 PLAN  
1" = 2,000'

HYDRAULICALLY PLACED BU MATERIAL MATCHED TO EXISTING ELEVATION (SANDS OR SOFT CLAYS)



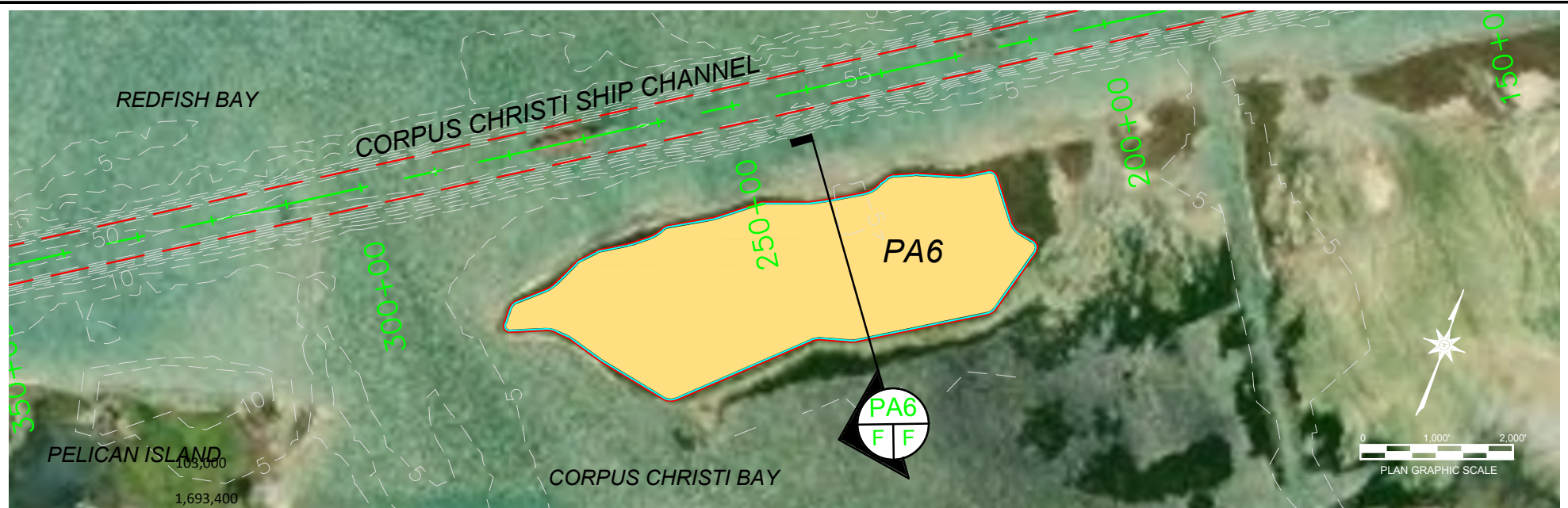
SS1 SS1  
E E NOT TO SCALE

### LEGEND

- EXISTING / PROPOSED SHIP CHANNEL DEEPENING
- DREDGE MATERIAL PLACEMENT
- EXIST CONTOURS

### GENERAL NOTES

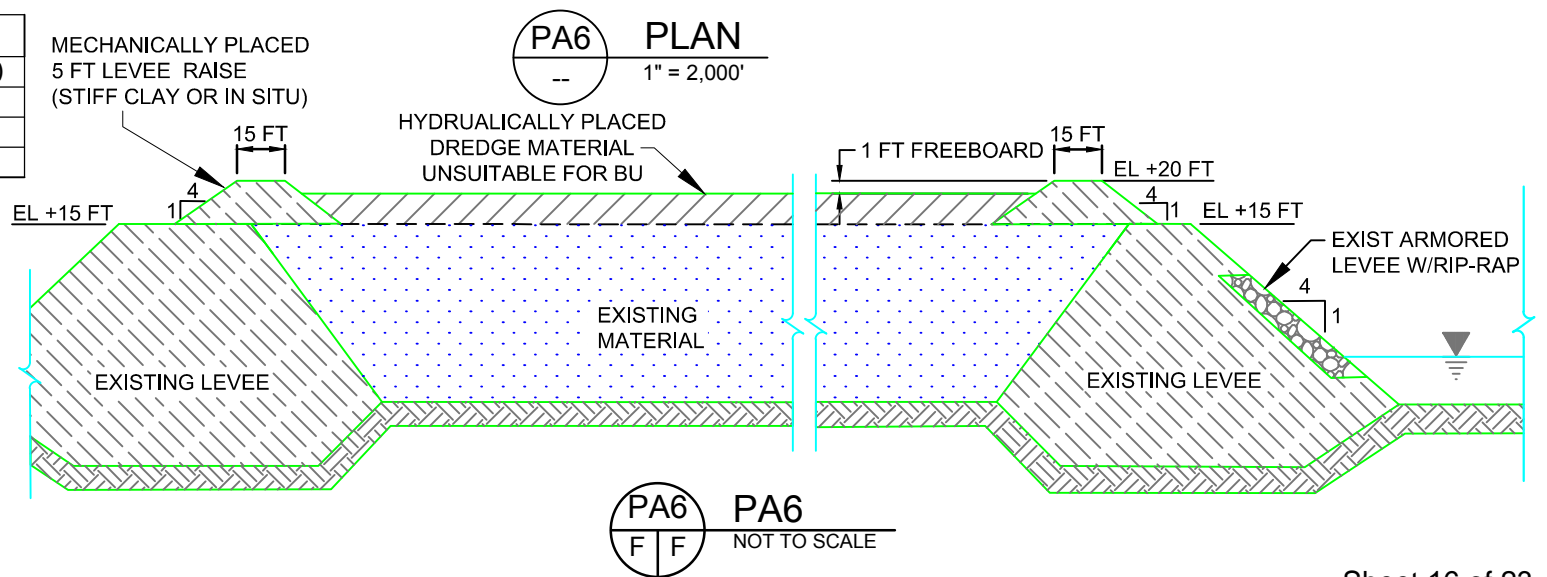
1. BASE MAPPING SHOWN IS ESRI WORLD IMAGERY, RETRIEVED FROM ARCGIS TO AUTOCAD IN MAY 2019 - LAST UPDATED IN SEPT 2018.
2. HORIZONTAL COORDINATE SYSTEM IS NAD83 TEXAS STATE PLANE, SOUTH ZONE, US FOOT.
3. VERTICAL DATUM IS REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
4. PIPELINE DATA FOR ARANSAS AND NUECES COUNTIES RETRIEVED FROM RAILROAD COMMISSION OF TEXAS ON NOVEMBER 19, 2018.



**1,796,400**

**Placement Site Neatline Quantity – Site PA 6**

Feature Description	Construction Volume (CY)
5-ft Levee Raise	
PA Fill	
<b>Total</b>	



### LEGEND

- EXISTING SHIP CHANNEL
- DREDGE MATERIAL PLACEMENT
- EXIST CONTOURS

### GENERAL NOTES

1. BASE MAPPING SHOWN IS ESRI WORLD IMAGERY, RETRIEVED FROM ARCGIS TO AUTOCAD IN MAY 2019 - LAST UPDATED IN SEPT 2018.
2. HORIZONTAL COORDINATE SYSTEM IS NAD83 TEXAS STATE PLANE, SOUTH ZONE, US FOOT.
3. VERTICAL DATUM IS REFERENCED TO MEAN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
4. PIPELINE DATA FOR ARANSAS AND NUECES COUNTIES RETRIEVED FROM RAILROAD COMMISSION OF TEXAS ON NOVEMBER 19, 2018.

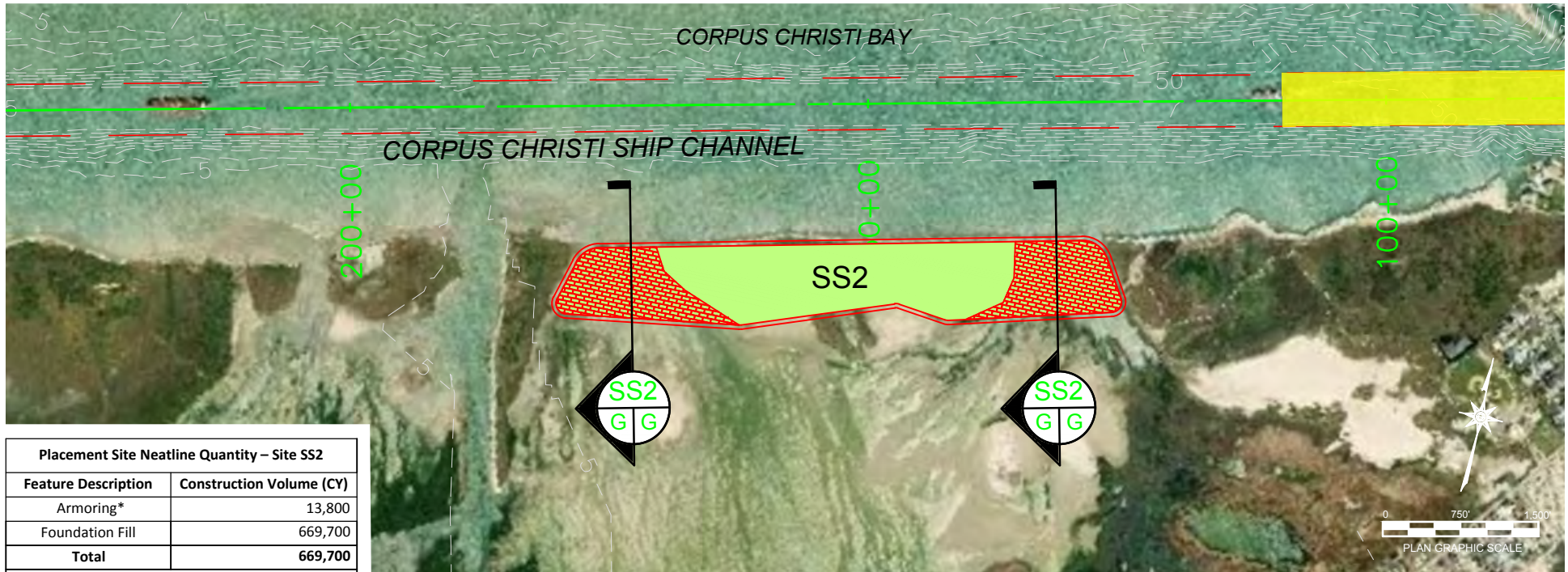
Sheet 16 of 23

Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-2019-00067

### DREDGE MATERIAL PLACEMENT SITE AND SECTION VIEW - PA6 5 FT LEVEE RAISE & FILL

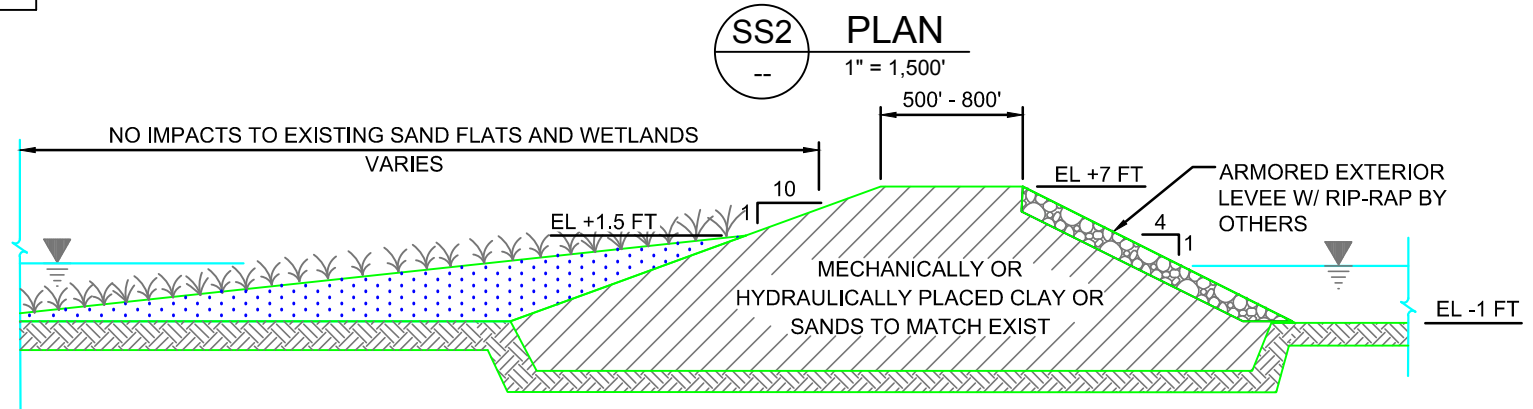
County: Aransas and Nueces  
Application By: Port of Corpus Christi Authority

State: Texas  
Date: May 2019



Placement Site Neatline Quantity – Site SS2	
Feature Description	Construction Volume (CY)
Armoring*	13,800
Foundation Fill	669,700
<b>Total</b>	<b>669,700</b>

\*Note: Quantity not included in CY total



**SS2 PLAN**  
1" = 1,500'

**SS2 SECTION**  
NOT TO SCALE

**LEGEND**

- EXISTING / PROPOSED SHIP CHANNEL DEEPENING
- DREDGE MATERIAL PLACEMENT
- EXIST CONTOURS

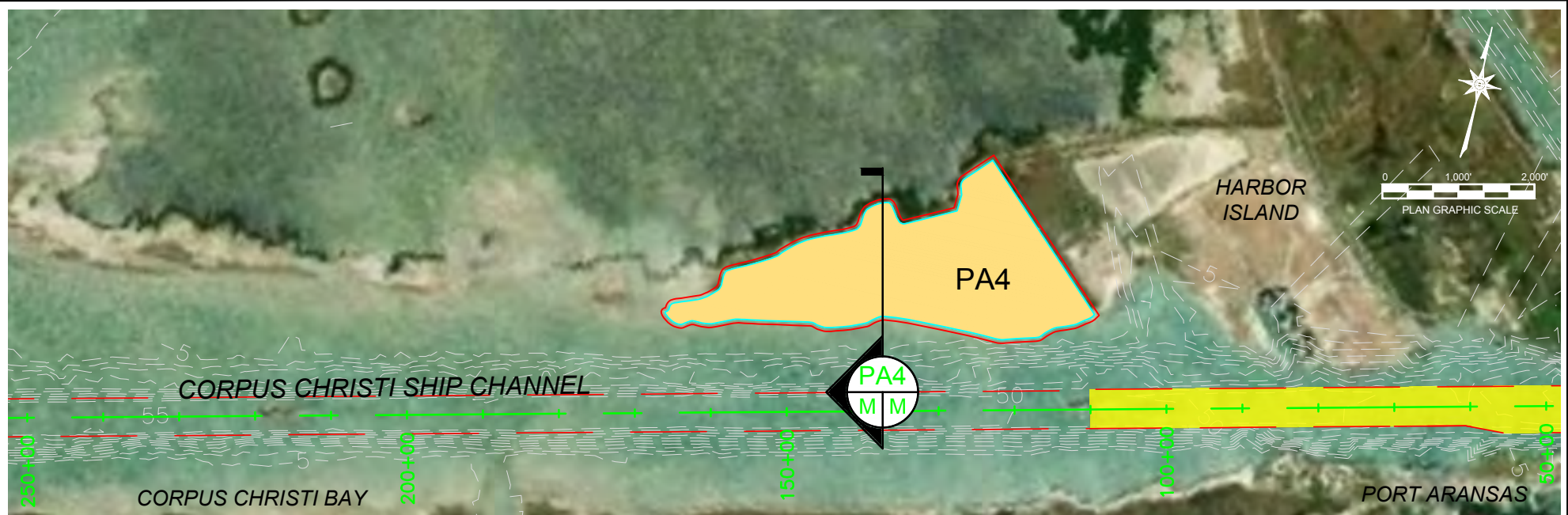
**GENERAL NOTES**

1. BASE MAPPING SHOWN IS ESRI WORLD IMAGERY, RETRIEVED FROM ARCGIS TO AUTOCAD IN MAY 2019 - LAST UPDATED IN SEPT 2018.
2. HORIZONTAL COORDINATE SYSTEM IS NAD83 TEXAS STATE PLANE, SOUTH ZONE, US FOOT.
3. VERTICAL DATUM IS REFERENCED TO MEAN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
4. PIPELINE DATA FOR ARANSAS AND NUECES COUNTIES RETRIEVED FROM RAILROAD COMMISSION OF TEXAS ON NOVEMBER 19, 2018.

Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-2019-00067

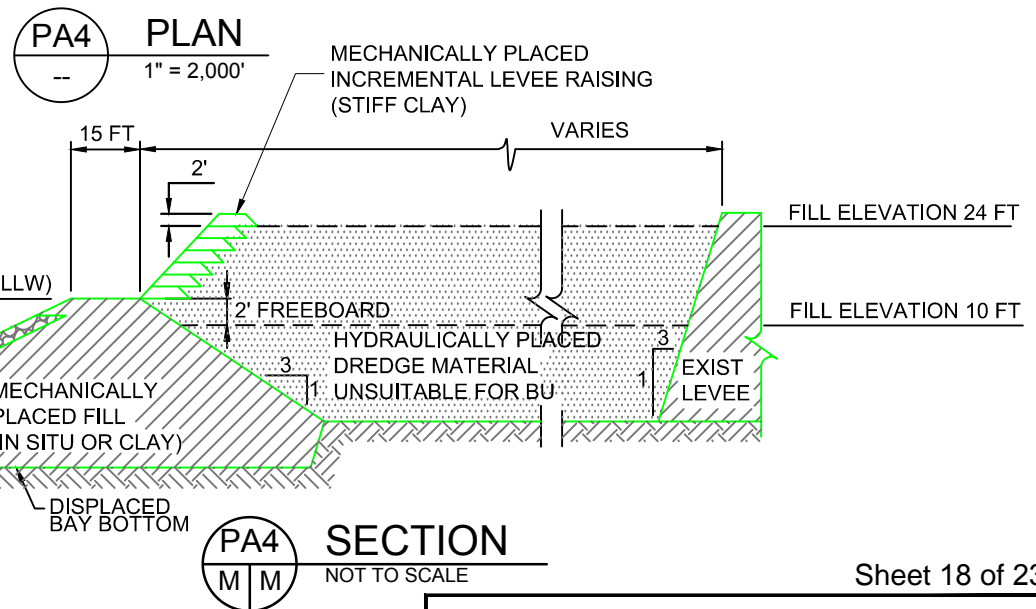
**BENEFICIAL USE SITE AND SECTION VIEW - SS2 SHORELINE BREACH FILL IN**

County: Aransas and Nueces      State: Texas  
Application By: Port of Corpus Christi Authority      Date: May 2019



Placement Site Neatline Quantity – Site PA 4	
Feature Description	Construction Volume (CY)
Armoring*	17,100
Levee	158,600
PA Fill	2,861,400
<b>Total</b>	<b>3,020,000</b>

\*Note: Quantity not included in CY total



### LEGEND

- EXISTING / PROPOSED SHIP CHANNEL DEEPENING
- DREDGE MATERIAL PLACEMENT
- EXIST CONTOURS

### GENERAL NOTES

1. BASE MAPPING SHOWN IS ESRI WORLD IMAGERY, RETRIEVED FROM ARCGIS TO AUTOCAD IN MAY 2019 - LAST UPDATED IN SEPT 2018.
2. HORIZONTAL COORDINATE SYSTEM IS NAD83 TEXAS STATE PLANE, SOUTH ZONE, US FOOT.
3. VERTICAL DATUM IS REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
4. PIPELINE DATA FOR ARANSAS AND NUECES COUNTIES RETRIEVED FROM RAILROAD COMMISSION OF TEXAS ON NOVEMBER 19, 2018.

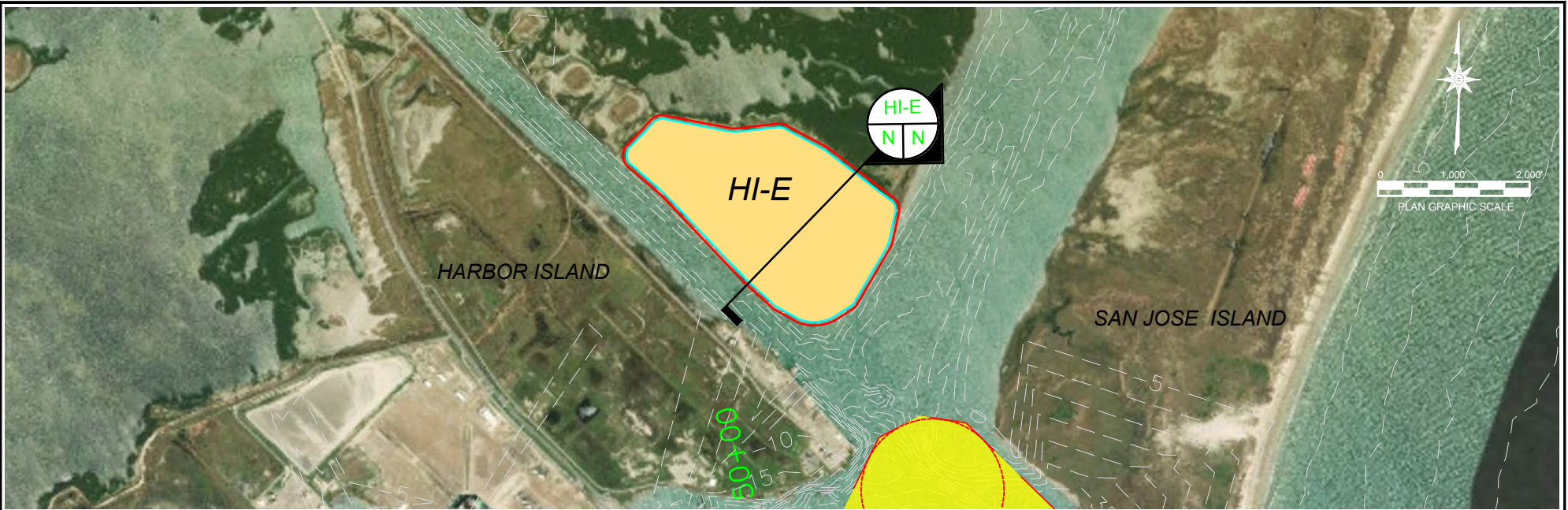
Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-2019-00067

### DREDGE MATERIAL PLACEMENT SITE AND SECTION VIEW - PA4 LEVEE CONSTRUCTION & FILL

County: Aransas and Nueces  
Application By: Port of Corpus Christi Authority

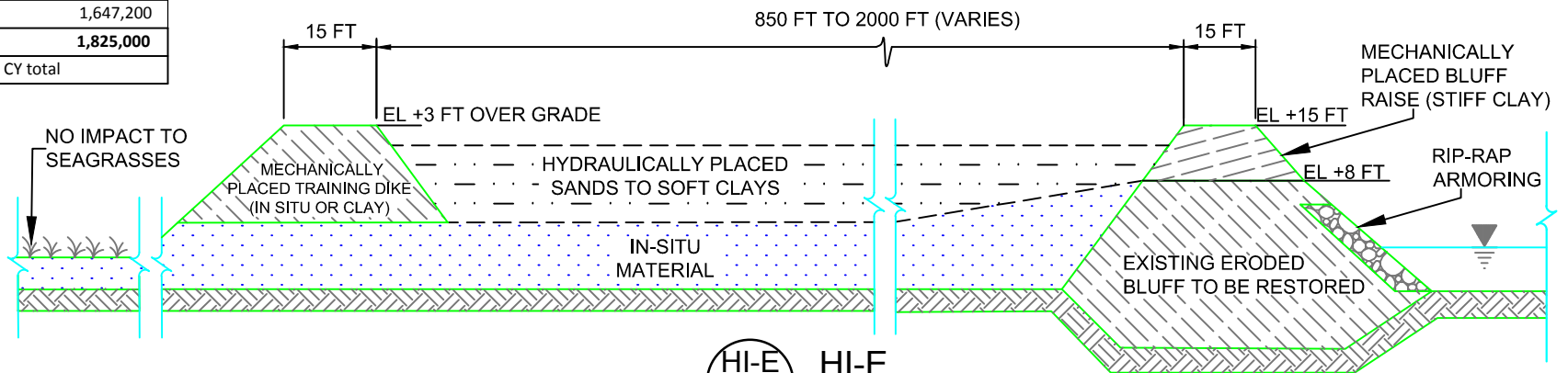
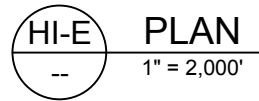
State: Texas  
Date: May 2019





Placement Site Neatline Quantity – Site HI-E	
Feature Description	Construction Volume (CY)
Armoring*	23,400
Levee	177,800
Fill Placement	1,647,200
<b>Total</b>	<b>1,825,000</b>

\*Note: Quantity not included in CY total



Sheet 19 of 23

### LEGEND

- PROPOSED SHIP CHANNEL DEEPENING
- DREDGE MATERIAL PLACEMENT
- EXIST CONTOURS

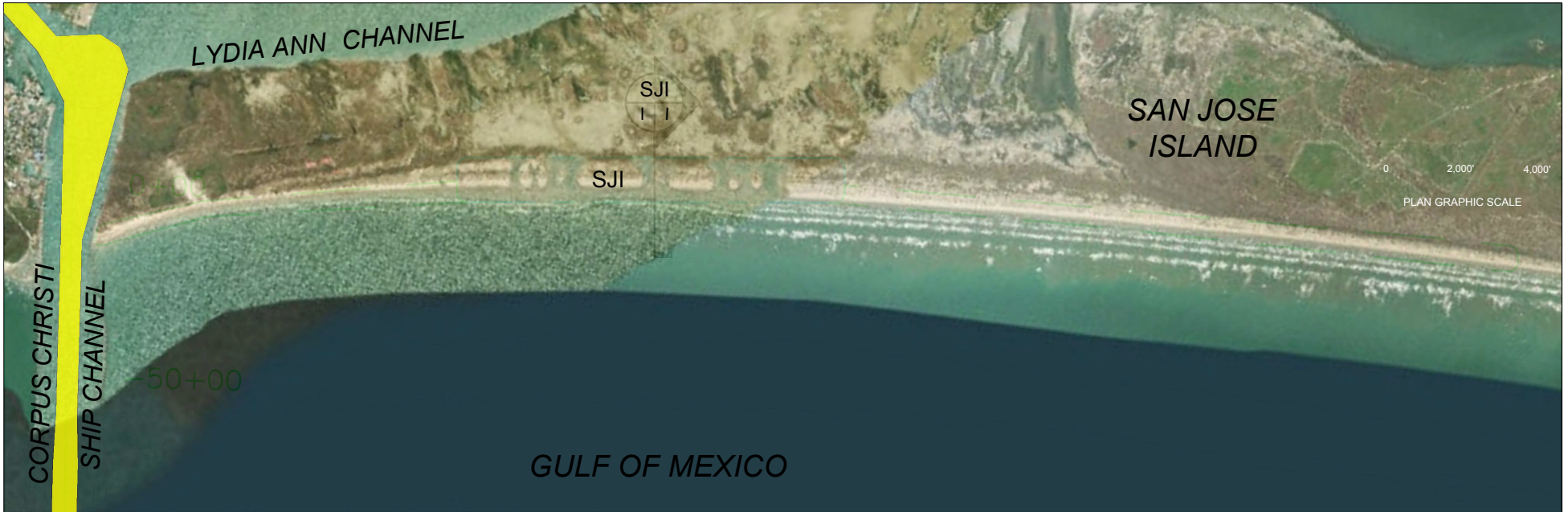
### GENERAL NOTES

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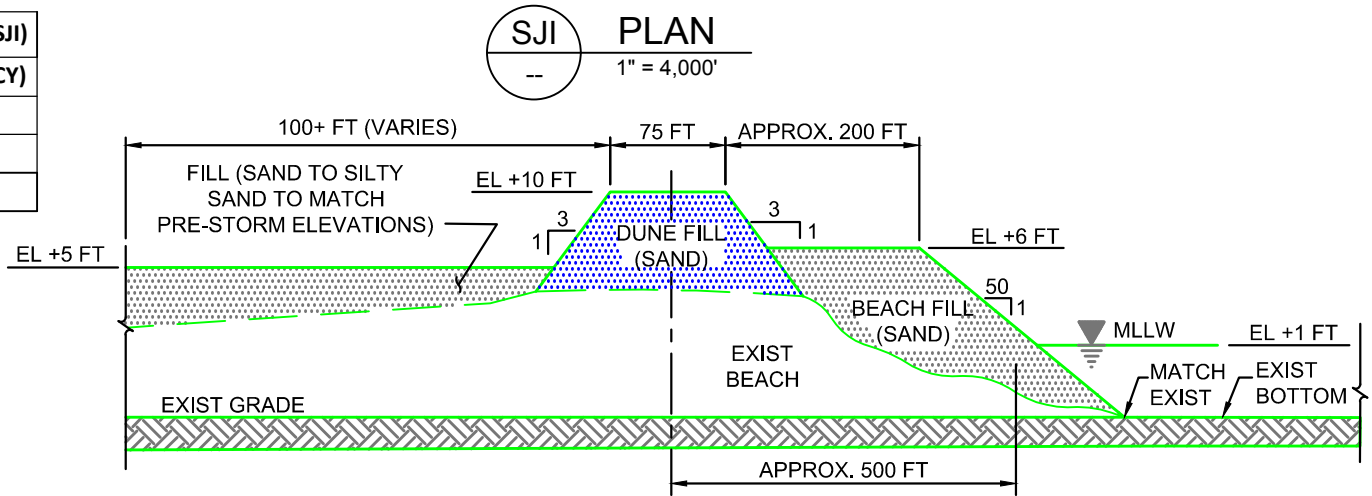
Corpus Christi Ship Channel Deepening Project  
 Individual Permit Application SWG-2019-00067  
**DREDGE MATERIAL PLACEMENT  
 SITE AND SECTION VIEW HI-E  
 SITE GRADING FILL AND  
 SHORELINE RESTORATION**

County: Aransas and Nueces  
 Application By: Port of Corpus Christi Authority

State: Texas  
 Date: May 2019



Placement Site Neatline Quantity	2,000,000
San Jose Island (SJI)	2,000,000
<b>Feature Description</b>	<b>Construction Volume (CY)</b>
Dune Restoration	4,000,000
Beach Restoration	
<b>Total</b>	



**LEGEND**

- PROPOSED SHIP CHANNEL DEEPENING
- EXIST CONTOURS
- DUNE RESTORATION
- BEACH RESTORATION

**GENERAL NOTES**

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Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-2019-00067

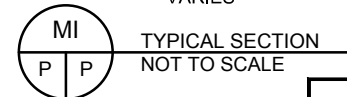
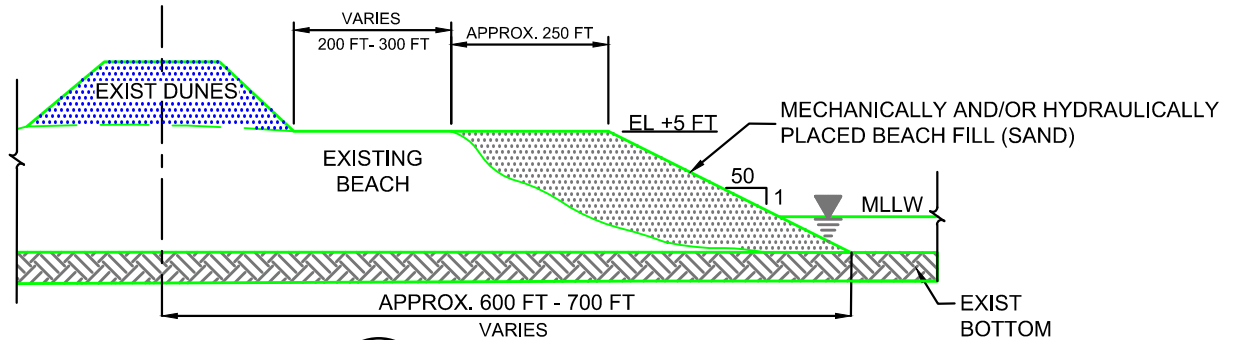
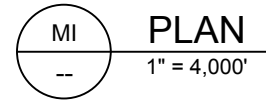
**BENEFICIAL USE SITE AND SECTION VIEW - SJI DUNE AND BEACH RESTORATION**

County: Aransas and Nueces  
Application By: Port of Corpus Christi Authority

State: Texas  
Date: May 2019



Placement Site Neatline Quantity – Mustang Island	
Feature Description	Construction Volume (CY)
Beach Nourishment	2,000,000
<b>Total</b>	<b>2,000,000</b>



Sheet 21 of 23

**LEGEND**

- PROPOSED SHIP CHANNEL DEEPENING
- EXIST CONTOURS
- BEACH NOURISHMENT

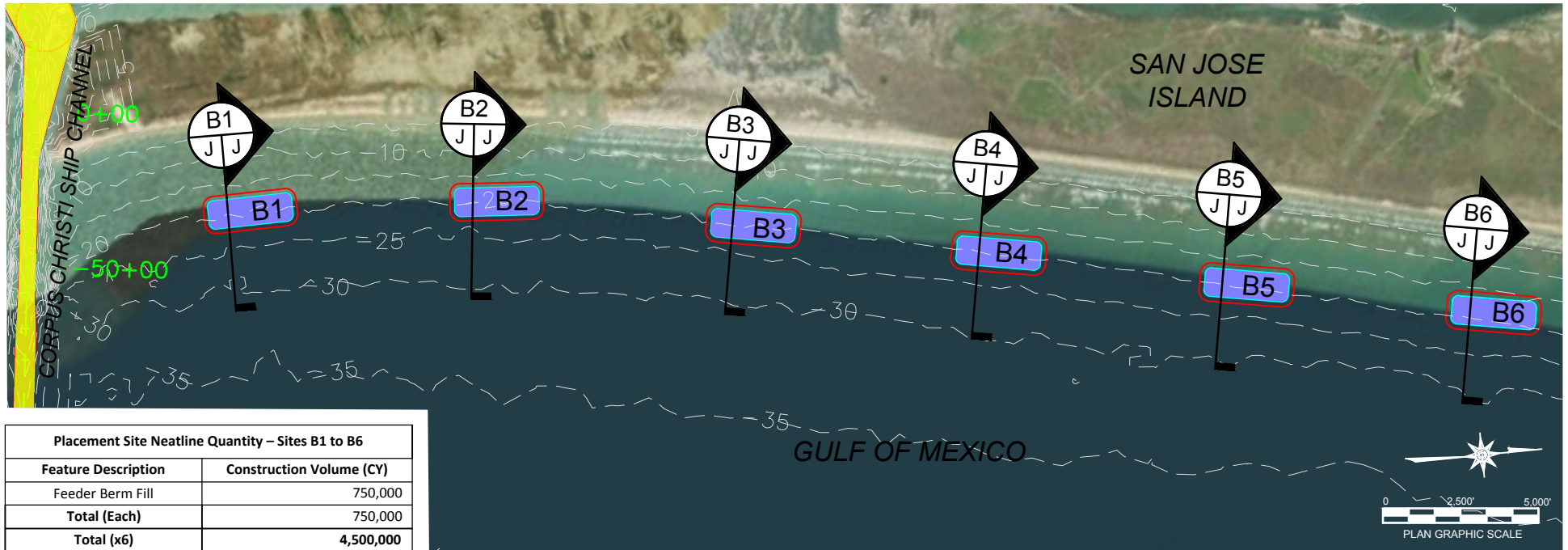
**GENERAL NOTES**

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Corpus Christi Ship Channel Deepening Project  
 Individual Permit Application SWG-2019-00067  
**BENEFICIAL USE SITE AND SECTION VIEW - MI MUSTANG ISLAND BEACH NOURISHMENT**

County: Aransas and Nueces  
 Application By: Port of Corpus Christi Authority

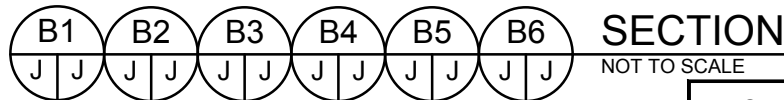
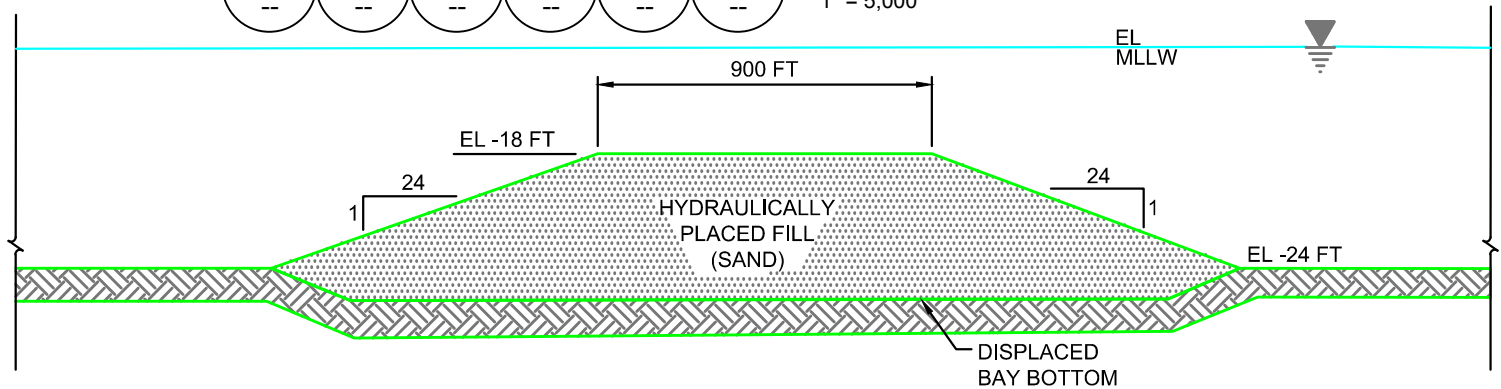
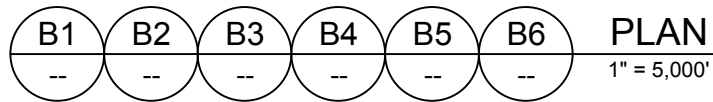
State: Texas  
 Date: May 2019



Placement Site Neatline Quantity – Sites B1 to B6	
Feature Description	Construction Volume (CY)
Feeder Berm Fill	750,000
<b>Total (Each)</b>	<b>750,000</b>
<b>Total (x6)</b>	<b>4,500,000</b>

BERM CONFIGURATION AND DESIGN TO BE FINALIZED IN P.E.D.

PLACEMENT QUANTITY NOT TO EXCEED AS SHOWN ABOVE.



**LEGEND**

- PROPOSED SHIP CHANNEL DEEPENING
- DREDGE MATERIAL PLACEMENT
- EXIST CONTOURS

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Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-2019-00067

**BENEFICIAL USE SITE AND SECTION VIEW - B1 TO B6 OFFSHORE FEEDER BERMS**

County: Aransas and Nueces  
Application By: Port of Corpus Christi Authority

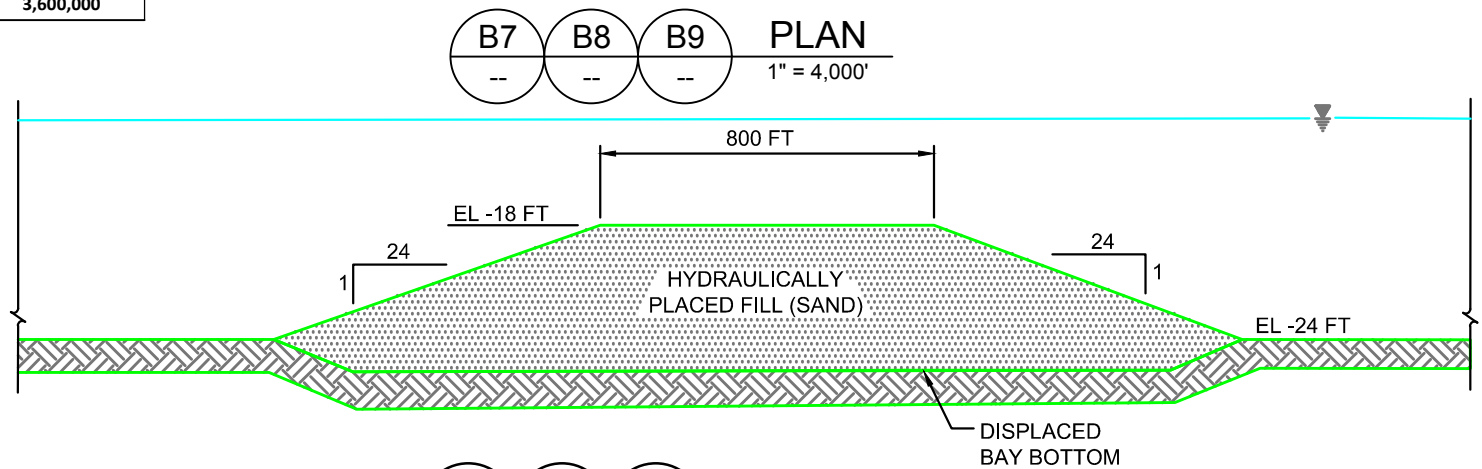
State: Texas  
Date: May 2019



Placement Site Neatline Quantity – Site B7, B8, B9	
Feature Description	Construction Volume (CY)
Feeder Berm Fill	1,200,000
<b>Total (Each)</b>	<b>1,200,000</b>
<b>Total (x3)</b>	<b>3,600,000</b>

BERM CONFIGURATION AND DESIGN TO BE FINALIZED IN P.E.D.

PLACEMENT QUANTITY NOT TO EXCEED AS SHOWN ABOVE.

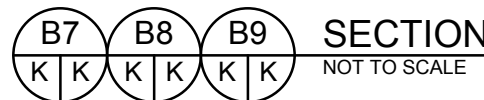


**LEGEND**

- DREDGE MATERIAL PLACEMENT
- EXIST CONTOURS

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Corpus Christi Ship Channel Deepening Project  
Individual Permit Application SWG-2019-00067

**BENEFICIAL USE SITE AND SECTION VIEW - B7, B8 & B9 OFFSHORE FEEDER BERMS**

County: Aransas and Nueces  
Application By: Port of Corpus Christi Authority

State: Texas  
Date: May 2019

**Block 25 Addresses of Adjoining Property Owners (from Nueces and San Patricio Counties 2019)**

<b>Owner</b>	<b>Mailing Address</b>	<b>City</b>	<b>State</b>	<b>Zip</b>
<b>San Patricio County</b>				
FLINT HILLS RESOURCES CORPUS CHRISTI LLC ATTN PROPERTY TAX DEPT	PO BOX 3755	WICHITA	KS	67201-2917
G&H TOWING COMPANY	PO DRAWER 2270	GALVESTON	TX	77553
GULF MARINE FABRICATORS L P	16225 PARK TEN PLACE, SUITE 280	HOUSTON	TX	77084
PORT OF CORPUS CHRISTI AUTHORITY OF NUECES COUNTY	PO BOX 1541	CORPUS CHRISTI	TX	78403
<b>Nueces County</b>				
12 BANYAN LLC	3200 Bryker Dr	Austin	TX	78703-1330
231 PORT A LLC	203 Humble Ave	San Antonio	TX	78225-1317
5D PROPERTIES LLC	107 Five Oaks Dr	San Antonio	TX	78209-2405
6221 STATE HIGHWAY 361 LLC	PO Box 781348	San Antonio	TX	78278-1348
ABELL REALTY LMTD PARTNERSHIP	4608 CRESTWAY DR	AUSTIN	TX	78731-5204
ABERNETHY GAYLE TRSTE GAYLE ABERNETHY DYNASTY TRUST	PO Box 1230	Port Aransas	TX	78373-1230
ALLEN BRUCE D TRUSTEE	61 Lincoln Dr	New Boston	NH	03070-4304
ANDERSON EVAN D & WF ANEESA W	503 Hummingbird Ln	Austin	TX	78734-4791
ARANSAS FIRST	81 GRIFFITH DR	ROCKPORT	TX	78382
ARNOLD HAYS L III & KRISTEN PLASTINO-ARNOLD	154 Country Ln	San Antonio	TX	78209-2228
ARNOLD MICHAEL J & WF SHERYL L	PO BOX 1118	PORT ARANSAS	TX	78373-1118
ATKINS RICHARD DALE & WF PAMELA BORNEMANN ATKINS	15096 Barrie Dr	Austin	TX	78734-6270
BADALICH CARL AND SHERRY BADALICH	PO Box 18150	CORPUS CHRISTI	TX	78480
BANYAN BEACH PROPERTY OWNERS ASSOCIATION INC	14613 S Padre Island Dr	Corpus Christi	TX	78418-6037
BEACH VIEW ESTATES OWNERS ASSN	211 COSTA BELLA DR	AUSTIN	TX	78734-2662
BENTON ELAINE ROBINSON EXEMPT APPT TRUST # 1	2403 Rockmoor Ave	Austin	TX	78703-1516
BERNSEN COASTAL BUILDERS LLC	722 Tarpon Unit J	Port Aransas	TX	78373-5182
BES INVESTMENTS LLC	502 E Center Ave	Carlsbad	NM	88220-6106
BIAGGI ANDRES E & BLANCA ONDINA	6850 San Pedro Ave	San Antonio	TX	78216-7201
BIEDENHARN ALBERT M III	1250 NE LOOP 410	SAN ANTONIO	TX	78209-1525
BIEHN DAVID P	9319 Waterview Rd	Dallas	TX	75218-2745
BIG SAND HILL DEVELOPMENT LP	19802 Messina	San Antonio	TX	78258-3192
BLACKERT JOSEPH	12607 Silver Creek Dr	Austin	TX	78727-2808
BLISS JIMMY AND MARCI BLISS	1016 BLUFF	PORTLAND	TX	78374
BODE BILLY WADE AND WF	5409 Northwest Trl	Corpus Christi	TX	78410-4814
BOGO/ORTIZ LTD	13817 Captains Row	Corpus Christi	TX	78418-6807
BRAMAN RANCHES LLC	PO Box 400	Victoria	TX	77902-0400
BREADY MARK AND STEVE BREADY	1142 Rip Jay Cir	Canyon Lake	TX	78133-4000
BREWSTER REVOCABLE TRUST	PO Box 368	Marietta	OK	73448-0368
BUECHEL FREDERICK MD TR	61 FIRST ST	SOUTH ORANGE	NJ	07079
C & F WEIL TRUST ETAL	500 N Shoreline Blvd Ste 1118	Corpus Christi	TX	78401-0359
C02 INC	110 Allen Ln	Center Point	TX	78010-5494

**Block 25 Addresses of Adjoining Property Owners (from Nueces and San Patricio Counties 2018)**

<b>Owner</b>	<b>Mailing Address</b>	<b>City</b>	<b>State</b>	<b>Zip</b>
CABELA JOSEPH & JENNIFER CABELA	220 Roy Creek Trl	Dripping Springs	TX	78620-4197
CALDWELL DOLORES M	6403 LOCHMOOR DR	SAN DIEGO	CA	92120
CAMPBELL CHARLES H FAMILY PARTNERSHIP LTD	5540 Saratoga Blvd	Corpus Christi	TX	78413-2999
CARLISLE THOMAS L	500 N WATER ST STE 900	CORPUS CHRISTI	TX	78471-0019
CASA OCEANSIDE LLC	3303 Rivercrest Dr	Austin	TX	78746-1718
CASERTA DIANE	1009 REDDING RD	FAIRFIELD	CT	06430
CHEEMA JASBIR S	4053 E. MORADA LANE	STOCKTON	CA	95212
CHOKE CANYON MOTEL, INC	PO Box 2181	Port Aransas	TX	78373-2181
CINNAMON SHORE COMMUNITY ASSOCIATION INC	PO Box 342585	Austin	TX	78734-0044
CITY OF CORPUS CHRISTI	PO BOX 9277	CORPUS CHRISTI	TX	78469-9277
CITY OF PORT ARANSAS	710 W AVENUE A	PORT ARANSAS	TX	78373-4128
COBBS JEFFREY DAN AND WF	11 HEWIT DR	CORPUS CHRISTI	TX	78404-1609
COCHRAN IRENE TR OF THE	GULF REALTY TRUST	APALACHICOLA	FL	32329-0400
GRANDALLS COTTAGE LLC	1511 Blackbird Ln	San Antonio	TX	78248-1743
CRENWELGE DALE A	PO Box 717	Comfort	TX	78013-0717
CUTLER HAYDN H JR	3825 Camp Bowie Blvd	Fort Worth	TX	76107-3355
DANGER SIX REVOCABLE MANAGEMENT TRUST	34 Royal Gardens Dr	San Antonio	TX	78248-1574
DENMAN BRYAN S	PO Box 775	GONZALES	TX	78629
DOYLE DAVID G & WF AMY L	318 Blue Bonnet Blvd	San Antonio	TX	78209-4633
DTB INVESTMENTS LP	28615 Interstate 10 W	Boerne	TX	78006-9126
DULCE DOG FAMILY LIMITED PARTNERSHIP	PO Box 1111	Leakey	TX	78873-1111
EASON KENNETH D AND SHIRLEY A WFE	4717 Miron Dr	Dallas	TX	75220-2018
EPISCOPAL CHURCH CORP IN	WEST TEXAS	SAN ANTONIO	TX	78209
ERF PORT ARANSAS INC	555 N Carancahua St #700	Corpus Christi	TX	78401-0800
ERWIN JOHN W & WF AMY D	13647 TREASURE TRAIL DR	SAN ANTONIO	TX	78232-3508
ESTRELLA BEACH LLC	5009 State Highway 361	Port Aransas	TX	78373-4833
EVANS JOHN R AND PATRICIA A EVANS WF	21 Inverness Blvd	San Antonio	TX	78230-5652
FACEY ENTERPRISES NVLTD.	A DELAWARE CORP	SAN MARINO	CA	91108
FCI-JJC LP A TEXAS LIMITED PARTNERSHIP	PO Box 366698	BONITA SPRINGS	FL	34136-6698
FISCHER JERRY E	PO Box 2464	CORPUS CHRISTI	TX	78403
FOREMAN SCOTT L AND WF	PO BOX 576	COLLEYVILLE	TX	76034-0576
FREEBORG GREGORY J AND CAROL A	1290 Gasparilla Dr NE	Saint Petersburg	FL	33702-2752
FRIESENHAHN DEVELOPMENT PROPERTIES LP	1204 Zanderson Ave	Jourdanton	TX	78026-3512
FRISHMAN BENJAMIN AND	4403 BALCONES DR	AUSTIN	TX	78731-5709
GARCIA HILARIO JR AND	PO Box 855	Pleasanton	TX	78064-0855
GARNER JEFF A AND WF CYNTHIA W	15513 Palmira Ave Apt A	Corpus Christi	TX	78418-6788
GATES THOMAS A	500 N Shoreline Blvd	Corpus Christi	TX	78401-0356
GATES THOMAS ALBERT JR AND WF	338 CATALINA PL	CORPUS CHRISTI	TX	78411-1602

**Block 25 Addresses of Adjoining Property Owners (from Nueces and San Patricio Counties 2018)**

<b>Owner</b>	<b>Mailing Address</b>	<b>City</b>	<b>State</b>	<b>Zip</b>
GER PORT ARANSAS HOUSE LTD	PO Box 9556	AUSTIN	TX	78766
GHADIMI RAMIN G AND DONA	E GHADIMI WFE	AUSTIN	TX	78746-6303
GOLDEN STEPHEN L AND WF	300 Convent St	San Antonio	TX	78205-3710
GONZALEZ ARNULFO JR ET UX	1510 CALLE DEL NORTE	LAREDO	TX	78401
GORCZYCA KIMBER LEI	520 Ocean Vw	Port Aransas	TX	78373-5711
GREEN WING INVESTMENTS LLC AVENUE G SERIES	101 W Goodwin Ave Ste 410	Victoria	TX	77901-6550
GRODSKY DAVID N AND JUNE PEARSON	PO Box 864	PORT ARANSAS	TX	78373
GROSSE RICHARD M ET UX	PO Box 872	PORT ARANSAS	TX	78373
GUENTHER LIFE INSURANCE TRUST	153 TREELINE PARK	SAN ANTONIO	TX	78209
GULF REALTY TRUST	PO Box 400	APALACHICOLA	FL	32329-0400
GULFWIND DEVELOPERS LTD	120 GULF WIND DR	PORT ARANSAS	TX	78373
HAGER CECILIA	3121 White Oak Rd	Fredericksburg	TX	78624-7894
HANMORE EROL R	PO Box 1541	PORT ARANSAS	TX	78373
HART JEFFERY L AND PATRICIA KILDAY HART	1504 Hardouin Ave	Austin	TX	78703-2519
HAUCK AMY K AND JOHN R HAUCK	11715 Spring Ridge Dr	San Antonio	TX	78249-2741
HAUSSER ROBERT JR ETALS	9901 W Interstate 10	San Antonio	TX	78230-2255
HAVERDA GARY CARLTON	PO Box 1411	Port Aransas	TX	78373-1411
HAVSAM PROPERTIES LLC	200 Patterson Ave	San Antonio	TX	78209-6264
HAWN EDWIN D	14222 Playa del Rey	Corpus Christi	TX	78418-7503
HEY PETER MALCHAM	121 Northoak Dr	San Antonio	TX	78232-1209
HH FAMILY INVESTMENTS II LTD	PO Box 207916	SAN ANTONIO	TX	78220-7916
HILL THOMAS W	PO BOX 3229	PORT ARANSAS	TX	78373
ILC REALTY LTD	TEXAS LIMITED PARTNERSHIP	SAN ANTONIO	TX	78258-7538
IMCO INDUSTRIES LTD	2801 - 5TH STREET			
ISLAND RETREAT II	CONDO COUNCIL OF CO-OWNERS	PORT ARANSAS	TX	78373-6012
JEAN KENNETH NORMAN & WF MICHELE	3606 W Deer Crossing Dr	Stillwater	OK	74074-7640
JENKINS CHARLES K ETUX	KATRINA C	HOUSTON	TX	77056-1414
JWI PARTNERS LTD	7373 Broadway St Ste 308	San Antonio	TX	78209-3266
JWW PROPERTIES LLC	615 N Upper Broadway St	Corpus Christi	TX	78401-0753
KINCAID JANET C AND	2009 Fringewood Dr	Midland	TX	79707-5051
KITE L WAYNE	PO Box 490	Port Aransas	TX	78373-0490
KJLSWS PROPERTIES LLC	145 Bluestem Ln	Boerne	TX	78006-7035
KLEBERG MARY LEWIS LTD	700 N Saint Marys St Ste 125	San Antonio	TX	78205-3538
KM BEACH, LLC	755 E Mulberry Ave Ste 600	San Antonio	TX	78212-6013
KNIETO PA LLC	700 N Saint Marys St Ste 125	San Antonio	TX	78205-3538
KNOPP GREGORY A & WF CAROL KNOPP	PO Box 1450	Port Aransas	TX	78373-1450
KOONTZ/MCCOMBS 1 LTD	755 E Mulberry Ave Ste 600	San Antonio	TX	78212-6013
KOXLIEN TIMOTHY J AND WF, LISA L KOXLIEN	24715 Fairway Spgs	San Antonio	TX	78260-4800



**Block 25 Addresses of Adjoining Property Owners (from Nueces and San Patricio Counties 2018)**

<b>Owner</b>	<b>Mailing Address</b>	<b>City</b>	<b>State</b>	<b>Zip</b>
LA CONCHA ESTATES OWNERS' ASSOCIATION INC	14493 S PADRE ISLAND DR	CORPUS CHRISTI	TX	78418
LA COSTA LAND DEVELOPMENT PARTNERS LP	248 Addie Roy Rd	Austin	TX	78746-4140
LABRUZZO DANNY ET UX	JEANNINE	PORT ARANSAS	TX	78373
LAYTON MATTHEW E & WF DEBORAH H	235 AMISTAD ST	CORPUS CHRISTI	TX	78404
LENNOX WILLIAM J JR AND ANNE M LENNOX	10521 Bermuda Isle Dr	Tampa	FL	33647-2721
LIKOVICH JOHN D AND SPSE	236 KING WILLIAM	SAN ANTONIO	TX	78204-1314
LINDNER DOROTHY NORTON	515 HOLIDAY RD	COMFORT	TX	78013-3107
LITTLETON MELVIN ET UX	DELANA	PORT ARANSAS	TX	78373
LOCO OCEAN LLC	PO Box 2290	Fort Worth	TX	76113-2290
MARSHIO BEVERLY AND DR P J MARSHIO	PO Box 669	FULTON	TX	78358
MARTIN OPERATING PARTNERSHIP LP	% MARTIN MIDSTREAM PARTNERS LP	KILGORE	TX	75662
MAYAN PRINCESS COUNCIL OF CO-OWNERS INC	7537 STATE HIGHWAY 361	PORT ARANSAS	TX	78373
MCALLISTER TADDY JO ELLEN	203 Terrell Rd	San Antonio	TX	78209-5915
MCALLISTER WALTER W III	4940 BROADWAY STE 104	SAN ANTONIO	TX	78209
MCCANN CHERYL SUZANNE	236 Dolphin Ln	Port Aransas	TX	78373-5407
MCCARTY DAN E	117 Rockhill Dr	San Antonio	TX	78209-2219
MCDONNELL HENRY JR AND WF MARY ROGERS MCDONNELL	135 Wildrose Ave	San Antonio	TX	78209-3812
MCDONOUGH JOHN G AND	5025 N Central Expy ,Ste 3012	Dallas	TX	75205-3447
MCGINNIS CAMPBELL/JAYNE WFE	1202 BELMONT PARKWAY	AUSTIN	TX	78703
MDW FINANCIAL LIMITED PARTNERSHIP	28255 Interstate 10 W	Boerne	TX	78006-6508
MEADOWS GILBERT R AND JAN B MEADOWS	807 CONTOUR DR	SAN ANTONIO	TX	78212
MHP TEXAS VENTURES LLC	1506 Hawks Mdw	San Antonio	TX	78248-1719
MILLS STEVE	18314 Emerald Oaks Dr	San Antonio	TX	78259-3637
MOKRY NANCY & WESLEY MOKRY	11223 BLOSSOM BELL DR	AUSTIN	TX	78758-4217
MOONEY RICHARD J TRUSTEE OF THE RJM TRUST	PO Box 1586	Frisco	TX	75034-0027
MOORE EDWARD ETUX TRUDY	1248 Austin Hwy 106-218	San Antonio	TX	78209-4867
MOORHOUSE BURTON L AND WF BEVERLY S BOLNER	684 Shoreline Cir	Port Aransas	TX	78373-4129
MUSTANG ISLAND DEVELOPMENT INC	120 Social Cir UNIT 4-101	Port Aransas	TX	78373-5091
MUSTANG ISLAND LLC	5916 Sterling Dr	Colleyville	TX	76034-7631
NEBLETT DUNCAN JR AND GEORGIA WFE	681 SHORELINE CIRCLE	PORT ARANSAS	TX	78373
NELLA GROUP LLC	427 N Broadway Blvd	Joshua	TX	76058-3413
NUECES COUNTY	901 LEOPARD ST	CORPUS CHRISTI	TX	78401-3606
OCEANSIDE ADDITION OWNERS	PO Box 236	Port Aransas	TX	78373-0236
PA POINT LTD	4418 OCEAN DRIVE	CORPUS CHRISTI	TX	78412
PA WATERFRONT L P	3455 PEACHTREE RD NE STE 650	ATLANTA	GA	30326
PAISANO PARTNERS LTD	4040 BROADWAY STE 501	SAN ANTONIO	TX	78209
PANOS MANAGEMENT TRUST	3716 Lagood Dr	Austin	TX	78730-3501
PATE RICHIE	1800 Hughes Landing Blvd	Spring	TX	77380-1684

**Block 25 Addresses of Adjoining Property Owners (from Nueces and San Patricio Counties 2018)**

<b>Owner</b>	<b>Mailing Address</b>	<b>City</b>	<b>State</b>	<b>Zip</b>
PAYNE DENNIS L & WF, DEBORAH J	5478 County Road 73	Robstown	TX	78380-9003
PERCOCO RICHARD A & THELMA A WFE	1011 Bayridge Rd	La Porte	TX	77571-3520
PHILLIPS BRICE	2004 PHILADELPHIA AVE	OCEAN CITY	MD	21842
PIONEER RV RESORT INC	120 GULF WIND DR	PORT ARANSAS	TX	78373
PITT STEPHEN M AND SARAH J	2929 Wesleyan St	Houston	TX	77027-2007
POMEROY ANNETTE	200 LEGACY DOWNS DR	FORT WORTH	TX	76126-5737
PORPOISE POINT HOMEOWNERS'	ASSOCIATION	PORT ARANSAS	TX	78373
PORT A MANAGEMENT CO	13647 Treasure Trail Dr	San Antonio	TX	78232-3508
PORT A SANDBOX LLC	PO BOX 17067	AUSTIN	TX	78760-7067
PORT ARANSAS MARICULTURE	CENTER - TEXAS A & M			
PORT ARANSAS MARINA ASSN	PO BOX 117	SAINT HEDWIG	TX	78152-0117
PORT ARANSAS RV PARK	907 ACCESS RD 1A	PORT ARANSAS	TX	78373
PORT OF CORPUS CHRISTI AUTH	PO Box 1541	CORPUS CHRISTI	TX	78403
PORTA CORPORATION	PO Box 460968	San Antonio	TX	78246-0968
POSEIDON REALTY TRUST	C/O ABACUS REALTY	APALACHICOLA	FL	32329-0400
POWER LAND COMPANY LTD	5601 EDMOND STE M	WACO	TX	76710-4321
PRESTON WILLIAM J & MELISSA V PRESTON	PO Box 7520	Spring	TX	77387-7520
R & R ROYALTY LTD	500 N Shoreline Blvd Ste 322	Corpus Christi	TX	78401-0313
RACHAL ED FOUNDATION	555 N Carancahua St Ste 700	Corpus Christi	TX	78401-0861
RANDALL JAMES PRESTON & WF LAURILEE GRACE	10603 Sierra Oaks	Austin	TX	78759-5166
REDDY GEETA	PO Box 272000	Corpus Christi	TX	78427-2000
RHODES SUZANNE S AND ALAN GARY THOMPSON	4511 Ridgehaven Rd	Fort Worth	TX	76116-7315
RIVERS WIL & JULIE V HUMBLE	610 Shoreline Cir	Port Aransas	TX	78373-4129
ROGERS WALLACE III 1992 FAMILY TRUST	305 Geneseo Rd	San Antonio	TX	78209-6124
RUSSELL JOHN	31211 Silver Spur Trl	Boerne	TX	78015-4107
S & K FAMILY TRUST	24165 W Interstate 10 Ste 217-419	San Antonio	TX	78257-9997
SAMBERSON RANDALL	688 Kaila Ct	Port Aransas	TX	78373-2240
SAND POINT N.U.D OWNER'S ASSOC INC	PO BOX 141	PORT ARANSAS	TX	78373-0141
SCHIRMER ROBERT G SR AND	324 DOLPHIN LN	PORT ARANSAS	TX	78373-5405
SCHOLL JACK W & SCHOLL HOLDINGS LTD	5740 Ocean Dr	Corpus Christi	TX	78412-2848
SCHRADER J ERIC ETUX DENISE A	6601 RIVER BEND DR	FT WORTH	TX	76132
SCHWEPPE HENRY IRVING JR TR	1752 NORTH BOULEVARD	HOUSTON	TX	77098-5414
SCOTT MICHAEL D & WF CONNIE SCOTT	638 Shoreline Cir	Port Aransas	TX	78373-4129
SEA OATS INVESTMENTS II LLC	5009 State Highway 361	Port Aransas	TX	78373-4833
SEAS THE VIEW	PO Box 1627	Kyle	TX	78640-1627
SEUREAU GLENN	3214 INWOOD DR	HOUSTON	TX	77019-3228
SHUTTERS PORTA LLC	203 HUMBLE AVE	SAN ANTONIO	TX	78225
SIGMA OCEAN VIEW PROPERTIES LLC	310 Champion Fls	San Antonio	TX	78258-4876

**Block 25 Addresses of Adjoining Property Owners (from Nueces and San Patricio Counties 2018)**

<b>Owner</b>	<b>Mailing Address</b>	<b>City</b>	<b>State</b>	<b>Zip</b>
SILVERCLOUD PROPERTIES LLC	221 E Guenther	San Antonio	TX	78204-1404
SKEWIS RONALD J AND WF	717 S 9th St Unit D	Port Aransas	TX	78373-4413
SNYDER BLAINE & KELLI SNYDER	673 Shoreline Cir	Port Aransas	TX	78373-4146
SPARR RICHARD A JR & WF JENNIFER	1313 NE LOOP 410 STE 100	SAN ANTONIO	TX	78209
SPEC-TACULAR INC	921 N Chaparral St Ste 103	Corpus Christi	TX	78401-2008
SPMP HOLDINGS LTD	115 Rio Cordillera	Boerne	TX	78006-5891
STAFFORD WESLEY W	AND JANE O STAFFORD WFE	CORPUS CHRISTI	TX	78411
STAHLMAN ALAN R	5691 FM 2722	NEW BRAUNFELS	TX	78132-2018
STATE OF TEXAS	PO Box 12608	Austin	TX	78711-2608
STERETT ROBERT HULINGS AND	409 Coral Pl	Corpus Christi	TX	78411-1530
STOVALL CHARLES WILLIAM AND WF	420 Ocean View Dr	Port Aransas	TX	78373-5711
SUNFLOWER BEACH DEVELOPMENT LTD	2215 Westlake Dr	Austin	TX	78746-2910
SWN LTD ET AL	2121 SAGE RD	HOUSTON	TX	77056-4341
TEMPLES RODGER D &	4701 Winthrop Ave W	Fort Worth	TX	76116-8239
TERRAMAR MI LTD	6315 Bandera Ave	Dallas	TX	75225-3621
TF JORGENSON BUSINESS	MANAGEMENT PARTNSHP LTD	NACOGDOCHES	TX	75961
THE WINAR GROUP LLC	C/O ROBBY ALLEN	JOSHUA	TX	76058
TURNER CHARLES R TRUSTEE	4201 Lomo Alto Dr Apt 109	Dallas	TX	75219-1511
UNITED STATES OF AMERICA	DEPT OF INTERIOR			
UNIVERSITY OF TEXAS	210 W 7th St	Austin	TX	78701-2903
VAGSHENIAN ATHENA	114 CRESTVIEW DR	AUSTIN	TX	78734
VAN FAMILY REAL ESTATE PARTNERSHIP LTD	8701 Research Blvd Ste E	Austin	TX	78758-6509
VAUGHAN BEN F III TRUSTEE OF THE	PO Box 460968	San Antonio	TX	78246-0968
WALLACE JUDITH LYN	3016 Mid Ln Unit B	Houston	TX	77027-5638
WATSON JOHN DOBREE AND WF	8005 Hidden Creek Ct	Mansfield	TX	76063-2088
WESTPLAN RESIDENTIAL FUND III LP	ONE GLENLAKE PARKWAY STE 1275	ATLANTA	GA	30328
WMI PROPERTIES LLC	605 E Dewey Pl	San Antonio	TX	78212-4012
WMI2 LLC	PO Box 90624	San Antonio	TX	78209-9088
WOLFE RONALD T & WF PAMELA K BURDA-WOLFE	211 COSTA BELLA DR	AUSTIN	TX	78734
YELLOW SHACK INVESTMENTS LLC	302 Dolphin Ln	Port Aransas	TX	78373-5405
ZARS KEITH M	12818 COUNTRY CREST	SAN ANTONIO	TX	78216-0000