US Army Corps of Engineers ®
Galveston District

Appendix B

Endangered Species Act Compliance

for

Coastal Texas Protection and Restoration Study

October 2020

Coastal Texas Protection and Restoration Feasibility Study

Biological Assessment for Federally-Listed Threatened and Endangered Species

October 2020

Prepared by:

United States Army Corps of Engineers
Regional Planning and Environmental Center

US Army Corps of Engineers ®
Galveston District

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1.0 INTRODUCTION

This Biological Assessment (BA) has been prepared in accordance with requirements outlined under Section 7 of the Endangered Species Act (ESA). Section (7)(a)(2) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that are proposed or listed as endangered or threatened, as well as their designated critical habitat (CH), if applicable.

This BA is the first of several anticipated ESA compliance documents that will be required to show the proposed action is compliant with ESA. This BA documents USACE's conclusions and the rationale to support the conclusions regarding the effects of the actionable measures (measures that could be constructed within a standard design and construction timeframe) of the proposed action. It also demonstrates the proposed action is in compliance with Section 7, which assures that, through consultation with the US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS), Federal actions do not jeopardize the continued existence of any threatened, endangered or proposed species, or result in the destruction or adverse modification of CH.

Implementation of the actionable measures of the recommended plan have the potential to impact the following ESA-listed species that could occur in one or more of the action areas: piping plover (*Charadrius melodus*), red knot (*Calidris canutus rufa*), whooping crane (*Grus americana*), northern aplomado falcon (*Falco femoralis septentrionalis*), Eastern black rail (*Laterallus jamaicensis jamaicensis*) West Indian manatee (*Trichechus manatus*), loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), Hawksbill sea turtle (*Eretmochelys imbricata*), and Kemp's Ridley sea turtle (*Lepidochelys kempii*). An additional 14 species were identified as potentially occurring in the action area including one avian species, one clam species, two fish species, six mammal species, and four plant species; however, these species' known range or preferred habitat is outside the action area. The only CH found in or near any of the action areas is for piping plover.

A second component of this document includes a broad level documentation of Tier 1 actions (actions that have longer than usual design and construction timeframes). Since construction of most of these actions is not likely to begin for at least 10 years, a Tiered NEPA strategy has been employed for these measures, meaning that subsequent NEPA reviews and ESA consultation would be required for these measures. The Tier 1 actions are described to seek technical assistance from USFWS and NMFS on potential impacts to listed species, recommendations to avoid or minimize potential impacts, and to document what questions remain that need to be answered prior to initiating official Section 7 consultation on these actions in the future. Effects determinations on these actions have not been made and official Section 7 consultation is not being requested at this time.

1.1 Study Background

The U.S. Army Corps of Engineers, Galveston District (USACE), in partnership with the Texas General Land Office, have undertaken the Coastal Texas Protection and Restoration Feasibility Study (the Study), which is examining coastal storm risk management (CSRM) and ecosystem restoration (ER) opportunities within 18 counties of the Texas Gulf coast (Figure 1). This Study seeks to develop a comprehensive plan along the Texas coast to mitigate coastal erosion, relative sea level rise (RSLR), coastal storm surge, habitat loss, and water quality degradation. The proposed Federal action (also referred to as the recommended plan) consists of two Coastal Storm Risk Management (CSRM) measures (Coastal Barrier located along Galveston Bay, Galveston Island, and Bolivar Peninsula and South Padre Island Beach Nourishment), and eight Ecosystem Restoration (ER) measures located along the Texas Gulf coast from Chambers to Cameron counties, Texas.

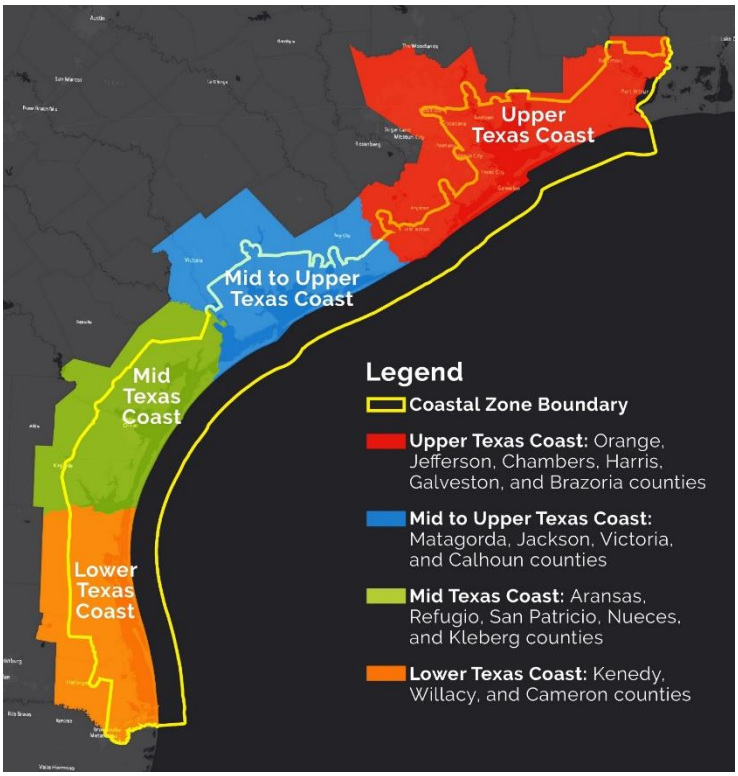

Figure 1. Coastal Texas Study Area

Currently, the Coastal Texas Study has completed the Agency Decision Milestone (ADM) meeting phase of the USACE Specific, Measurable, Attainable, Risk Informed, Timely (SMART) Civil Works planning process, where a plan has been recommended by the USACE vertical chain of command. At this stage of the planning, the major components of the plan have been identified and evaluated at a higher level of analysis. Consistent with USACE policy in Planning Bulletin PB 2017-01, there is a certain level of uncertainty expected in the size and make-up of the recommended plan, and other plans identified from the suite of alternatives analyzed in this initial phase, including the National Economic Development (NED) Plan, or a variant preferred by the non-Federal sponsor. As such, the final size of the measures (e.g. width, length, etc.), and location presented in this BA may change in the next planning phase. These changes can affect the habitat impacted. Because of the conservative nature of economic and engineering assumptions used during the initial planning of the recommended plan, it is anticipated that the design of proposed structures will result in equal or lesser environmental impacts.

On March 31, 2016, the U.S. Army Corps of Engineers (USACE), Galveston District published a Notice of Intent (NOI) in the Federal Register (Volume 81, Number 62, 18601) declaring its intent to prepare an EIS to determine the feasibility of implementing the Coastal Texas Study. Because of the uncertainty and complexity of a number of the potential solutions to the problems, the Study employs a tiered NEPA compliance approach, in accordance with the Council on Environmental Quality's (CEQ's) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (40 CFR 1500—1508,

specifically 1502.20). Under this structure, rather than preparing a single definitive EIS as the basis for approving the entire project, the USACE will conduct two or more rounds – or "tiers" – of environmental review. For projects as large and complex as the Study, this approach has been found to better support disclosure of potential environmental impacts for the entire project at the initial phase. Subsequent NEPA documents are then able to present more thorough assessments of impacts and mitigation need as the proposed solutions are refined and more detailed information becomes available in future phases of the project. This tiered approach also provides for a timely response to issues that arise from specific, proposed actions and supports forward progress toward completion of the overall study.

A Tier One assessment analyzes the project on a broad scale, while taking into account the full range of potential effects to both the human and natural environments from potentially implementing proposed solutions. The purpose of the Tier One EIS is to present the information considered to selected a preferred alternative, describe the comprehensive list of measures, and identify data gaps and future plans to supplement the data needed to better understand the direct, indirect, and cumulative effects of the proposed solutions.

Once refinements and additional information is gathered, USACE will shift to a Tier Two assessment, which involves preparation of one or more additional NEPA documents (either an EIS or Environmental Assessment) that build off the original EIS to examine individual components of the Recommended Plan in greater detail. Whether an EIS or EA is developed will be dependent on the significance of impacts anticipated from the action. In either situation, Tier Two assessments will comply with CEQ Regulations, including providing for additional public review periods and resource agency coordination. The Tier Two document would disclose site specific impacts to the proposed solution and identify the avoidance, minimization, and compensatory mitigation efforts to lessen adverse effects.

This BA is consistent with the Tiered NEPA approach in the draft EIS in that some measures, known as actionable measures, are described in sufficient detail to allow complete assessments consistent with environmental compliance laws and regulations. The remaining measures, known as Tier 1 measures, will have a more broad-level review acknowledging supplemental or subsequent environmental statements or analysis, including additional coordination and consultation under ESA, will be required at a later stage when more site-specific design level details are available and the full range of impacts are understood.

1.2 Consultation History

Significant coordination with USFWS, NMFS, Texas Parks and Wildlife Department (TPWD), Natural Resource Conservation Service (NRCS), Bureau of Ocean Energy Management (BOEM), Texas Commission on Environmental Quality (TCEQ), Environmental Protection Agency (EPA), and Texas General Land Office (GLO) has occurred since the start of the study. Coordination has included: problem and opportunity development; contributing to identifying restoration measures and priority restoration locations; describing the existing, future without- and future with-project condition; and review of benefit and impact analyses. Each of the listed agencies were involved in developing assumptions and assigning values for the Habitat Evaluation Procedure (HEP) species models that were used to predict future conditions with and without the recommended plan. The following documents coordination with USFWS and NMFS regarding ESA and general resource agency coordination:

- November 19, 2003 – Biological Opinion (BO) issued for regular maintenance hopper dredging of navigation channels and offshore sand mining for beach restoration/nourishment activities in the US Gulf of Mexico by USACE's Jacksonville, Mobile, New Orleans, and Galveston Districts and its effects on 13 species and one CH within the NMFS jurisdiction. The BO covers maintenance dredging activities within the SNWW. (Consultation Number F/SER/2000/01287)
- October 25, 2018 – Official Correspondence from USACE to USFWS Requesting Formal Consultation signed by Col. L. Zetterstrom
- October 25, 2018 -- Official Correspondence from USACE to NMFS Requesting Formal Consultation signed by Col. L. Zetterstrom
- November 26, 2018 – Official Correspondence from USFWS Regarding USACE Request to Initiate Formal Consultation (FWS/R2/CESFO/02ETXX0-2019—0375). Letter from C. Ardizzone indicating the BA and initiation package are incomplete and identifies several deficiencies that need to be corrected prior to continuing with formal consultation and acceptance of the initiation package.
- September 4, 2019 – Resource agency meeting to present project updates and to discuss ESA and Marine Mammal Protection Act concerns. Discussions included impacts to and minimization measures for piping plover, red knot, all five sea turtle species, West Indian manatee, bottlenose dolphin, oceanic white tip shark, giant manta ray, and whale species.
- December 30, 2019 – January 03, 2020 – Updated Species Lists Requested for each individual measure of the recommended plan. (Consultation Numbers: 02ETTX00-2020-SLI-0607, 02ETTX00-2020-SLI-0608, 02ETTX00-2020-SLI-0609, 02ETTX00-2020-SLI-0610, 02ETTX00-2020-SLI-0611, 02ETTX00-2020-SLI-0613, 02ETTX00-2020-SLI-0614, 02ETTX00-2020-SLI-0615, 02ETTX00-2020-SLI-0658, 02ETTX00-2020-SLI-0662, 02ETTX00-2020-SLI-0655, 02ETTX00-2020-SLI-0664, 02ETTX00-2020-SLI-0666
- January 7, 202 – In person meeting at the USFWS Clear Lake Office with NMFS attending by conference call. Continued discussions regarding species identified for ESA consultation and potential impacts to individuals and their habitat from project measures.
- June 4, 2020 – Meeting with USFWS to continue discussions on the Study and ESA compliance.
- September 23, 2020 – Meeting with USFWS to provide an overview of the recommended plan for new USFWS staff responsible for overseeing the consultation actions. As well, discussions about how information will be presented in the Draft BA and the tentative effects determinations provided consensus on the path forward.

1.3 Recommended Plan

The Recommended Plan includes a combination of ER and CSRM features that function as a system to reduce the risk of coastal storm damages to natural and built infrastructure and to restore degraded coastal ecosystems through a comprehensive approach employing multiple lines of defense. Focused on redundancy and robustness, the proposed system provides increased resiliency along the Bay and is adaptable to future conditions, including relative sea level change. The Recommended Plan can be

broken into three groupings: a Coastwide ER plan, a lower Texas coast CSRM plan, and an upper Texas coast CSRM plan.

Coastwide ER Plan: A Coastwide ER plan was formulated to restore degraded ecosystems that buffer communities and industry on the Texas coast from erosion, subsidence, and storm losses. A variety of measures have been developed for the study area, including construction of breakwaters, marsh restoration, island restoration, oyster reef restoration and creation, dune and beach restoration, and hydrologic reconnections. Figure 2 shows the location of the ER measures and the following describes what each measure includes:

- **G-28: Bolivar Peninsula and West Bay Gulf Intracoastal Waterway (GIWW) Shoreline and Island Protection**
    - Shoreline protection and restoration through the nourishment of 664 acres of eroding and degrading marshes and construction of 40.4 miles of breakwaters along unprotected segments of the GIWW on Bolivar Peninsula and along the north shore of West Bay,
    - Restoration of 326 acres (approximately 5 miles) of an island that protected the GIWW and mainland in West Bay, and
    - Addition of oyster cultch to encourage creation of 18.0 acres (26,280 linear feet) oyster reef on the bayside of the restored island in West Bay.
- **B-2: Follets Island Gulf Beach and Dune Restoration**
    - Restoration of 10.1 miles (1,113.8 acres) of beach and dune complex on Gulf shorelines of Follets Island in Brazoria County.
- **B-12: West Bay and Brazoria GIWW Shoreline Protection**
    - Shoreline protection and restoration through nourishment of 551 acres of eroding and degrading marshes and construction of about 40 miles breakwaters along unprotected segments of the GIWW in Brazoria County,
    - Construction of about 3.2 miles of rock breakwaters along western shorelines of West Bay and Cow Trap lakes, and
    - Addition of oyster cultch to encourage creation of 3,708 linear feet of oyster reef along the eastern shorelines of Oyster Lake
- **M-8: East Matagorda Bay Shoreline Protection**
    - Shoreline protection and restoration through the nourishment 236.5 acres of eroding and degrading marshes and construction of 12.4 miles of breakwaters along unprotected segments of the GIWW near Big Boggy National Wildlife Refuge (NWR) and eastward to the end of East Matagorda Bay,

- Restoration of 96 acres (3.5 miles) of island that protects shorelines directly in front of Big Boggy NWR, and

- Addition of oyster cultch to encourage creation of 3.7 miles of oyster reef along the bayside shorelines of the restored island.

- **CA-5: Keller Bay Restoration**

  - Construction of 3.8 miles of rock breakwaters along the shorelines of Keller Bay in order to protect submerged aquatic vegetation (SAV), and

  - Construction of 2.3 miles of oyster reef along the western shorelines of Sand Point in Lavaca Bay by installation of reef balls in nearshore waters.

- **CA-6: Powderhorn Shoreline Protection and Wetland Restoration**

  - Shoreline protection and restoration through the nourishment of 529 acres of eroding and degrading marshes and construction of 5.0 miles of breakwaters along shorelines fronting portions of Indianola, the Powderhorn Lake estuary, and Texas Parks and Wildlife Department (TPWD) Powderhorn Ranch.

- **SP-1: Redfish Bay Protection and Enhancement**

  - Construction of 7.4 miles of rock breakwaters along the unprotected segments of the GIWW along the backside of Redfish Bay and on the bayside of the restored islands

  - Restoration of 391.4 acres of islands including Dagger, Ransom, and Stedman islands in Redfish Bay, and

  - Addition of oyster cultch to encourage creation of 1.4 miles of oyster reef between the breakwaters and island complex to allow for additional protection of the Redfish Bay Complex and SAV.

- **W-3: Port Mansfield Channel, Island Rookery, and Hydrologic Restoration**

  - Restoration of the hydrologic connection between Brazos Santiago Pass and the Port Mansfield Channel by dredging 6.9 miles of the Port Mansfield Channel, providing 112,864.1 acres of hydrologic restoration in the Lower Laguna Madre,

  - 9.5 miles of beach nourishment along the Gulf shoreline north of the Port Mansfield Channel using beach quality sand from the dredging of Port Mansfield Channel, and

  - Protection and restoration of Mansfield Island with construction of a 0.7 mile rock breakwater and placement of sediment from the Port Mansfield Channel to create 27.8 acres of island surface at an elevation of 7.5 feet (NAVD 88).

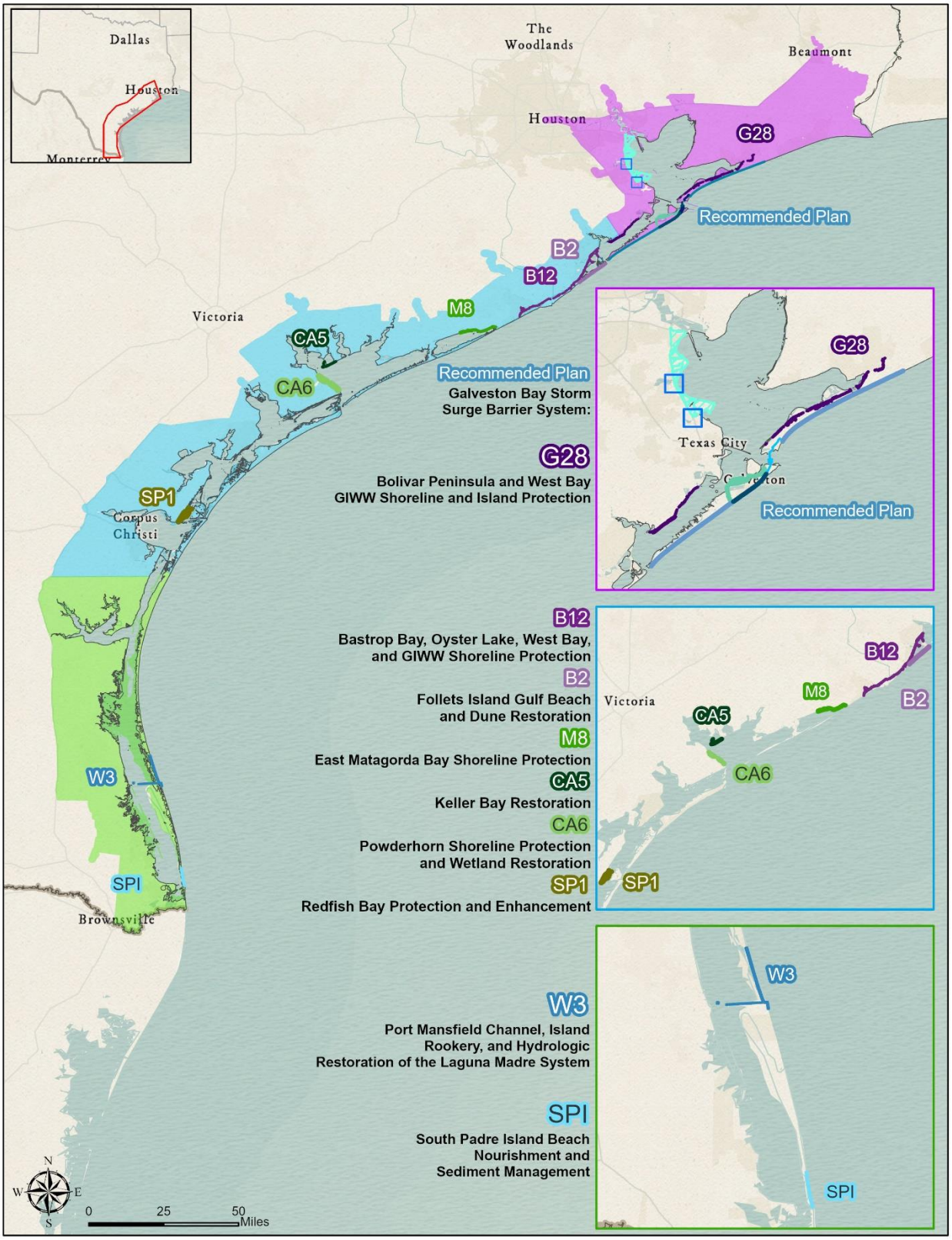

Figure 2. Coastwide ER Measures of the Recommended Plan

Lower Texas Coast Plan: The lower Texas coast component of the recommended plan includes 2.9 miles of beach nourishment at South Padre Island to be completed on a 10-year cycle for the authorized project life of 50 years (Figure 3).

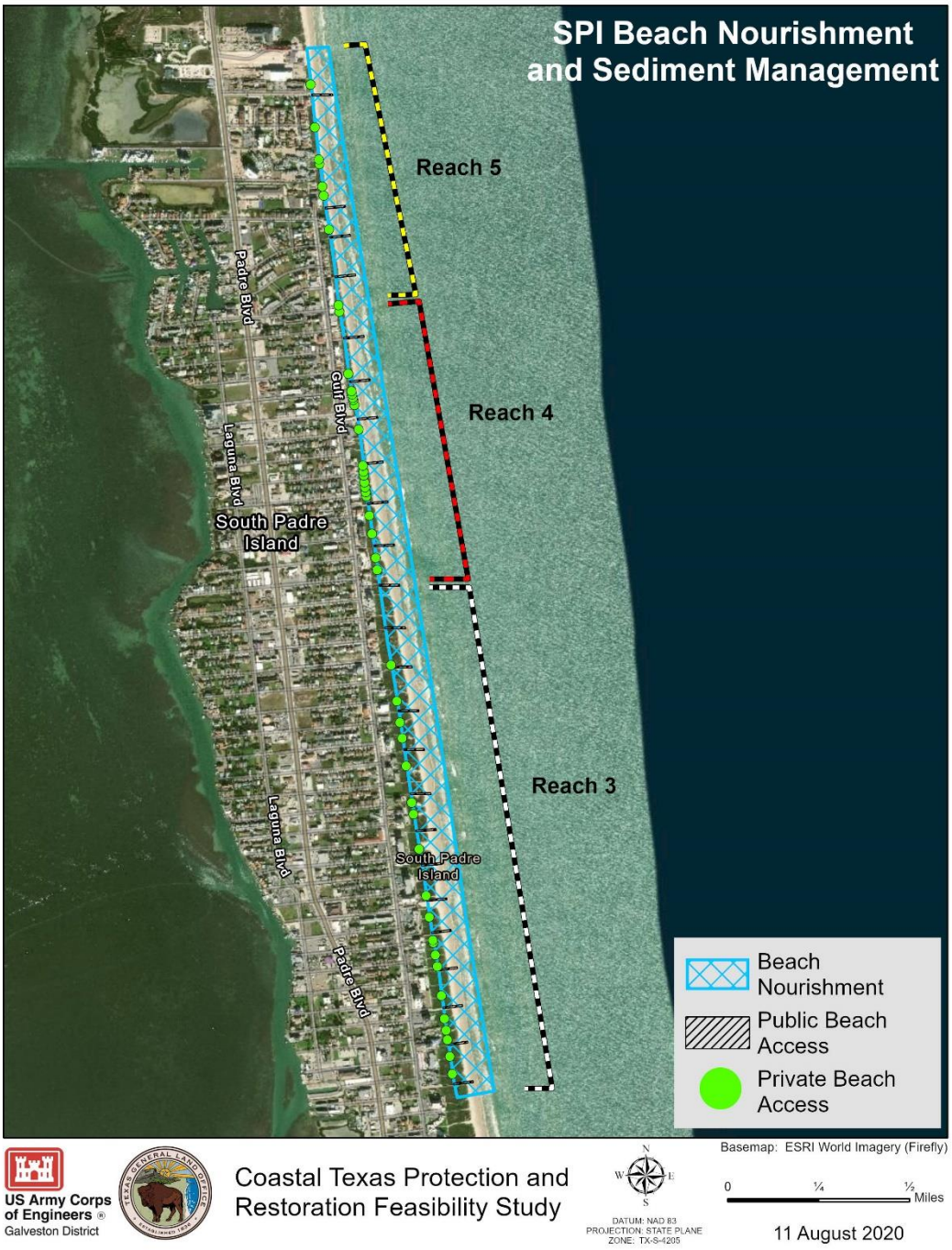

Figure 3. South Padre Island CSRM

Upper Texas Coast Plan: The upper Texas coast component of the recommended plan includes a multiple-lines-of-defense system known as the Galveston Bay Storm Surge System. The system is designed to provide a resilient, redundant, and robust solution to reduce risks to communities, industry, and natural ecosystems from coastal storm surge. The system includes a Gulf line of defense which separates the Galveston Bay system from the Gulf of Mexico to reduce storm surge volumes entering the Bay system. It also includes Bay defenses which enable the system to manage residual risk from waters already in Galveston Bay. Figure 4 shows the spatial relationship between the Gulf and Bay lines of defense. Measures which make up the system include:

- The Bolivar Roads Gate System, across the entrance to the Houston Ship Channel, between Bolivar Peninsula and Galveston Island (Figure 5);

- 43 miles of beach and dune improvements on Bolivar Peninsula and West Galveston Island that work with the Bolivar Roads Gate System to form a continuous line of defense against Gulf of Mexico surge, preventing or reducing storm surge volumes that would enter the Bay system (Figure 5);

- Improvements to the existing 10-mile Seawall on Galveston Island to complete the continuous line of defense against Gulf surge (Figure 5);

- An 18-mile Galveston Ring Barrier System (GRBS) that impedes Bay waters from flooding neighborhoods, businesses, and critical health facilities within the City of Galveston;

- 2 surge gates on the west perimeter of Galveston Bay (at Clear Lake and Dickinson Bay) that reduce surge volumes that push into neighborhoods around the critical industrial facilities that line Galveston Bay; and

- Complementary non-structural measures, such as home elevations or floodproofing, to further reduce Bay-surge risks along the western perimeter of Galveston Bay.

Within the recommended plan, it has been determined that several features, identified as "actionable" measures, have a sufficient level of site-specific detail to fully understand the context and intensity of the anticipated impacts of the feature. Therefore, the EIS has incorporated a site-specific Tier Two analysis for some features for which the measures would be fully compliant with NEPA and all environmental laws and regulations, including MSFCMA. Feature identified as "Tier One" measures will require separate independent NEPA analysis at which time additional EFH consultation would occur to ensure full compliance with MSFCMA once the impacts are fully understood. Table 1 shows which measures are actionable and which are not.

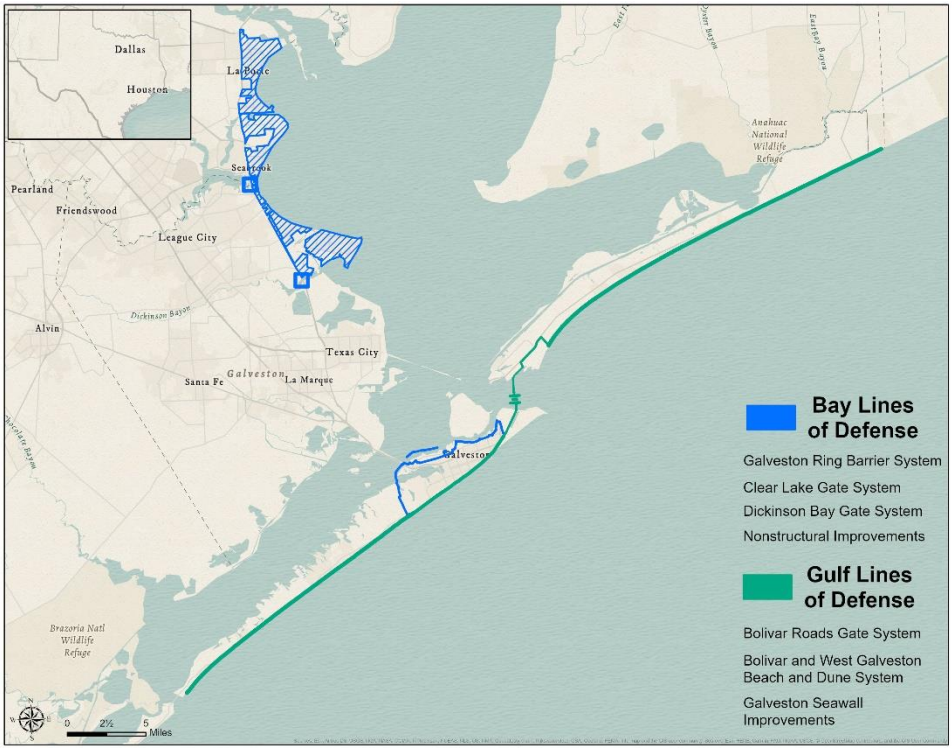

Figure 4. Galveston Bay Storm Surge System

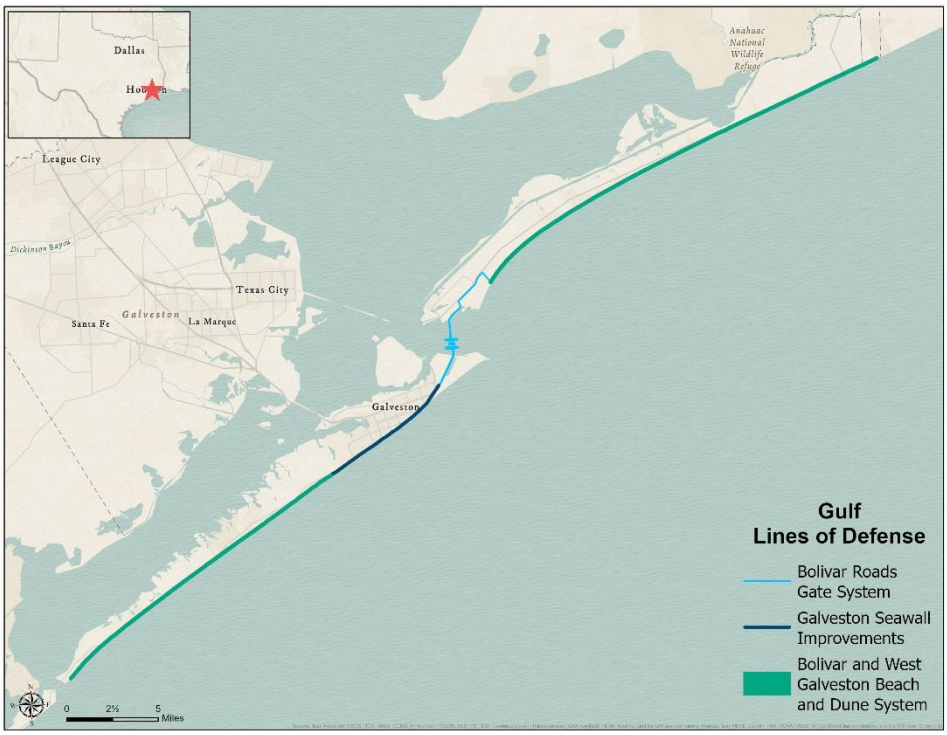

Figure 5. Gulf Lines of Defense of the Galveston Bay Storm Surge System

Table 1. Actionable and Tier One Measures of the Recommended Plan

Recommended Plan Component	Actionable[1]	Tier One[2]
G-28 – Bolivar Peninsula and West Bay GIWW Shoreline and Island Protection	X	
B-2 – Follets Island Gulf Beach and Dune Restoration		X
B-12 – West Bay and Brazoria GIWW Shoreline Protection	X	
CA-5 – Keller Bay Restoration	X	
CA-6 – Powderhorn Shoreline Protection and Wetland Restoration	X	
M-8 – East Matagorda Bay Shoreline Protection	X	
SP-1 – Redfish Bay Protection and Enhancement	X	
W-3 – Port Mansfield Channel, Island Rookery, and Hydrologic Restoration	X	
South Padre Island Beach Nourishment	X	
Bolivar Roads Gate System		X
Bolivar and West Galveston Beach and Dune System		X
Galveston Seawall Improvements		X
Galveston Ring Barrier System		X
Clear Lake Surge Gate		X
Dickinson Surge Gate		X
Non-structural Measures		X

[1] The Actionable Measures have sufficient detail to assess potential impacts to species under the protection of the ESA.

[2] The Tier One Measures will have future Tier Two environmental studies including ESA consultations. The Tier One Measures are mentioned in this BA to document the considerations and concerns identified to date so that the ESA consultations associated with the Tier Two environmental studies can pick up where this documentation ends.

2.0 DESCRIPTION OF THE ACTIONABLE MEASURES

This section describes the proposed action including the benefits and impacts associated with implementing the action and a description of the action area. The information contained here is a summary of the overall project and impacts. Additional information, specifically in regards to benefits and impacts can be found in the Draft Feasibility Report and Draft EIS.

2.1 Design, Construction, and Long-Term Operation of the Actionable Measures

The Actionable Measures and the accompanying Monitoring and Adaptive Management Plan have been developed to a feasibility level of design (i.e. estimates, design level that is not detailed enough for construction) based on currently available data and information developed during plan formulation. There is significant institutional knowledge regarding the construction of the restoration measures; therefore, there is minimal uncertainty from a construction standpoint. Uncertainties relating to measure design and performance are mainly centered on site specific, design-level details (e.g. exact sediment quantities, invasive species removal needs, extent of erosion control needs, construction staging area locations, pipeline pathways, timing and duration of construction, engineering challenges, etc.), which would be addressed during the pre-engineering and design phase (PED).

This section further describes the design of each measure of the Actionable Measure components. The design would be applied to every restoration location where that measure is being employed unless indicated (i.e. everywhere marsh restoration is being done would have the same marsh design). Table 2 shows which measures (e.g. breakwater, marsh, oyster restoration, etc.) would be applied to which component (G-28, M-8, W-3, etc.) of the recommended plan, along with the anticipated total construction duration needed to construct all measures of the component, and the anticipated total sediment needs.

Timing of initial construction of the actionable measures is dependent on a number of factors including: timing of authorization, duration of pre-engineering and design (PED) phase, identification of a cost-share sponsor, and Federal- and non-federal funding cycles. As well, a number of measures depend on material dredged from existing channels during the normal operations and maintenance (O&M) cycle or as part of another project (e.g. dredged material from construction of the surge gates). For the purposes of this analysis and the "worst case scenario", the construction duration assumes that only one restoration area is worked on at a time and that when one area is complete the next would commence without extended breaks between contracts. The reality is that contracts will most likely overlap and concurrent work will be implemented (e.g. breakwaters may be constructed simultaneously to the marsh restoration). The seasonality of the timing of the actions and dependency on other actions is further discussed in the description of the action.

At this phase of the study potential pipeline routes and staging areas have not been identified. Identification of access routes, staging areas, pipeline routes, and placement of floatation docks would occur during PED. Each disturbance for access and staging would be placed outside of environmentally sensitive areas to the greatest extent practicable and utilize areas already disturbed when possible. As well, the disturbance would be limited to the smallest area necessary to safely operate during the project. All ground disturbance for access and staging areas would be temporary and fully restored to result in no permanent loss.

A Monitoring and Adaptive Management Plan (Appendix K of the EIS) has also been developed for the ER actionable measures which provides a coherent process for making decisions in the face of uncertainty and increases the likelihood of achieving desired project outcomes based on the identified monitoring program. The Monitoring and Adaptive Management Plan addresses uncertainties associated with ecosystem function and how the ecosystem components of interest will respond to the restoration efforts in light of changing conditions (e.g. sea-level change is different than anticipated) or new information (e.g. surveys indicate the design needs modification in order to function properly).

A number of maps and cross-section plates are included in Attachment A and will not be included in the following descriptions in order to keep the size of this document to a minimum.

2.1.1 Breakwaters

GIWW armoring would involve constructing 114 miles (601,920 linear feet) of breakwater structures. The structures would be built in shallow water (<3 feet deep, -3 feet NAVD88) along unprotected portions of shoreline of the GIWW, at varying distances from the shoreline and where soils are conducive to supporting the weight of the stone without significant subsidence. The distance from the shoreline would be determined during PED, after site specific surveys have been completed, but sufficiently offset from the boundaries of the GIWW navigation channel to ensure continued safe navigation.

The design would be a trapezoidal, step-down structure built of rock up to a height of +7.0 MSL, which will yield approximately 5.75 feet of rock exposed above the mean high high water level. Other approximate features of the design include a two 3-foot wide crests at +7 feet and +1 feet NAVD88, a 2H:1V slope, and a base that is roughly 46 feet wide. The base of the structure would be on filter cloth ballasted to the water bottom to secure placement and prevent displacement of the outboard edges. The number of openings and width of each would be determined during PED and dependent on the location of major channel entrances or access points required for fishery access or circulation. It is anticipated that the breakwaters would need to be raised at least two times and throughout the 50-year period of analysis to keep up with relative sea level change and remain effective. For purposes of the study materials would need to be added in year 15 and year 25, but timing could vary depending on observed local conditions and identified need to continue functioning as designed.

For GIWW armoring, rock would be purchased from a commercial quarry and transported to the site by barge, where it would then be placed by crane or hopper barge. Various support equipment would also be used, such as crew and work boats, trucks, trailers, and construction trailers to facilitate loading and unloading of personnel and equipment.

Breakwater armoring could be constructed at any time of year and would not have any seasonal construction restrictions. The timing of construction is only dependent on availability of funding.

Table 2. Actionable Measures

Actionable Measures (Recommended Plan Component)	Construction Duration (months)	Breakwaters (miles)	Island Restoration (acres)	Wetland and Marsh Restoration (acres)	Oyster Reef (miles)	Dune/ Beach Restoration (miles)	O&M Dredging (cy)	New Work Dredging (cy)	New Work Dredging (miles)
Bolivar Peninsula and West Bay GIWW Shoreline and Island Protection (G-28)	120	36	362	664	5	--	6,537,964	--	--
West Bay and Brazoria GIWW Shoreline Protection (B-12)	120	43	--	551	0.7	--	399,863	--	--
Keller Bay Restoration (CA-5)	24	3.8	--	--	2.3	--		--	--
Powderhorn Shoreline Protection and Wetland Restoration (CA-6)	36	5	--	531		--	385,760	--	--
East Matagorda Bay Shoreline Protection (M-8)	84	12.4	96.0	236.5	3.7	--	1,443,077	--	--
Redfish Bay Protection and Enhancement (SP-1)	120	7.4	391	--	1.4	--	6,685,556	--	--
Port Mansfield Channel Island Rookery and Hydrologic Restoration (W-3)	24	0.7	27.8	--	--	9.5	--		6.9
South Padre Island Beach and Dune Improvement						2.9	168,000		

2.1.1.1 Beneficial Impacts

Breakwaters allow for the stabilization and protection of the existing shoreline and support the reestablishment of intertidal emergent vegetation along the shoreline through retention of sediments and reduced land loss. Under the existing condition, the rate of loss is approximately 4 feet per year, which translates to approximately 55.25 acres per year (about 2,763 acres over a 50-year period) of interior marsh that would be protected and improved with implementation of the breakwaters. Additionally, breakwaters are expected to improve overall water quality with reduced saltwater intrusion and turbidity and may decrease operations and maintenance costs of the GIWW by reducing the amount of dredging. Overall, emergent shoreline habitats and interior marshes are expected to improve thereby supporting a more diverse and productive habitat for aquatic and terrestrial species. The breakwater structure itself can provide additional aquatic habitat by facilitating formation of a reef to support a greater abundance and diversity of aquatic species. Rock substrate is expected to also provide benefits to some aquatic species by providing them a refuge from predation.

2.1.1.2 Adverse Impacts

Direct and indirect impacts associated with constructing breakwaters are temporary in nature and limited in scope. Construction activities would contribute the greatest impacts to the environment and could include: localized effects to water quality, including increased turbidity and total suspended sediments, organic enrichment, reduced dissolved oxygen, elevated carbon dioxide levels, and decreased light penetration, among others; habitat removal and/or fragmentation; temporary habitat avoidance because of increased noise, vibrations, and overall temporary lower quality habitat; losses of slow moving and less mobile species (aquatic invertebrates, benthic species, mussels, and smaller/younger fish); and temporary loss of recreation opportunities. The level and duration of the impacts is dependent on the final design the measure, type of equipment used, and duration of construction activities. However, it is anticipated that once construction is complete, temporary impacts related to construction activities would cease.

Long-term impacts from placement of the breakwaters would permanently convert inland open water habitat to a hardened structure thereby reducing available habitat for aquatic species. This loss, which equates to only the footprint of the structure, is generally considered minimal when compared to the extent of inland open water habitat available. As well, the structures would be designed in such a way as to not hinder movement of aquatic species. These impacts would have an overall minimal impact to fisheries and aquatic populations in the area and would in the long-term protect adjacent habitat that aquatic species depend on for survival that would be lost in the future if the measures were not implemented. The overall benefits of implementing the measure far outweigh any temporary or permanent loss realized during construction.

2.1.2 Marsh Restoration

Marsh restoration measures involve placement of borrow material dredged from the GIWW during routine maintenance dredging or from the surge barrier gate disturbance area into marsh restoration locations. Material placed into the marsh would have similar properties to the existing native material. Under the existing and projected future dredging cycles, there is enough quantities of suitable material available to meet all restoration needs without seeking other borrow sources (e.g. offshore, upland placement areas).

A total of 2,052 acres of marsh would be restored in four different locations throughout the study area including: along the GIWW at Bolivar Peninsula, West Bay, and Matagorda Bay, along the GIWW in Brazoria County; near Big Boggy NWR; and along the shorelines of Powderhorn Estuary near Indianola and Powderhorn Ranch. Within each of the marsh restoration units, material dredged from the GIWW or would be hydraulically pumped into open water and low lying areas assuming that 65% of the restoration unit will have a post-construction settlement target elevation of +1.2 feet mean sea level (MSL). As necessary, earthen containment dikes would be employed to efficiently achieve the desired initial construction elevation. Dikes would be breached following construction to allow dewatering and settlement to the final target marsh elevation.

Following marsh restoration actions, non-native/undesirable species monitoring would be implemented. If species are found, measures would be taken to stop or slow the expansion of the species within the restoration units.

Sediment transport equipment would include hydraulic dredges (e.g. hopper dredges or cutterhead suction dredge), pipelines (submerged, floating, and land) and booster pumps. Heavy machinery would be used to move sediment and facilitate construction. Heavy equipment could include bulldozers, front-end loaders, track-hoes, marshbuggy, track-hoes, and backhoes. Various support equipment would also be used, such as crew and work boats, trucks, trailers, construction trailers, all-terrain vehicles, and floating docks and temporary access channels to facilitate loading and unloading of personnel and equipment.

Implementation of the marsh restoration measures is highly dependent on dredging cycles and the source of the dredged material. Currently, seasonal timing restrictions related to ESA compliance includes a seasonal dredging window for hopper dredge use between December 1 and March 31, unless work outside this window cannot be completed, in which NMFS would need to approve the deviation. This seasonal timing restriction would be applicable to marsh restoration sites that are dependent on material from the surge gate dredging actions where a hopper dredge may be used. Placement of material into marsh areas dependent on navigation channel maintenance dredging (GIWW, Houston Ship Channel, Brazos Island Harbor, etc.) could occur any time of year due to the use of a cutterhead suction dredge which has no seasonal restrictions.

2.1.2.1 Beneficial Impacts

The unconfined placement of dredged material in marsh restoration units and along the shoreline would have a net beneficial effect on the environment. A total of 2,052 acres of marsh habitat would be restored by reducing the extent of open water in the restoration unit to less than 35 percent of the unit. This value has been identified as providing optimal marsh habitat in areas throughout Texas. As well, increasing available sediment in the marsh units is expected to increase the potential for accretion into the future by supporting an assemblage of desired vegetative species. Once vegetative species composition is restored, the value of the marsh habitat to avian, terrestrial, and aquatic wildlife and fish is expected to increase by providing higher quality nesting, foraging, roosting, and nursery habitat.

2.1.2.2 Adverse Impacts

Many of the same adverse temporary impacts associated with construction of the breakwaters can be expected for marsh restoration. Placement of dredged material into the restoration unit has the

potential to: degrade water quality locally within the placement site; compact soils and mix soil horizons; smother, trample, and kill existing vegetation and slow moving or less mobile species (small mammals, aquatic invertebrates, benthic species, etc.); and create noise and vibrations that cause fish and wildlife to avoid the area. The level and duration of the impacts is dependent on the final design the measure, type of equipment used, and duration of construction activities, as well as the species ability to avoid the habitat during the construction period and until the habitat has recovered from the disturbance. It is anticipated that once construction is complete, temporary impacts related to construction activities would cease.

Although marsh restoration would result in the loss of approximately 65 percent of the open water in the restoration units, wildlife species currently utilizing this habitat would not be expected to be adversely affected over the long-term. Wildlife species currently utilizing the shallow open water and vegetated shoreline habitat in the restoration units are highly mobile allowing them to relocate into adjacent open water habitats outside the restoration units. The conversion of open water to marsh habitat is generally considered a benefit to aquatic species.

2.1.3 Island Restoration

The general conceptual design for island restoration includes placing material dredged from nearby navigation channels to remnant island locations to raise the elevation of the island and prevent overwash of ground nesting birds. A total of 15.2 miles of bird rookery island restoration would be completed at four restoration sites. Island construction would use clean sediments consisting of clay, silts, and sands, which would be sculpted to prescribed slopes (5H:1V) and elevations (+7.5 to +9 feet NAVD88, post-settlement). The island would be sloped into the tidal zones at all edges to provide water access for juvenile colonial waterbirds and all for natural gradient of fringe marsh to upland vegetative communities. The island crest and bottom widths vary depending on the island site, shape and target acreage.

Fill material would be mixed with some in-situ water as it is placed, requiring a settlement period and the controlled discharge of decant water from within the restoration site. Breakwaters or temporary structures would be constructed where necessary to contain fill material in place. The height of any temporary structure and construction method required to contain the fill would be determined by the type of material used and its estimated water content. Where permanent structures are required to protect the island from waves and currents, breakwaters would be constructed 75 to 550 feet from the island shoreline in the same manner as described in section 2.1.1. The locations of temporary and permanent structures would ensure containment and settlement of the fill materials, using BMPs.

Once the fill has dewatered and sediments have settled, the temporary berms would be breached and portions of the island would be planted with species found at similar island sites to promote desired vegetation establishment; although the extent, specific species, and method of planting would be determined during PED. Monitoring for and removal of invasive or undesirable species would occur during the monitoring and adaptive management period.

Additionally, oyster reef restoration (as described in section 2.1.4) would be completed near all island sites in order to facilitate treatment of degraded water quality caused from the increase in bird defecation to the surrounding waters.

Construction may require temporary channels to access the restoration and borrow sites. The need for temporary channels would be determined during PED based on site specific conditions and the borrow location for each island. All temporary channels would be backfilled upon completion of construction work.

In general, construction would require the use of barges, small watercraft, large track hoe excavators, earth moving equipment, hydraulic dredges, and a dockside staging area. Equipment and materials for the construction activities would be transported via roads and marine waterways. Large equipment and materials moved by barges would use established interconnected waterways.

As with other dredged material placement measures, the timing of the action would be dependent on the dredging cycle of the source of material. Most of the action areas do not currently support nesting habitat, so no seasonal timing restrictions would be placed on construction. For the remnant islands, surveys would be completed prior to construction to confirm no nesting is occurring. If nesting is found, construction would need to avoid the nesting season, which is usually February 1 through August 15. However, some field activities that pose minimal disturbance to nesting birds may be acceptable during this time. Any such activities would be coordinated with state and federal resource agencies.

Beyond the adaptive management and monitoring period, no long-term maintenance of the islands are proposed as part of the recommended plan. Although at some point in the future, the islands could serve as a suitable site for disposal of dredge materials rather than placing materials in an upland or offshore disposal site.

2.1.3.1 Beneficial Impacts

Restoration of islands would increase available nesting habitat by expanding the size of the islands and enhancing the quality of habitat for ground nesting birds such as skimmers, terns, reddish egret, and American oystercatcher, as well as shrub nesters like spoonbills and pelicans. The islands would likely serve as a source populations for recolonizing other sites and reduce issues associated with overcrowding on existing islands. They would be important in sustaining or increasing regional populations given the few nesting islands available along the coast.

The shoreline length of each of the islands would increase and provide for additional area for fringe marsh habitat to establish thereby increasing suitable habitat for a number of additional aquatic species. Additionally, the increase in nutrients to the water from bird defecation has been known to create conditions which promote seagrass meadow establishment. Where seagrasses already occur, the islands would provide additional protection to the sensitive habitat.

The islands would also be consistently susceptible to erosion, but would in turn be providing protection to intertidal and freshwater marshes from currents and wave energies from barge, tides, and storms. Habitat longevity would be increased by raising the island elevation and constructing protective features, such as breakwaters and oyster reefs. As erosion occurs, the islands would be prime sites for beneficial use of future sediment disposal rather than placing material into upland or offshore disposal sites.

2.1.3.2 Adverse Impacts

Placement of material onto remnant islands or on the bay bottom would have nearly identical adverse impacts as described for marsh restoration. The main difference would be that it is unlikely any terrestrial species would be impacted by construction actions. All adverse impacts are anticipated to be temporary in nature and the benefits of the action would far outweigh any adverse impacts.

Long term impacts would result from the placement of material on the open bay bottom in a similar manner as described for the breakwaters. Any long-term loss of open bay bottom is expected to be outweighed by the benefits the island would provide as a rookery and protection to seagrass meadows and marshes. As well, use of the islands by colonial waterbirds is expected to cause localized water quality degradation due to the extent of defecation that would occur into adjacent waters. To mitigate degraded water quality, oyster reefs would be constructed to filter the water and improve or maintain existing water quality.

2.1.4 Oyster Restoration

The goal of the oyster restoration measures is to increase the amount of hard substrate bottom in the restoration area to provide additional surface for oyster recruitment. Restoration would be achieved in one of two ways. Approximately 12.32 miles (65,050 linear feet) of oyster reef would be restored at five different sites. The first and most likely method involves placing cultch material, either loose or contained, directly on the soft bottom substrate of the restoration area. The cultch veneer would be clean crushed, limestone or concrete, or other suitable substrate deemed acceptable by TPWD. These materials have been successfully used in Galveston Bay reef restoration including those by USACE, the NFS, and TPWD. The cultch would most likely be barged in and then placed evenly over the restoration site submerged bottom. A 6-inch thick cultch layer has been assumed for all restoration sites but during PED the thickness would be modified based on local reef restoration target relief for the recruitment layer. The size of the substrate would vary depending on the material and site characteristics. Material that is approximately six to 10 inches in diameter and weighing approximately 25-75 pounds would be targeted to ensure suitable interstitial spaces for reef habitat and proper weight to withstand velocities and currents at the site.

For CA-5, oyster reef construction would involve placing a series of molded precast concrete structures that are designed to mimic the attributes of a natural three-dimensional oyster reef. The reef ball design is proposed and involves a hollow concrete mound with several holes that provide attachment points for oyster recruitment. The size of the reef balls would be determined during PED and would be specific to the restoration site conditions. A layer of hardened substrate, such as concrete rubble, may need to be placed on the bottom before the reef ball is placed. Supplementary shell and/or rock mats may be used if needed. The need for additional support would be determined during PED.

Oyster reefs would be constructed in the intertidal zone of the various bays. Considering post-construction settling of material, reef habitats would be built to an elevation that would avoid sedimentation of the reefs over time. If settlement occurs post-construction, additional material may be placed on the reefs in an adaptive management measure to ensure the height of the reef is approximately one foot above the existing bottom. Specific locations, size, and shape of reef may be revised after site-specific surveys are completed and based on resource agency recommendations for

site selection criteria. The size and shape of the constructed reef is expected to range from small circular patches to elongated irregularly shaped reefs that extend for miles.

The GLO and TPWD would share responsibility for managing the site and each site is retained in public ownership. Each oyster restoration site is within an area currently protected under state law from commercial harvest and are not be eligible for lease. The site may be subjected to light recreation harvest; however, the design is expected to be self-sustaining and capable of supporting light use. This protection is expected to continue for the life of the project.

Oyster cultch and reef balls would be placed primarily by tugboat and barge but large workboats may also be used. With either barges or large workboats, cultch material would be washed overboard using high pressure water hoses or cannons, with the vessel moving continuously through the placement area to control the thickness and acreage of the placement. Larger materials, such as reef balls or blocks of alternative cultch material, may be placed using a crane/excavator or front-end loader.

Oyster reef restoration would be completed at any time of the year and would not be dependent on the timing of other actions, except for funding. No long-term maintenance is included in the recommended plan.

2.1.4.1 Beneficial Impacts

Most of the beneficial impacts described for breakwaters also apply to oyster reef restoration; however, oyster reef restoration would also restore the ecological function of oyster reefs in the action area. Oyster reefs provide a host of ecosystem services including: enhanced recruitment, growth and survival of oyster populations, water filtration and regulations of water column phytoplankton dynamics, enhanced nitrogen cycling between the benthic and pelagic system components, enhanced phosphorus burial in sediments, nursery and predation refuge habitat for a diverse community of invertebrates and small fish, and foraging habitat for transient piscivorous and bethivorous fish (Rodney and Paynter 2006; Newell et al. 2004).

Oysters can affect other organisms by changing the physical and chemical environment of the open water ecosystem. Oysters filter water while feeding, thereby removing sediment and other particles from the water and depositing it on the bottom in pellets called pseudo-feces. Filtration by large numbers of oyster can reduce the time that sediment remains suspended in the water column and increase the clarity of the filtered water. Oysters' pseudo-feces are rich in nutrient and, therefore, help support primary production among bottom-dwelling organisms in areas immediately surrounding oyster bars and reefs. Local nutrient enrichment also stimulates the exchange of various forms of nitrogen and nitrogen compounds from one part of the system to another. (Newell et al. 2002)

Oyster reefs are also know to support a complex and extremely productive marine community. Total macrofaunal abundance (free living and sessile organisms) is typically an order of magnitude higher on restored reefs compared to unrestored areas, while free living macrofauna are twice as abundant on restored reefs and two orders of magnitude more abundant than on unrestored reefs. Epifaunal organism density is on average three times higher and demersal fish density was four time higher in restored reefs. As well, restored reefs support a higher level of secondary production. Many of the organisms that are significantly more abundant on restored reefs are also known to be important food items for several commercially and recreationally important finfish species.

2.1.4.2 Adverse Impacts

The adverse impacts from construction and long-term operation of the oyster reefs is nearly identical to those anticipated for the breakwaters, except that the long-term adverse impacts from conversion of the bay bottom to hard substrate is would be more productive as an oyster reef than as a breakwater.

2.1.5 Dune and Beach Restoration/Nourishment

The beach and dune restoration/nourishment would involve placing beach compatible dredged material on the beach above the mean high water mark. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Such material would be similar in color and grain size distribution (sand grain frequency, mean and median grain size, and sorting coefficient) to the material in historic beach sediment at the placement site.

Temporary training dikes would be constructed using existing beach sand parallel to the shore. The dikes would be used to contain the slurry discharge. A sand/water mixture would be pumped through a series of pipes laid parallel to the shoreline (no pipes placed directly on the beach) and sprayed onto the beach. Once the sand is pumped onto the beach, bulldozers would shape the fill in the design template from the backshore to the approximate mean sea-level (MSL) contour. Sand below the MSL would be shaped and redistributed to a natural profile by waves. As each section of beach is completed additional pipe would be added to the discharge line, pipe on the completed beach would be removed, and the active construction zone would move along the project area until all sections of beach have been nourished.

Sand fencing and/or native vegetation would be planted in strategic locations along the proposed dune following nourishment in accordance with a vegetation plan that would be developed with resource agency input during PED.

Nourishment would be accomplished by hydraulic dredge (cutterhead suction dredge), an off-shore platform with booster pumps, pipelines to the beach, and heavy equipment (bulldozers and loaders) shaping the fill on the beach.

W-3

For W-3, material dredged during the hydrologic restoration component of W-3 (dredging Port Mansfield Channel to reopen the channel) would be beneficially used to nourish and restore 9.5 miles of Padre Island National Seashore from the Port Mansfield Channel north. This section of beach is currently severely sediment starved due to the presence of a jetty at the entrance of the Port Mansfield Channel. The proposed restoration efforts would aim to restore the beach profile similar to existing turtle nesting beaches in other parts of the Padre Island National Seashore.

The beach nourishment sections would consist of a berm starting at the toe of the dune at +5 feet NAVD88 and sloping seaward at 1V:275H for approximately 550 feet where it would then transition to a 50-foot wide swatch with a 1V:10H slope that transitions to existing grade. The berm width would vary according to fill density. In general, the active dry-sand beach would be situated between +5 feet and +X NAVD88. During neap tides and low wave conditions, dry sand may be found at lower elevations.

A 150-foot wide, trapezoidal dune configuration with a crest elevation of +10 feet (NAVD88) and +5 feet (NAVD88) foundation elevation (toe of dune) would be constructed approximately 650 feet from the mean high high water (MHHW) elevation to the center line and parallel the current beach for 9.5 miles. The side slopes would be 1V:10H and the dune crest would be approximately 10 feet wide. The berm would be constructed from material dredged from the Port Mansfield channel.

The timing of the nourishment activities would occur outside the turtle nesting season (March 15 to October 1), to the greatest extent practicable. The specific timing would be dependent on the availability of funding and dredges to complete the Port Mansfield dredging, which would be completed simultaneously. Because the nourishment area is not near any development, construction could occur any time of day. If construction occurs during the night, temporary nighttime lighting would be required.

South Padre Island Beach and Dune Improvement

For the South Padre Island Beach and Dune Nourishment action, the existing beach and dune profile maintained by past nourishment actions would be maintained for the life of the project. Existing beach access points, in the form of breaks in the dune, would be plugged and sand walkovers would be installed to provide beach access. The proposed design would maintain a 120-foot wide berm with a crest height of +12.5 feet (NAVD 88) along 2.9 miles of developed shorefront (reaches 3 through 5). Material for nourishment would continue to come from the Brazos Island Harbor (BIH) navigation project during normal O&M cycles or from one of four offshore sand borrow sources located approximately 5 miles offshore.

Unlike in W-3, construction of an initial profile is unnecessary so the first nourishment action would occur in year 10. Thereafter, renourishment would be completed on roughly a 10-year cycle for the life of the project to maintain CSRM benefits, which would result in the same actions described here being completed 5 times throughout a 50 year period. However, the exact timing of nourishment would be dependent on site specific monitoring of erosion rates (i.e. erosion accelerates may need to complete the nourishment cycle sooner than 10 years, conversely if erosion rates slow down the nourishment cycle may be after 10 years). As well, the timing would need to be coordinated with the need for maintenance dredging of the BIH.

Nourishment of the South Padre Island beach and dune would occur between October 1 and March 15 to avoid turtle nesting season as well as the prime recreation season. Because this area is immediately adjacent to development, all construction activities would occur during daylight hours.

2.1.5.1 Beneficial Impacts

Beach restoration/nourishment involves placing sand on an eroding beach to create a wider beach that is more resilient during seasonal cycles and erosion events. A wide, nourished beach system absorbs wave energy, protects upland areas from flooding, and mitigates erosion. The beach provides a buffer between storm waves and landward areas, and it can prevent destructive waves from reaching the dunes and upland developments. When sediment is naturally moved offshore from a nourished beach, it causes waves to break farther from the shoreline, which weakens their energy before reaching the shore. The wide, relatively flat beach berm with a sufficient volume of sand keeps the erosive power of the waves from reaching and eroding the dune or hardened structures and can reduce damages caused

by waves, inundation, and erosion. Without the beach nourishment, the starting point for damage would be farther onshore.

Both project also propose construction of a dune. By acting as a protective barrier, dunes help prevent flooding and storm damage caused by storm surge, wave runup, and overtopping into areas behind the dune. For W-3, marsh habitat would not be subjected to storm surge inundation, except under the most extreme events, which then reduces the extent of marsh degradation when saltwater or high energies enter the marsh degrade a marsh ecosystem. For areas behind the South Padre Island action area, a healthy beach can protect shoreline development from the impacts of coastal erosion and flooding, which are increasing with climate change and RSLC.

The proposed beach nourishment design would closely mimic existing areas that have been identified as suitable and stable shoreline. This alternative allows for natural processes to continue to work without hindering long-shore sediment transport or modifying circulation patterns, which can often be seen with jetties, groins, or revetment type hardened structures.

2.1.5.2 Adverse Impacts

These beach nourishment projects are designed and engineered to work like natural beaches, allowing sand to shift continuously in response to changing waves and water levels. However, there are short- and long-term impacts that could be realized, particularly if the beach profile or sediment is not compatible with existing shorelines or reference shorelines. Potential adverse effects include: disturbance of species' feeding patterns; disturbance of species' nesting and breeding habitats; temporary elevated turbidity levels; changes in near shore bathymetry and associated changes in wave action; burial of intertidal and bottom plants and animals and their habitats in the surf zone; and, increased sedimentation in areas seaward of the surf zone as the fill material redistributes to a more stable profile (National Research Council, 1995). Of particular concern are the impacts to endangered species such as sea turtles and shorebirds which use the beach as nesting, foraging, or loafing areas. The impacts of beach nourishment are further described in the Effects of Actionable Measures chapter of this BE (chapter 5.0).

2.1.6 Hydrologic Connections

The hydrologic connection measure involves opening Mansfield Pass in order to facilitate the exchange of water between the Gulf of Mexico and the Lower Laguna Madre. Opening Mansfield Pass requires excavation, or dredging, of deposited material within Port Mansfield Channel. Approximately 7 miles of the shallow-draft channel would be dredged from the Gulf of Mexico, through a jettied inlet and the pass to about the halfway mark to the mainland, although the actual length of the dredged area would be determined during PED to ensure that only sandy material is dredged. The authorized depth (-14 feet NAVD88) and width (125 feet) would be maintained and no widening or deepening is proposed, resulting in approximately 12 feet of sediment that needs to be removed from the channel. Shoaled material in the channel is primarily sandy and is not known to have any contaminants. Dredged material would be beneficially used for the island restoration and beach and dune restoration actions included with W-3.

Dredging would be completed by a hydraulic pipeline dredge, which creates a slurry combination of water and solids that is then pumped to the disposal site through floating and land based pipes. Other

equipment needed to support the dredging operation include: tugboats, pipelines, booster pumps, and support watercraft.

The timing of the dredging would be dependent on funding and availability of equipment. No seasonal restrictions are proposed for the dredging; however, efforts would be taken to complete dredging and subsequent disposal between October 1 and March 15 to avoid the turtle nesting season, to the greatest extent practicable. Because there is no development in or near the action area, it is very likely that dredging would occur 24 hours per day until all work is complete.

2.1.6.1 Beneficial Impacts

Dredging Mansfield Pass would facilitate water exchange between the Lower Laguna Madre and the Gulf of Mexico. The Lower Laguna Madre is a hypersaline lagoon that has become accustomed to salinity levels in the range of 40-50 ppt; however, as the pass continues to close from shoaling, the exchange of lower saline Gulf of Mexico water (near 35 ppt) decreases and the salinity in the lagoon increases. By maintaining the pass, the wind-driven circulation patterns in the lagoon system (flow counterclockwise in winter and clockwise in summer) will help to maintain lower salinity levels by replacing hypersaline lagoon with lower salinity water from the Gulf of Mexico. The current would also flush pollutants and low oxygen water from the lagoon, while also bringing in more nutrients and facilitating continued movement of marine species of various life stages between the Gulf of Mexico and the Lower Laguna Madre, including spotted seatrout, red drum, and juvenile green and hawksbill sea turtles. Restoring the hydrologic connection would maintain or improve 112,864.1 acres of the Lower Laguna Madre including maintaining or improving existing species diversity and habitats, and reverse the projected loss of seagrass meadows and fringe marshes if no action is taken.

2.1.6.2 Adverse Impacts

Potential adverse impacts resulting from dredging would be mostly temporary in nature and only occurring as long as dredging operations are underway in areas that have been previously disturbed by recurring maintenance dredging in the past.

Water quality adverse impacts are expected to be minor and include increases in turbidity that would be monitored and remain below levels mandated by the Clean Water Act Section 401 water quality certifications issued by TCEQ and water column degradation from slurry releases at the outfall of the dredge. Anaerobic sediment will likely be a minor fraction, if any, of the material dredged therefore, it is anticipated that there would likely be little to no reduction in ambient DO during dredging. Maintenance dredging is accumulated sediment that has not become hard packed and resistant to being "churned up" by infaunal and benthic organisms, thus the potential for finding much anaerobic sediment is small.

Effects on the biological environment are a direct result of removing sediment from the action area and the presence of dredging operations. In general, the literature suggests that dredging causes reductions in biomass, abundance, and species diversity for varying lengths of time, depending on surrounding conditions. Marine mammals and pelagics are likely to compensate for small-scale changes in prey abundance by switching precise, moving to alternative foraging grounds, or increasing time spent foraging.

For infaunal communities, all but the deepest burrowing organisms would be lost; although communities typically recover in six to 18 months (Desprez 2000) with colonization coming from

adjacent areas. Epibethic organisms may undergo mortality due to entrainment; however, many of these species are capable of avoiding the disturbance area. The temporary loss or decrease in bethic organisms is not expected to have detectable effects on local species that prey on infauna or epibethic organisms and the effect would be minor in relation to the entire benthic community available in the local area.

2.2 General Description of the Action Areas

The Texas Gulf coast is highly complex and ecologically diverse, with obvious differences in geomorphology between the upper, mid, and lower coast. The action areas lies within the Gulf Prairie and Marsh ecological region, which extends along the Texas Gulf Coast from the Sabine River south to the Rio Grande (Gould et al. 1960). The prominent features of this coastal ecosystem include tidal, micro-tidal, and freshwater coastal marshes; bays and lagoons which support seagrass beds, tidal flats and reef complexes; barrier islands; tallgrass prairie with small depressional wetlands, and forest riparian corridors, oak mottes and coastal woodlots, and dense brush habitats. Wetland habitats provide important wintering and migration stopover habitat for migratory birds including Central Flyway waterfowl, shorebirds, wading birds, and waterbirds. A string of refuges and wildlife management areas (WMAs) along the coast serve as critical staging areas for waterfowl migrating to and from Mexico (TPWD 2013, USFWS 2013).

Natural forces, which shape the system include dominant south to southeast winds, tropical weather systems, and a substantial rainfall of over 60 inches per year. Flooding and freshwater inflows are key systemic processes, which buffer salinity and provide nutrients and sediments to extensive estuary in the Sabine region. While highly impacted by human activities, this ecosystem remains very productive for a wide variety of fish and wildlife.

There are a total of eight action areas that are being consulted on in this assessment. The action area for purposes of this assessment is defined as all areas that may be affected directly or indirectly from implementation of the actionable measures. The action area for each component of the recommended plan includes the immediate disturbance areas affected by constructed as well as any geographic extent beyond the disturbance area where environmental change could be realized.

This section briefly describes the 6 distinct biotic communities that each occur within the recommended plan component action areas (Table 3). Other biotic communities are found in the study area including: upland scrub-shrub, coastal prairies, freshwater wetlands, bottomland hardwood forests, and open water marine environments; however, none of these communities are in the action area and would not be directly or indirectly affected by any of the proposed actions and are therefore, not discussed further.

Table 3. Habitats within the Action Areas of each Component of the Recommended Plan

Recommended Plan Component	Estuarine Wetlands (Marsh)	Beaches and Dunes	Bird Rookery Islands	Open Bay Bottoms	Submerged Aquatic Vegetation (Seagrasses)	Oyster Reefs
G-28	X		X	X		X
B-12	X			X		X
CA-5				X	X	X
CA-6	X			X		
M-8	X		X	X		X
SP-1			X	X	X	X
W-3		X	X	X	X	
South Padre Island Beach Nourishment		X		X		

2.2.1 Estuarine Marshes (Wetlands)

Estuarine wetlands are found along the bay shorelines within an estuary and directly inland of beaches, dunes, and barrier islands. These estuarine ecosystems support unique plant and animal communities that have adapted to brackish water, requiring tidal and freshwater exchange. Vegetative communities within the estuarine wetland community are dependent on the daily tidal fluctuation, which influences salinity gradients. Vegetative communities found within or near some of the action areas are indicative of saline, brackish, and some intermediate marshes. None of the actions proposed would impact freshwater wetlands.

Salt marsh has the greatest daily tidal fluctuation of the estuarine wetland types and has a well-developed drainage system. This community is found in marsh areas closest to the Gulf and waterways. Water salinity averages 18 parts per thousand (ppt), which leads to a marsh type that supports the least diverse vegetation. Salt marshes are typically dominated by smooth cordgrass/oystergrass and are often accompanied by seashore saltgrass (*Distichlis spicata*), blackrush (*Juncus romerianus*), saline marsh aster (*Aster tenuifolius*), and marshhay cordgrass. The dominant species in high salt marsh areas, which are subjected to less-frequent tidal inundation, is glasswort (*Salicornia spp.*).

Brackish marshes (salinity range of 5.0 to 18.0 ppt with an average of about 8.0 ppt) grade inland from salt marsh and are found at the fringes of large water bodies and behind the beach barriers. This marsh type is also subjected to daily tidal action, but also receives some freshwater influence, and its water depths normally exceed that of salt marsh. Plant diversity is greater than that of salt marsh. The dominant species in low brackish marsh is saltmarsh bulrush (*Scirpus robustus*), while seashore saltgrass and marshhay cordgrass are co-dominant species in high brackish marsh.

Intermediate marshes are subjected to periodic pulses of salt water and maintain a year-round salinity in the range of 3 to 4 ppt. They grade inland from brackish marsh and dominate interior marshes. The diversity and density of plant species are relatively high with marshhay cordgrass the most dominant species in high marshes. Co-dominant species in low marsh are seashore paspalum (*Paspalum vaginatum*), Olney bulrush (*S. americanus*), California bulrush/giant bulrush (*S. californicus*), and common reedgrass/Roseau cane (*Phragmites australis*); bulltongue (*Sagittari lancifolia*) and sand spikerush (*Eleocharis montevidensis*) are also frequent. Submerged aquatics such as pondweeds (*Potamogeton spp.*) and southern waternymph (*Najas guadalupensis*) are abundant in intermediate marsh.

Estuarine wetlands provide spawning grounds, nurseries, shelter and food for finfish, shellfish, birds, and other wildlife. The abundance and health of adult stocks of commercially harvested shrimp, blue crabs, oysters, and other species are directly related to the quality and quantity of estuarine wetlands. This is especially true in the Gulf, where 97 percent (by weight) of the fish and shellfish caught by fishermen are dependent on wetlands at some point in their life cycle. Migratory birds use estuarine wetlands as foraging and hunting areas and support major wintering areas for waterfowl of the central flyway. A frequent pressure to this ecosystem is reduced freshwater inflows, which can result in an increase in salinity, sometimes beyond what estuarine species can tolerate.

Ecological function of the marsh action areas have been significantly altered and degraded as a result of a long history of land development, particularly construction of navigation channels. The GIWW, in particular, divided the once-contiguous marshes in the study area and severed the natural freshwater inflows of the marsh system to downstream marshes. Today, the effects of this disruption vary, but generally they have created artificial barriers between wetlands and wetland building and maintenance processes; introduced tidal energies into historically non-tidal or micro-tidal marshes, which has resulted in decreased plant productivity, plant mortality, peat collapse and erosive loss of organic marsh soils; facilitated salt water intrusion into historically low salinity environments causing loss or conversion of vegetation and exposed marsh sediment; and caused a rapid rate of land loss due to erosion associated with wave energies caused by barge traffic. All of these effects have led to the current degradation of the action area, which is being converted from productive vegetated emergent marsh to less productive open water.

Continued altered hydrologic regimes, lack of sediment input, subsidence and salt water intrusion will continue the trend of marsh conversion to less productive, saline habitats or open water. Under future RSLC conditions, rising sea levels will exacerbate the existing trend and lead to an increase in marsh loss.

2.2.2 Beaches and Dunes

Beaches are the transition from land to sea. In the lower portion of the beach where sediments are covered frequently by water, aquatic organisms thrive. However, in areas at and just above the high tide zone, conditions are particularly harsh. The lack of water makes life difficult for aquatic or terrestrial species, and the dry sand is easy to heat and cool, resulting in strong swings in temperature. In oceanfront dunes, this high beach area also experiences strong swings in salinity, from highly saline conditions during dry weather caused by salt spray being concentrated by evaporation, to being diluted of salt during intense rains. As a consequence, except in specialized habitats (such as the wrack line, where rotting organic material forms both food and a mechanism for water storage), very few animals and no true plants can live in this zone.

In the wrack zone (base of supratidal zone), a small oasis of life in the otherwise dry and barren sand forms. Here, the debris (e.g. seashells, animal remains, decomposing seaweed and sea grasses, and other materials) left by the high tide forms a narrow band along the shore. The rich organic content of this area provides a reservoir of water and food for the animals found in this area. Species present are usually cryptic species that emerge from the sand at night or when the tide is high, but only in the small number of areas where a significant sand veneer is present over the clay ridges. Some of the species include: crabs, sand hoppers/beach fleas, worms, beetles, spiders, and flies.

Because of the abundance of arthropods and worms, the wrack zone is prime foraging habitat for shorebirds. Shorebird counts are conducted along the Texas Coast between March 22 and May 17 during two week intervals. The most abundant species observed are typically American avocet (*Recurvirostra americana*), western sandpiper (*Calidris mauri*), long-billed and short-billed dowitchers (*Limnodromus scolopaceus* and *L. griseus*, respectively), semipalmated sandpiper (*C. pusilla*), pectoral sandpiper (*C. melanotos*), black-bellied plover (*Pluvialis squatarola*), dunlin (*C. alpine*), sanderling (*C. alba*), willet (*Catoptrophorus semipalmatus*), semi-palmated plover (*Charadrius semipalmatus*), least sandpiper (*C. minutilla*), and snowy plover (*Charadrius alexandrines*). Common nesting shorebird species include the willet, killdeer (*Charadrius vociferous*) and black-necked stilt (*Himantopus mexicanus*). Colonies of nesting birds including least terns (Sterna antillarum) and black skimmers (*Rynchops niger*) occur on beaches and washover terraces.

The backbeach and dune is a more productive habitat than other areas in the shoreline system from a vegetative standpoint. Both contain a mosaic of salt-tolerant plants, which are adapted to shifting sands, high winds, and rising waters. These plants help form dunes by trapping wind-blown sand, while their roots help stabilize the dunes and protect the dune from erosion. Species found growing here include seapurslane (*Sesuvium portulacastrum*), saltmeadow cordgrass/ marshhay cordgrass, (*Spartina patens*), bitter panicum (*Panicum amarum*), Virginia dropseed (*Sporobolus virginicus*), white morninglory (*Ipomoea stolonifera*), camphor daisy (*Rayjacksonia phyllocephala*) goat-foot morninglory (*I. pes-caprae*), glassworts (*Salicornia spp.*), sea-lavender (*Limonium carolinianum*), and busy sea-ox-eye (*Borrichia frutescens*).

Texas beaches change shape regularly and move landward (retreat) or seaward (advance) in response to wind, waves, currents, the short and long-term relative sea level rise, and the supply of sand. However, in the W-3 action area, short-term changes can be variable and long-term changes, combined with a well-documented lack of coarse-grained sand supply, and long-term sea level rise generally creates a long-term retreat scenario. Shoreline retreat averaging three to four feet per year has been observed since the 1930s. Within the W-3 action area, the historic dune system has been degraded and lowered to completely removed over the years by ongoing annual erosion, unseasonably high tides, and large-scale storm events and hurricanes.

Within the SPI action area, shoreline retreat occurs but a much lower rate and is mitigated through ongoing beach nourishment actions taken by the City of South Padre Island. As a result, the beaches here are very similar to the conceptual design. If no action is taken and funding is unavailable for future nourishment actions, the action area would be expected to degrade and experience shoreline loss and dune lowering and degradation.

2.2.3 Bird Rookery Islands

Rookery islands in the action areas are typically small – only a few acres or less in size – and while some naturally formed most were created through the placement of dredged material or fragmentation of land features during construction or maintenance of navigation channels, particularly the GIWW. These islands dot the back side of the barrier islands and adjacent bays and protect bay shorelines and navigation channels from erosion.

Rookery islands are isolated from the mainland and are too small to sustain predator populations, thereby providing optimal foraging, roosting, breeding, nesting, and rearing habitats for migratory birds and a wide variety of colonial waterbirds and coastal shorebirds, including herons, terns, pelicans, egrets and cormorants. Colonial waterbirds rely on open water, mud flats, estuarine wetlands and seagrass for foraging, which is abundant near the island action areas. Rookery islands provide areas for birdwatching, ecotourism, and recreational fishing. Nesting pairs on rookery islands can range from a few pairs to thousands depending on the island size.

In addition to providing quality bird habitat, the islands have been noted as providing suitable habitat for establishment and growth of seagrass meadows through modification of tides and currents and the increase in nutrients from bird defecation.

Rookery islands in the action area are currently severely degraded due to erosion, which averages 2.7 feet of loss per year, or non-existent. Deepening of adjacent water for navigation channels, increased ship traffic, loss of oyster reef structure due to commercial harvesting, and relative sea level rise have resulted in increased wave energy battering rookery island shorelines, resulting in a net loss of island area. Where remnant islands remain within the action area, only a small portion of the island remains dry and provides minimal suitable habitat to serve as a rookery. Existing islands are expected to be lost under future conditions of continued erosion and RSLC.

2.2.4 Open Bay Bottom/Inland Open Water

Open bay bottom is one of the most abundant and productive habitats found in estuaries. Being an open system, bay bottom interacts with other systems including seagrass meadows, tidal flats, marshes, etc. Open bay bottom is made up of soft sediments, home to many infauna (organisms that live in the sediments). These benthic invertebrates, mostly bivalves and polycheates, are vital to the system, converting energy from detritus and the sediments back into the water column, making it available for phytoplankton. Phytoplankton are the base of the food web and are important to having a productive system. Anywhere from 30 to 100 percent of nutrients used by these phytoplankton have been recycled, making this process essential for life in these areas.

A significant portion of the action areas where open bay bottom action exists is routinely disturbed in order to maintain the authorized navigational channel depth. The frequency of dredging disturbance is dependent on the shoaling rates in a particular area and can occur as frequently as every year to every ten or more years. After the disturbance occurs, there is a temporary loss of benthic invertebrates; however, they typically recolonize shortly after the dredging has been completed.

Lower Laguna Madre/Mansfield Pass

The action area specific to W-3 is unique from other open water action areas. The action area encompasses all of the Lower Laguna Madre.

The Laguna Madre is a narrow (maximum width of 7 miles), shallow (average depth of 4.5 feet) hypersaline (saltier than the ocean) lagoon that extends the entire length of the south Texas coast from Corpus Christi Bay to the Mexico border. It is separated from the Gulf of Mexico by Padre Island, one of the longest barrier islands in the world. Most of the island is undeveloped and owned by the National Park Service as the Padre Island National Seashore. The lagoon is composed of the Upper and Lower Laguna Madre, which are divided by a coastal land mass known as Saltillo Flats.

Most of the Lower Laguna Madre shorelines are protected from development by large ranches on the west and Padre Island National Seashore on the east, the lagoon is as removed and pristine as any in Texas. Their clear shallow waters promote growth of extensive seagrass meadows. The seagrass meadows provide protective nursery areas for larval and juvenile fish, shrimp and crabs as well as cover and feeding areas for adult fish including spotted seatrout and red drum.

Because of low freshwater inflow, little rainfall, and high evaporation, the salinity in the Laguna Madre often exceeds that of seawater. The Laguna Madre system is the only hypesaline coastal lagoon in North America and one of only five in the world. Despite harsh conditions imposed by high salinities, the Lower Laguna Madre is an extremely productive and dynamic bay system.

Oyster reefs are only found in South Bay at the southern end of Lower Laguna Madre where salinities are more moderate. Rock reefs represent another natural hard substrate found in the bay. There are two types of rock reefs found in the Lower Laguna Madre, both of which provide habitat for a variety of plants and animals. Reefs along the western shore of the Lower Laguna Madre are comprised of beach rock were formed from the remnants of Gulf beaches that disappeared long ago as the level of the sea rose and fell. The rocks are composed of whole shells, shell fragments, and grains of sand bound together by a calcium carbonate cement. Serpulid reefs, the second type of rock reef, is more commonly found in the Upper Laguna Madre, the infamous rocks of Baffin Bay, but is still sparsely found in the Lower Laguna Madre. These reefs began forming about 3,000 year ago from the calcareous tubes of serpulid worms.

Waters of the Mansfield Pass are used by various species to travel between the Gulf of Mexico and the Laguna Madre, and by juvenile green and hawksbill sea turtles for foraging and resting. Waters of the Laguna Madre are also used for foraging, primarily by juvenile green sea turtles. The Lower Laguna Madre and Laguna Madre as a whole, are renowned among anglers for its world class fisheries for spotted seatrout and red drum.

Water exchange between the Lower Laguna Madre and the Gulf of Mexico occurs through Mansfield Pass and Brazos Santiago Inlet. Mansfield Pass, within the action area, is a small manmade inlet within the National Seashore that bisects Padre Island 35 miles north of the Brazos Santiago Inlet. The pass was historically maintained as an inlet authorized to -14 feet (NAVD88); however in 2011, the USACE discontinued maintenance dredging because Port Mansfield was designated as recreational, rather than commercial. Currently, shoaling in the pass has reduced the depth of the channel to -2 feet NAVD88 and the rate of sedimentation is expected to continue until the pass is completely closed off.

As Mansfield Pass closes from shoaling and lack of maintenance, the circulation patterns within the lagoon and between the Gulf of Mexico are being cut off, resulting in salinity levels slowly rising, water quality degrading, habitats degrading and converting to less productive habitats, and decreases in species diversity and abundance. (King et al. 2018)

2.2.5 Submerged Aquatic Vegetation (Seagrass Meadows)

Submerged aquatic vegetation (SAV) includes aquatic grasses (seagrasses) and attached macro-algae. SAV is highly valuable habitat since it provides numerous important ecological functions that are difficult to replace; yet it is especially vulnerable to coastal development and water quality degradation. Animals are drawn to SAV for shelter and food and to reproduce. Animal abundance is grass meadows is 10 to 100 times more than in open bay bottom areas. Almost 40,000 fish and one thousand times as many small invertebrates are supported by a single acre of seagrass (TPWD 1999).

The most common species of seagrass in Texas coastal waters are shoal grass (*Halodule beaudettei*), manatee grass (*Cymodocea filiformis*), widgeon grass (*Ruppia maritime*), clover grass (*Halophila engelmanni*), and turtle grass (*Thalassia testudinum*). Shoal grass is the most common of the five species of seagrass, followed by widgeon grass and manatee grass. Shoal grass and widgeon grass are pioneer specie that can grow quickly in areas of little productivity. Clover grass can also colonize in areas of bare or algae-covered substrate or as an understory within the other four species of grass beds. As the substrate becomes more stable, turtle grass begins to appear last, initiating the climax of succession. It is important to note this because the ecological niche of each species determines the order of succession. As these climax species begin to increase in abundance, the structure of the seagrass community becomes more complex, involving the increase of leaf surface area. This allows for epiphytic growth on the blades which provides food to grazing organisms that control the growth of the epiphytes. (TPWD 1999).

Open bay bottom and seagrass meadows have an inverse relationship, meaning that if one of these habitats is decreased, then the other increases. If enough light and nutrients are available and environmental factors are right, seagrass can take root in open bay bottom. This was seen after the GIWW was dredged in the late 1940s, as the exchange with the Gulf of Mexico increased causing salinities to decrease, making it possible for more seagrasses to become established. More recently, the opposite has been observed, as decreased freshwater input, brown tide and prop scarring have all caused decreases in seagrass meadows. Once the Seagrasses die and area gone, the areas will return to open bay bottom. (TPWD 1999)

Seagrass meadows provide many benefits to the ecosystem. One important aspect is that seagrass helps to reduce wave action with their above ground leaf structure and erosion with their below ground root and rhizome structure, thus keeping the substrate firm and maintaining water clarity. (TPWD 1999)

Seagrass also help to increase bottom surface areas, allowing for larger and more diverse communities of organisms to exist. Seagrasses provide substrate on which many other organisms can grow especially smaller attached algae and filter-feeing animals including sponges, bryozoans, and tunicates. Filter-feeders clear the water of particles and algae that compete for light and in turn serve as food for baitfish and juvenile fish. For larger organisms, seagrass meadows serve as nurseries and provide shelter. Commercially and recreationally important, federally-managed fisheries and many other species are dependent on seagrasses for all or part of their life history including: spotted sea trout (*Cynoscion*

nebulosus), red drum (*Sciaenops ocellatus*), black drum (*Pogonias cromis*), blue crabs, and shrimp. (TPWD 1999)

Seagrasses in the action area are currently productive, healthy environments. However, under future conditions, the quality of seagrass meadows are expected to degrade due to increased sedimentation, higher salinities, and deeper waters. The low quality would eventually be expected to result in loss of the community in the action area and convert to open bay bottom.

2.2.6 Oyster Reefs

Eastern oyster reefs are present throughout the Texas coast although at a substantially reduced amount than historically. Most oyster reefs are subtidal or intertidal and found near passes and cuts, and along the edges of marshes. Oyster reefs are formed where a hard substrate and adequate currents are plentiful. Currents carry nutrients to the oysters and take away sediment and waste filtered by oyster.

Oyster reefs provide ecologically important functions including maintaining or improving water quality and providing productive habitats. Oysters can filter water 1,500 times the volume of their body per hour which, in turn, influences water clarity and phytoplankton abundance. Due to their lack of mobility and their tendency to bioaccumulate pollutants, oysters are an important indicator species for determining contamination in the bay.

Many organisms, including mollusks, plychaetes, barnacles, crabs, gastropods, amphipods, and isopods, can be found living on the oyster reef, forming a very dense community. Oyster reefs are dependent upon food resources from the open bay and marshes. Many organisms feed on oysters including fish, such as black drum, crabs (*Callinectes spp.*), and gastropods such as the oyster drill (*Thais haemastoma*). When oyster reefs are exposed during low tides, shore birds use the reef areas as resting places.

Within the action areas, oyster reefs are not present. The lack of oyster reef establishment in the action areas is primarily related to the presence of soft bottom sediments rather than the hard bottom substrate required for establishment. Historically, most of the action areas supported some amount of oyster reef; however, the oyster population declined from degradation of water quality and quantity, increases in shoaling and sedimentation rates, oil and chemical spills, storms, disease, overharvesting, and destructive fish practices. Implementation of the ER measures would increase the long-term availability of oyster reef in each of the applicable action areas.

3.0 DESCRIPTION OF THE TIER 1 MEASURES

The following description of Tier 1 measures have been conceptually designed, but still require additional design refinement and investigation to determine the appropriate method to construct, the most feasible, cost-effective, and high performing dimensions of the features, and will require additional impact analysis to better understand the full range of potential impacts. The USACE is not requesting consultation on these measures, but instead are asking for technical assistance in identifying preliminary concerns with the designs as they are.

A number of maps and cross-section plates are included in Attachment A and will not be included in the following descriptions in order to keep the size of this document to a minimum.

3.1 Galveston Bay Storm Surge Barrier System

The design for the Galveston Bay Storm Surge Barrier System has been improved since the 2018 draft report. In 2019, the PDT hosted workshop where a team of surge barrier experts from around the world met in Galveston to consider the design for the system. The workshop concluded with several recommendations: only use gates that are currently in operation to reduce engineering challenges, incorporate multiple sector gates to improve resiliency, include small sector gates so that non-commercial vessel traffic doesn't have to use the same gates as the large commercial vessels. The Environmental Team discussed the 2018 designs with the agency review team and came up with some priorities to that were given to the Structural Team and they included, reducing the constriction on the channel as much as possible (allow the highest possible tidal exchange), minimize increased velocities in proximity to the structure, design the structures with the smallest footprint possible without jeopardizing the functioning of the structure, maintain shallow water exchange, and ensure that the sill does not create an abrupt change in elevation (ramp down).

The Structural Team took these recommendations and updated the design for the system. Some notable changes include the use of two 650-foot-wide sector gates instead of one larger gate, the inclusion of two 125-foot-wide sector gates to provide an alternative to the main channels that doesn't have a mast restriction, 300-foot wide vertical lift gates instead of 100-foot-wide gates to reduce construction, the incorporation of 16-foot-wide monolith gates with sill depth of -5-foot to provide shallow water exchange, and ramped sills. The new design reduced the channel constriction from 27.5% to 9.5%.

The CSRM features of the Galveston Bay Storm Surge Barrier System consist of beach and dune, levee, floodwall, combi-wall, seawall, roadway gates, railroad gates, navigation gates, vertical and sluice gates to serve navigation or for tidal exchange, drainage closure structures, and pump stations.

3.1.1 Bolivar Roads Gate System

The Bolivar Roads Gate System is made up of a series of gate structures (Figure 7) that would remain open until a storm surge event is eminent, at which time they would be closed to prevent storm surge from entering Galveston Bay.

The gate structure starts on Bolivar Peninsula at the end of Biscayne Beach Road with 3.03 miles of earthen levee and proceeds northwesterly to State Highway 87, where the levee turns south westerly to

near the intersection of Keystone and 23rd Streets. The levee will consist of a 1V:3H slope on the protected side and a 1V:6H slope on the unprotected side. The unprotected side of the levee will be armored with stone protection and the reminder of the levee will be turfed. A Typical section of levee is shown on Plate 2 (Annex 12 of Attachment A).

The barrier continues southwest with a combi-wall for 5,000 feet reaching the start of the gate system across the Galveston Entrance Channel. The structure continues south with a series of gates. The 2.08-mile gate system crossing Galveston Harbor Entrance Channel consists of 16 shallow water environmental gates at elevation -5.0 feet MLLW; 5 vertical lift gate at elevation -20.0 feet MLLW; 3 vertical lift gates at elevation -40.0 feet MLLW; 125' sector gate at sill elevation of -40.0 feet MLLW for recreational traffic; 2 vertical lift gates at a sill elevation of -40.0 feet MLLW; and 2-650' floating sector gates at a sill elevation of -60.0 feet MLLW. The sill elevation across the ship channel will allow for any future deepening of the Galveston Harbor Entrance Channel, which is currently maintained at a depth of -48 feet MLLW. The sector gates across the ship channel are anchored and housed in man-made "islands" on either side of the Entrance Channel. The channel crossing continues with a 125' sector gate at a sill elevation of -40.0' for recreational traffic, 2 vertical lift gates at a sill elevation of -40.0, and 3 vertical lift gates at a sill elevation of -20.0. The gate system than ties into the end of the existing seawall at the San Jacinto Placement Area on Galveston Island. The top elevation for the crossing is 21.5 feet NAVD 88.

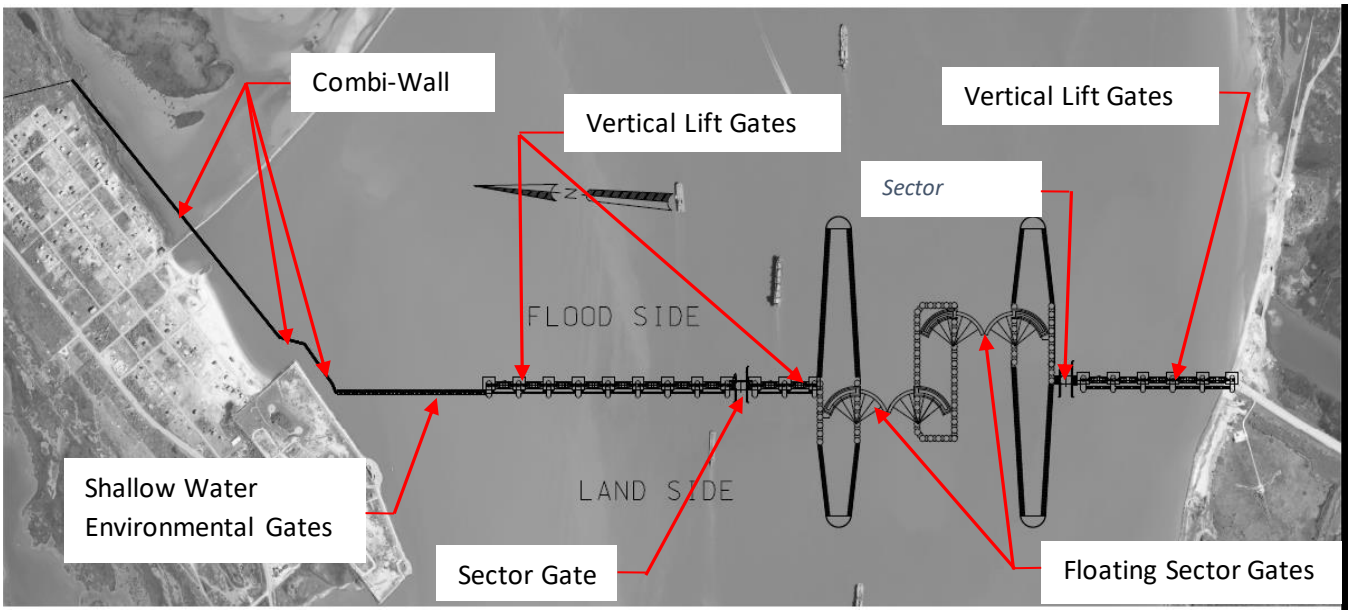

Figure 7. Bolivar Roads Gate

3.1.1.1 Combi-Wall

The combi-wall is a continuous concrete barrier that does not allow tidal circulation (Figure 8). There are no moving parts or gates for this feature that would require deployment in advance of impending tropical event.

To construct a traditional inverted T-type flood wall within the Galveston Bay would require a cofferdam in order to construct the flood wall in the dry. A cofferdam would add both cost and additional

temporary impacts to the Galveston Bay bottom. The proposed "Combi-wall" can be constructed in the wet with all the construction equipment located on a temporary platform, thus eliminating some of the bay bottom impacts and in more streamlined construction sequence. The proposed "combi-wall" system consists of vertically driven 66 in diameter hollow concrete spun cast piles with 18 in closure piles closing driven to complete the closure of the system. The lateral resistance for this system comes from a 36-in Ø steel batter piles with a concrete deck sections that ties the system together with a small parapet wall. The concrete deck sections will serve as an access roadway for the entire length of the combi-wall. A blanket of scour will be placed on both the Flood and Land side of this structure to prevent erosion.

It is assumed the combi-wall will be constructed from a temporary work platform in order to minimize the impacts of dredging a floatation channel for access on the marine habitat in this area. A similar type floodwall was constructed as part of the New Orleans Hurricane Storm Damage Risk Management System, Lake Borne Barrier. The Lake Borne Barrier has performed as designed during several tropical events without any issues.

Figure 8. Conceptual Drawing of the Combi-Wall

3.1.1.2 Vertical Lift Gates

The Vertical Lift Gates (VLGs) are proposed for the intermediate and deeper parts of the Bolivar Roads crossing. The VLGs are specifically designed to provide a large opening to allow for free passage of the tides for both sides of the gate. The VLGs will be stored in the up at normal/open position. The gates will remain in the up position until they are needed to be deployed for a tropical event (Figure 9). These gates have a low clearance between the bottom of the gates in the stored position and the normal water surface elevation in Galveston. Therefore, the VLGs are not intended for any type of navigation.

There are VLGs on both the Bolivar Island and the Galveston Island side of the barrier. There are eight (8) VLGs with a sill elevation of EL. -20.0 and seven (7) VLGs with a sill elevation of elevation -40.0 MLLW. The feasibility level design assumed the gate will transfer all the lateral load to the piers which is founded on a large matt foundation supported on 24-in Ø pipe piles. There is a concrete sill set at the gate invert that spans between the tower foundations and is founded on a large matt foundation supported on 24-in Ø pipe piles. A blanket of scour will be placed on both the Flood and Land side of this structure to prevent erosion.

The vertical lift gates will have an access bridge on the land side of the structure to allow maintenance crews access to maintain the gates and operate equipment. The access bridge is assumed to span the entire gate opening by using large precast pre-stressed concrete highway girders with a concrete deck serving as the roadway on top.

The vertical lift gates are suspended between the structure's towers on either side of the opening. The lift gates and the towers of the barrier have a unique shape: the gates are elliptical, and the towers are oval. The vertical lift gates are driven by hydraulic cylinders with a long piston which are hinged to the side towers. The VLG's for the Bolivar Road crossing have a clear opening of 300 ft.

The VLGs are assumed to be constructed using conventional cast in place construction methods. A temporary retaining structure consisting of cellular cofferdams that are dewatered to facilitate the construction of the structure. The dredging of a floatation channel is required for marine access to the VLG with a sill elevation of -20.0. However, the VLGs with a sill elevation of -40.0 MLLW do not require the dredging of a floatation because the location of these structures already have adequate draft for the marine equipment required for construction. It was assumed these structures will be constructed using equipment set on a floating plant.

The VLGs assumed for this study are modeled after the Hartel Canal storm surge barrier located in Spijkenisse, Netherlands. The Hartel Canal floodgate has been in operation and has been reliable since construction completion 1996. In the event the closing operating system fails, these gates have a local, automatic closure system, battery controlled, using gravity to close the gate. Like the Hartel Gates, it is assumed any minor maintenance will be performed while the gates are in place. If there are substantial repairs, the gate or the gate machinery will be removed from the site and brought to a dry dock where the required maintenance can be performed.

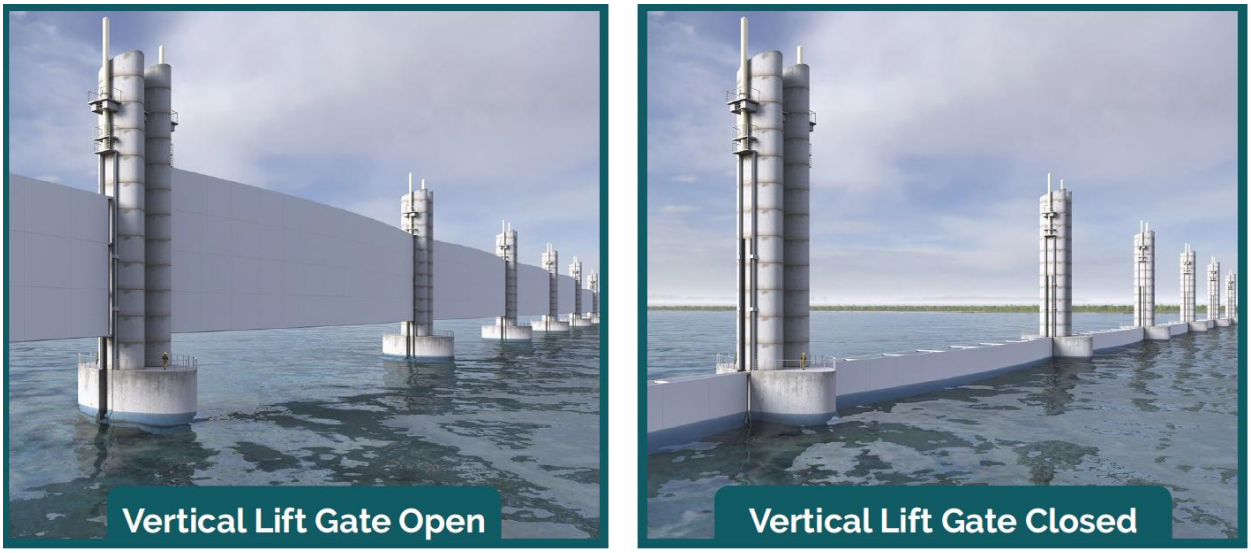

Figure 9. Conceptual Drawing of Vertical Lift Gates

3.1.1.3 Navigational Gates

The Houston Ship Channel (HSC) is the most active deep draft channel in the nation and is one of the hearts of the countries Entergy production. Galveston Bay sees both recreational and commercial vessels, for this reason, the Bolivar Road crossing must have navigation gates designed for both commercial and recreational vessels. Figure 10 shows a rendering of the navigation gate complex. The navigation gates are intended to remain open year-round to maintain continuous navigation and existing flow characteristics. The gates are intended to remain open year-round to maintain continuous navigation and natural flow characteristics. The gates will be closed in the event of a tropical system threatening the coast.

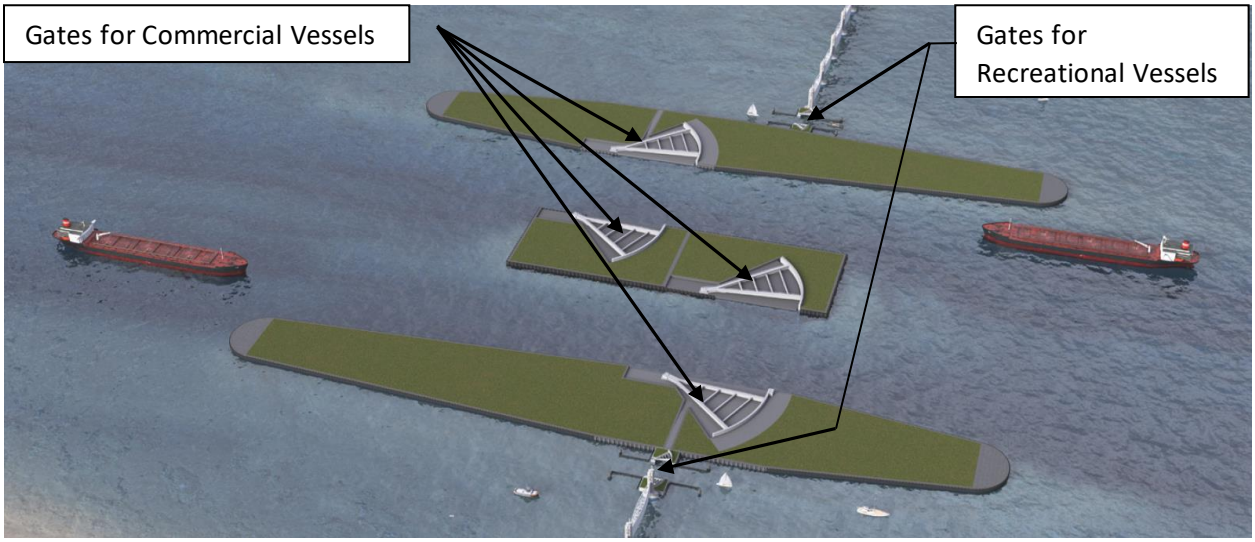

Figure 10. Conceptual Drawing of Navigational Gates

Recreational Sector Gate

There is one 125' opening sector gate complex on either side of the Houston Ship Gate Complex for recreational vessel passage. This will prevent recreational vessels from having to cross the Houston Ship Channel to travel from the Galveston Bay side of the system to the Gulf of Mexico side. While the gates are open, the steel fabricated gates would be stored in the structure gate bays to protect them from vessel impact. Timber guide walls are also part of the complex. These sector gates are assumed to have a clear opening of 125' opening with sill elevation of El. -40.0 MLLW. The feasibility level design assumed a large matt foundation supported on 24" Ø pipe piles. A blanket of scour will be placed on both the Flood and Land side of this structure to prevent erosion.

The sector gate is assumed to be constructed using conventional cast in place construction methods. A temporary retaining structure consisting of cellular cofferdams that are dewatered to facilitate the construction of the structure. This sector gate does not require the dredging of a floatation because the location of these structures already have adequate draft for the marine equipment required for construction.

The sector gate structures will have maintenance dewatering bulkheads that allow for the gate complex to be dewatered and the required maintenance can be done in the dry. Adjacent to the sector gate complexes. The gates will be designed to allow vehicles to use the gates as access from one side of the gate bay to the other side. The sector gate assumed for this study is modeled after the Harvey Canal Sector Gate constructed within in the New Orleans area, which has been in service for over 10 years and has shown to be reliable.

Houston Ship Channel Sector Gate

A horizontally rotating floating sector gate was deemed most suitable for HSC. A complex of two (2) gates and associated artificial islands to store the gates is proposed for this crossing. The decision to use 2 smaller gates in lieu of one large gate was for redundancy in navigation and assist in the maintenance cycles. In the unlikely event, one of the gates will not open after a storm or there is maintenance that requires the gate to be closed, navigation can continue through the other gate. The gate openings are assumed to be 650 feet wide each with a sill elevation of El. -60.0. The feasibility level design assumed the gate will transfer all the lateral load to the hinge which is connected to a large matt foundation supported large diameter steel pipe piles. A blanket of scour will be placed on both the Flood and Land side of this structure and around the islands to prevent erosion.

The gates will be stored in a dry dock within the manmade islands. The gates will be stored within the dry dock and only be deployed for a tropical event or for any required maintenance. With the floating sector gates in dry dock, this will help inhibiting corrosion and debris accumulation and facilitates routine maintenance. When it is time to employ the gate, the dry dock will be flooded allowing the gate to float into place and then water will be pumped in the sections of the gate allowing it to sink in place. Once the event has pasted, the gate sections will be pumped out and the gate will be floated back to the dry dock. With the gates stored within the dry dock area will help minimize the probability of vessel impacts while the gates are in the stored position.

The islands will be constructed with the perimeter of the island consisting of large cellular cofferdams backfilled with select fill material. The perimeter of the island will be constructed first followed by

demucking the bay bottom and finally backfilled with dredged material to the final design grade. This sector gate does not require the dredging of a floatation because the location of these structures already have adequate draft for the marine equipment required for construction.

At no time will navigation be blocked during the construction of these gates. A temporary bypass channel will be dredged to allow for continued navigation. Prior to any island construction, navigation will be shifted to the bypass channel. Upon completion of one of the gate-and-island complexes, traffic will be diverted to the newly constructed channel and gate opening. At which time, the second gate and the other island will be constructed. The selected gate was modeled after the gate constructed in St. Petersburg Russia and the Maeslant Barrier in the Netherlands. It was important to model these gates after similar existing gates to ensure the reliability of the gates when called on to open and close.

3.1.1.4 Channel Widening

Construction of the crossing across the Galveston Harbor Entrance Channel will be widened to accommodate the inbound channel and sector gate. The construction of the inbound channel will occur prior to the construction of the sector gate across the existing Entrance Channel in order to minimize impacts to existing channel traffic. The widening of the channel will be north of the existing channel toe, through existing anchorage areas and will be maintained at 800-foot toe to toe wide and depth of –48 MLLW, which is consistent with the existing channel authorized depths.

Due to the extension of the existing Galveston Entrance Channel toe to the east to accommodate an inbound lane through the sector gate existing aids to navigation will need to be relocated and additional aids provided due to extension. New aids will be required for the recreational sector gate structures that comprise the crossing. Existing and/or new aids to navigation aids would be can or conical type. Further coordination with the Coast Guard will be conducted during the detailed design phase.

The gate crossing the Galveston Entrance Channel will impact existing anchorages A, B and C. The PDT coordinated with industry to address the impacts and present proposed anchorage areas to mitigate the impacts to the existing anchorage areas. Because of the amount of dredging required and the need to relocate a 24" pipeline, the local sponsor and the District carried forward a New Anchorage Area A which is an expansion of the existing area and Anchorage Area D (Figure 11). The new anchorage area would cover an area of about 2.4 square miles.

3.1.1.5 Galveston Island Control/Visitor Center

The Bolivar Roads Gate System would also include a central control center on the Galveston side of the barrier. The Control Center will be located on the protected side of the barrier near the northeast corner of the San Jacinto Placement Area. The 5,000 square foot building would be on Government owned lands and would be accessible via the construction of a 0.32-mile all-weather concrete road from the existing USMC Reserve Center access road to the building location. The road would be aligned outside the San Jacinto Placement Area perimeter levee and have a width of 30 feet and a crown elevation of at least 21.5 feet. The Control Center would be at elevation +21.5 feet NAVD88 and would be equipped with backup systems to allow for continued operation during power lost.

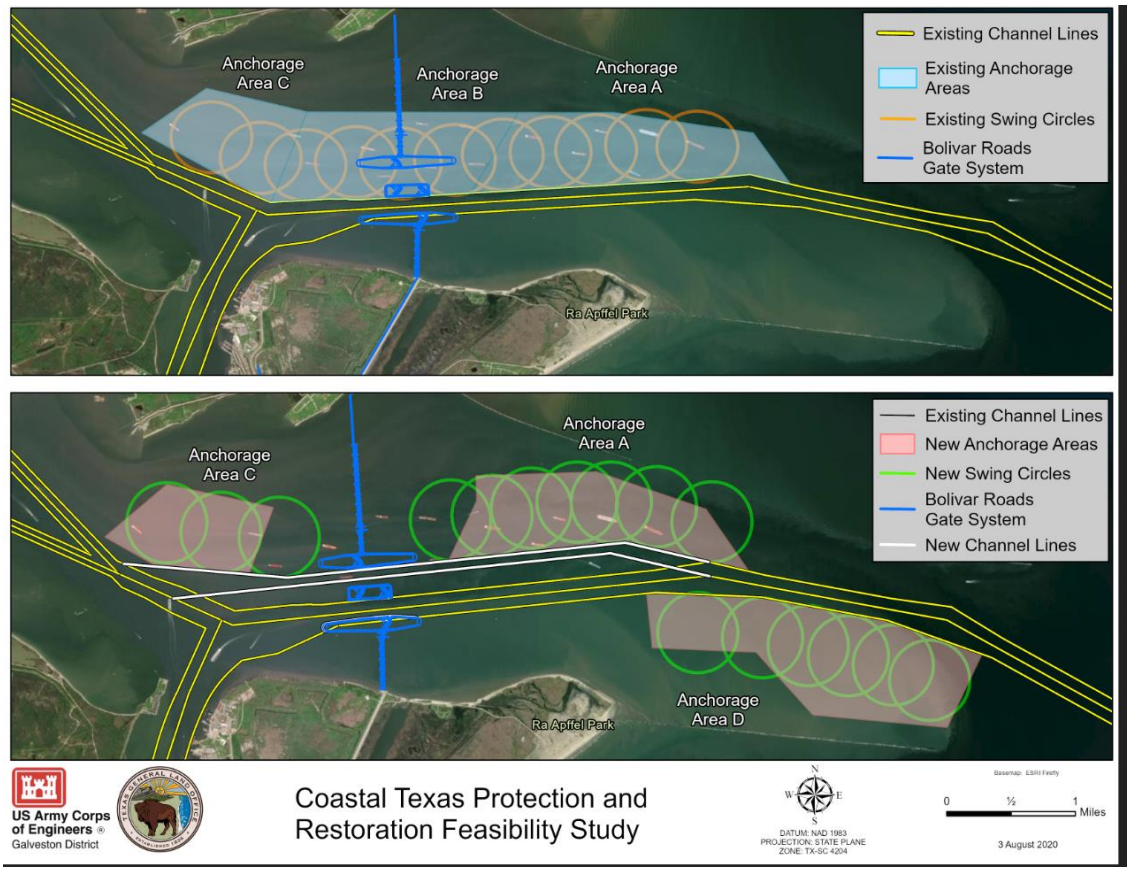

Figure 11. Existing and Proposed Study Anchorage Areas

3.1.2 Bolivar Peninsula and West Galveston Beach and Dune System

The Bolivar Peninsula and West Galveston Beach and Dune System would be constructed in a very similar manner to the beach nourishment actions being conducted for Ecosystem Restoration as actionable measures (section 2.1.5).

The Bolivar Peninsula beach and dune system starts approximately 2.0 miles east of State Highway 87 and continues southwest for 25.1 miles to the end of Biscayne Beach Road where the system will tie-into an earthen levee system adjacent to Fort Travis. The dune field will have a seaward elevation of +12.0 feet and a landward elevation of +14.0 feet NAVD88.

The West Galveston beach and dune system would start at the end of the existing Galveston seawall and continue westerly for 18.4 miles ending at San Luis Pass. The dune field system will have a seaward dune elevation of +12.0 feet and a landward dune elevation of +14.0 feet NAVD 88. Both beach and dune systems are further detailed in the Annex 12 and 13 Mapbook of Attachment A. Refer to Plate 1 (Annex 12) for a Typical Beach and Dune Section.

Beach and dune material sourcing and re-nourishment is discussed in Chapter 5.0. The design guidance for the beach and dune vegetation, sand fencing, walkovers and access is based on the, Dune Protection and Improvement Manual for the Texas Gulf Coast (XX 5th Edition).

The dune would be planted with common grass species found on reference dunes including: bitter panicum (*Panicum amarum*), sea oats (*Uniola paniculata*), and marshhay cordgrass (*Spartina patens*). Dune plants would either be obtained from commercial sources or transplanted from natural stands along the cost. Plant species that are not available commercially would be obtained from natural stands, which would increase the survivability of the species. If suitable stands cannot be found on state-owned property, harvesting from neighboring private property could be accomplished with agreement from the property owner. The optimum time for transplanting and establishing vegetation on Bolivar and West Galveston is during the months of February, March, or April. It was assumed that 1,000 plants would stabilize a 50x100-foot strip within a year and include watering, mulch, fertilization, and replanting due to lost.

Standard slatted wood sand fencing would be installed at appropriate locations to allow for the sustainability of the dune system. A height of four feet, measured from the ground surface after installation, has been incorporated into the design, except for where sand conditions are poor for dune building, a height of two feet would be utilized. The fencing would be supported with treated pine posts at 10-foot intervals. Minimum practical length for posts is 6.5 feet; a length of 7 to 8 feet is optimum. Wooden posts be no larger than three inches in diameter. The fencing would be secured to each post with four ties of galvanized wire that is not smaller than 12 gauge. The fencing material would be weaved between posts so that every other post has fencing on the seaward side. Sand fencing would be placed in non-continuous, diagonal segments—at least 35 degrees to the shoreline—so as not to adversely affect nesting sea turtles. A typical sand fencing installation detail is shown in Figure 12.

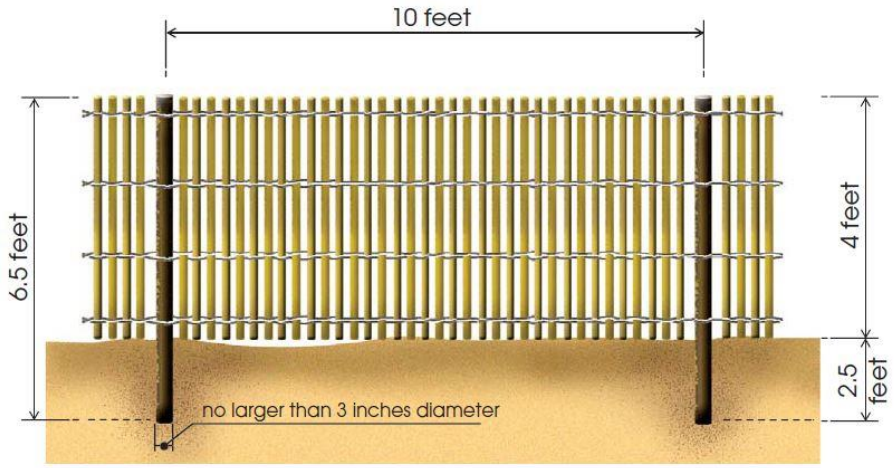

Figure 12. Typical Sand Fencing Installation Detail

3.1.2.1 Beach Access

The dune walkovers would be constructed of treated lumber and galvanized hardware. Typical structural design for the walkovers are shown in Figure 12Figure 13. These designs have been successfully constructed for accessible dune walkovers. Pedestrian traffic volume will be investigated during PED to determine an appropriate walkover width for the location. During PED the PDT will work with local, state, and federal ADA/ABA boards to provide dune walkovers designs that improve accessibility for the handicapped. The structure height would be at least one to one and a half times its width (3' minimum)

to allow sunlight to reach vegetation underneath the structure. The maximum slope for ADA is 1V:12H in inches and for every 30 inches in drop vertically, a level platform is required before proceeding at the maximum slope.

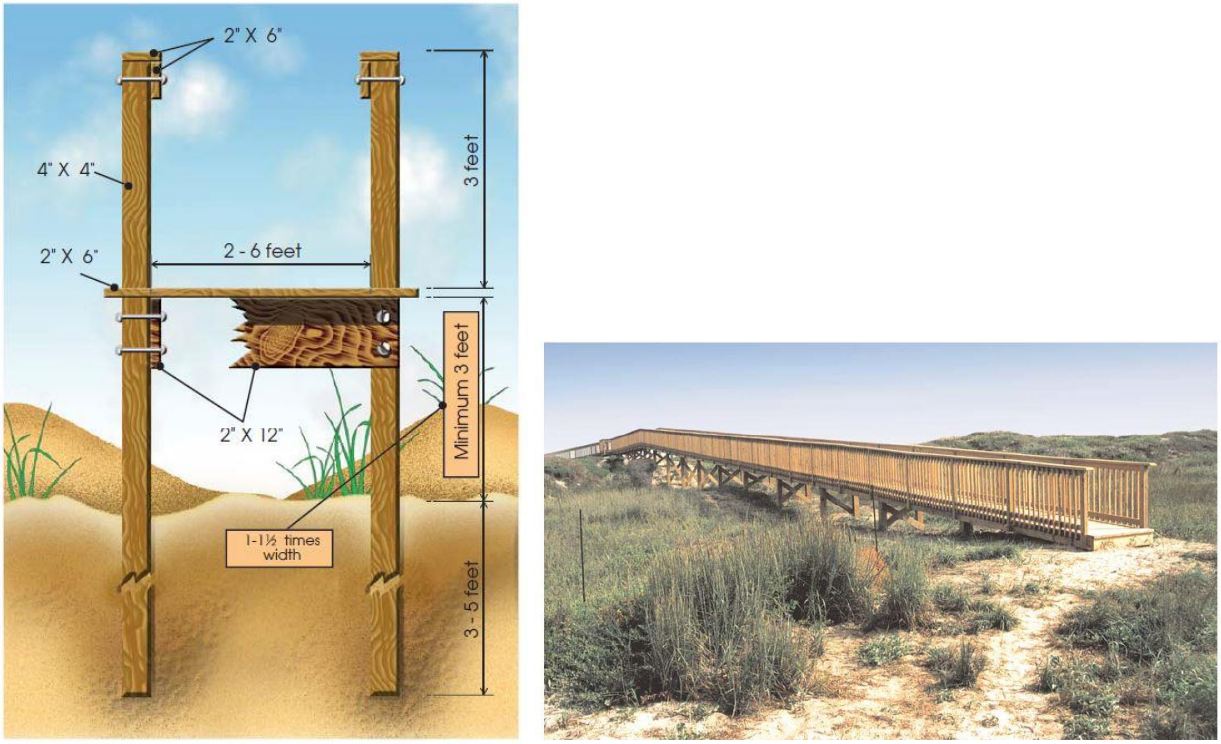

Figure 13. Typical Walkover Section and Ramp

Proposed vehicle access ramp locations are shown on the mapbooks for both Bolivar and West Galveston (Annex 11 and 13). The ramps would be oriented at an angle to the prevailing wind direction to reduce water and wind from being channeled along the ramp eroding the dunes at the side of the road cuts. The access ramp would slope to the elevation of the landward dune and would than slope down to a break in the seaward dune. This approach would minimize the ramp length needed to cross the two-dune system. Ramps would be 12-foot in width with a minimum ramp slope of 6% slope, constructed of sand fill, 8" of gravel base material stabilized with the utilization of a geogrid. The ramp concept is shown on Plate 3 (Annex 12). User surveys will be conducted during the design phase to identify heavy traffic use areas to properly locate access ramps.

3.1.2.2 Borrow Source

Construction of the Bolivar Peninsula and West Galveston Bay Beach and Dune System would require approximately 39.33 MCY. The potential source of beach-quality sand is located 25 to 32 miles (40 to 50 km) offshore in water depths of about 15 to 56 feet (4.5 to 17 m) in the Sabine and Heald Banks. These sand-rich shoals are reworked nearshore and shallow marine sediments and are generally considered beach compatible sediments. Despite the large total volume available (approximately 1.8 BCY) in the banks, there will be avoidance areas that need to be considered (e.g., offshore platforms, pipelines, etc.). Three will also need to be additional geotechnical and geophysical investigations during PED to better constrain locations with the most ideal sediment sources. During future refinements and

investigations for this feature, other potential sources would be evaluated to include shoreface sediment, dredging associated with the Houston Ship Channel deepening and widening project, measures complementary to navigation projects, and other paleo-channel deposits.

The method of dredging and placement will have to be determined during future phases of development. Based on previous studies, extraction of sand from Sabine and Heald Banks would require a dredge that is mobile and able to withstand moderate wave-energy conditions. Because the distance from the banks to the placement sites are all greater than 12.5 miles (20 km) away, it is very likely a hydraulic sidecast dredge or mechanical bucket dredge and a system of tugs and scows that would move sand between the banks and the placement site.

3.1.3 Galveston Island Ring Barrier System

The Galveston Ring Barrier System (GRBS) is a system of floodwalls, Navigation Sector gates, Shallow Water Environmental gates and roadway closure gates, roller and swing gates pump stations, and a levee that provides flood risk management to approximately 15 square miles of the City of Galveston. The proposed GRBS incorporates the existing Seawall and proceeds counterclockwise from the west end of the Sewall north in the proximity of 103rd street to Offatts Bayou, crosses the Teichman Point area and ties into I-45, continues east along the Harborside area to the 47st street area, then continues north to the Galveston Ship Channel, then continues east through the Port of Galveston to UTMB, turns northward to the Ferry and then back south to the seawall. See Figure 14 below for a map of the GRBS. Details of plans and cross sections are available in Annex 19.

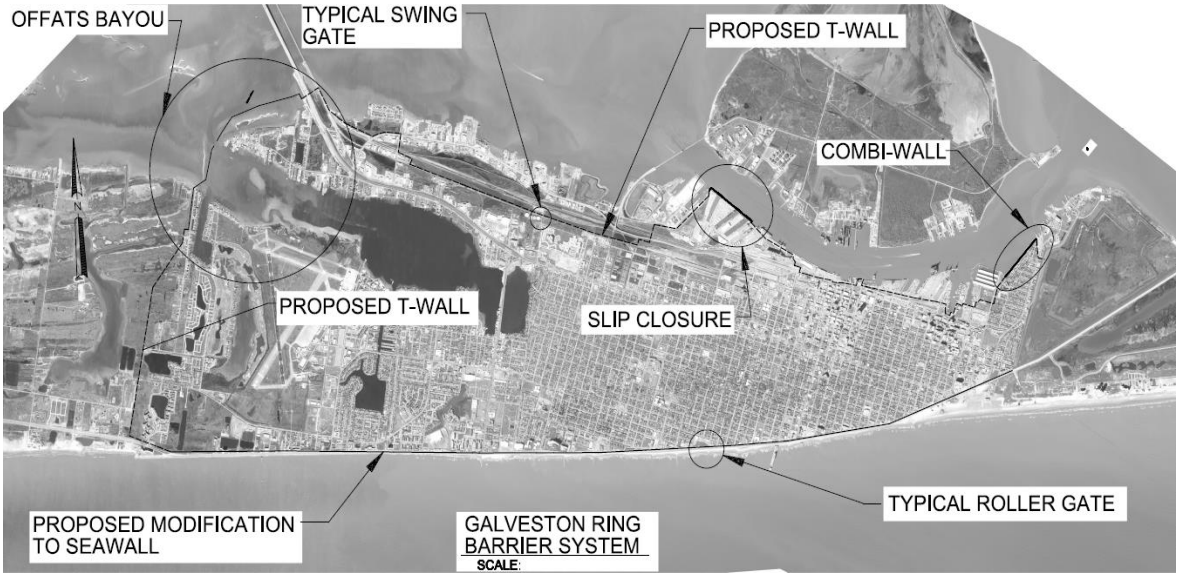

Figure 14. Galveston Ring Barrier System

3.1.3.1 Flood Wall

Galveston Island has significant stretches that don't have the real estate to construct levees or are subject to barge or boat impacts. For those reasons, an inverted "T-wall" was deemed the most appropriate type of floodwall for the GRBS system. The assumption of a T-wall, allows flexibility in wall height, inverted "T-wall's do not have any height limitations.

Only one design section for Galveston Island was used to develop quantities and one load case (water to the top of the floodwall) was analyzed (Figure 15). A top of floodwall elevation of elevation +14.0 feet NAVD 88 was assumed with an associated top of base slab elevation of elevation +0.0 NAVD 88. The slab was assumed to be 3 foot thick. The quantities assume a continuous line of steel sheet pile seepage cut-off wall driven under all of the T-walls. The wall is assumed to be founded on 18" Ø pipe piles.

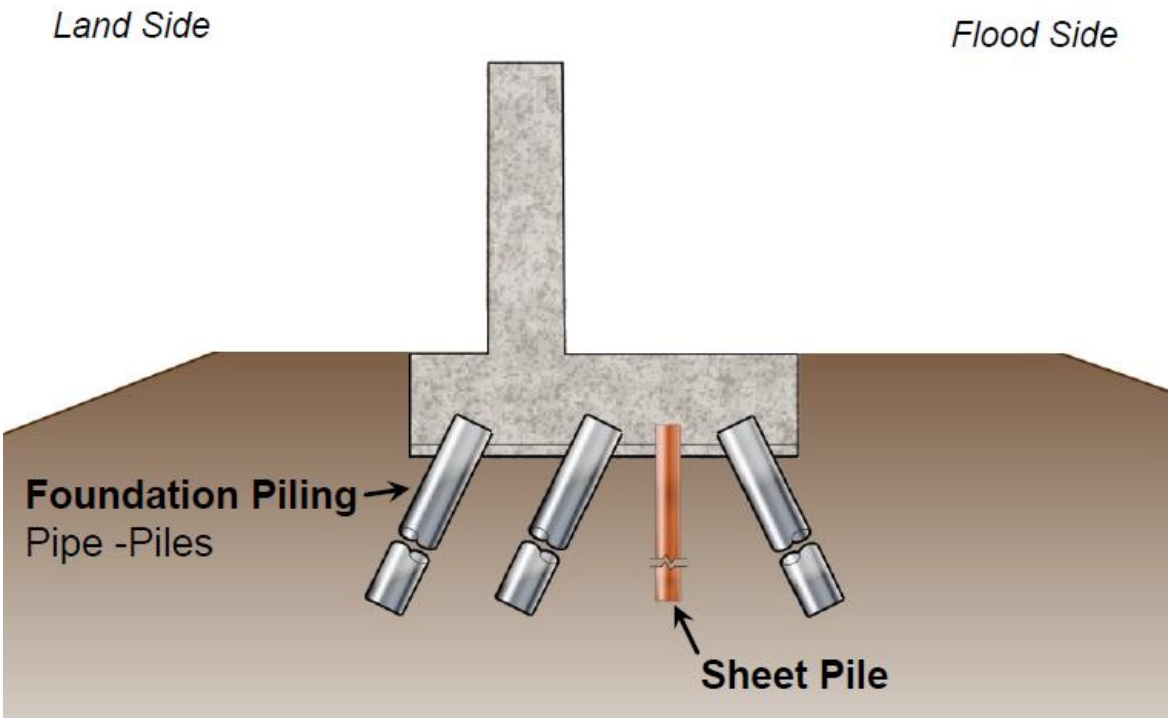

Figure 15. Typical Flood Wall Cross-Section

3.1.3.2 Offatts Bayou Crossing

The closure of Offatts Bayou starts at the edge of the Galveston Bay Foundation (GBF) property and continues north then northeast offshore of the Teichman Point neighborhood then ending at the Offatts Bayou pump station adjacent to the Galveston Causeway. This project feature is a combination floodwall system (Combi-wall) that consists of vertical piling, batter piling and a concrete cap system. This feature also includes a section of shallow water environmental gates/water circulation gates and two navigation sector gates. All of the Offats Bayou structures will have a top of structure of +14.0 feet NAVD88.

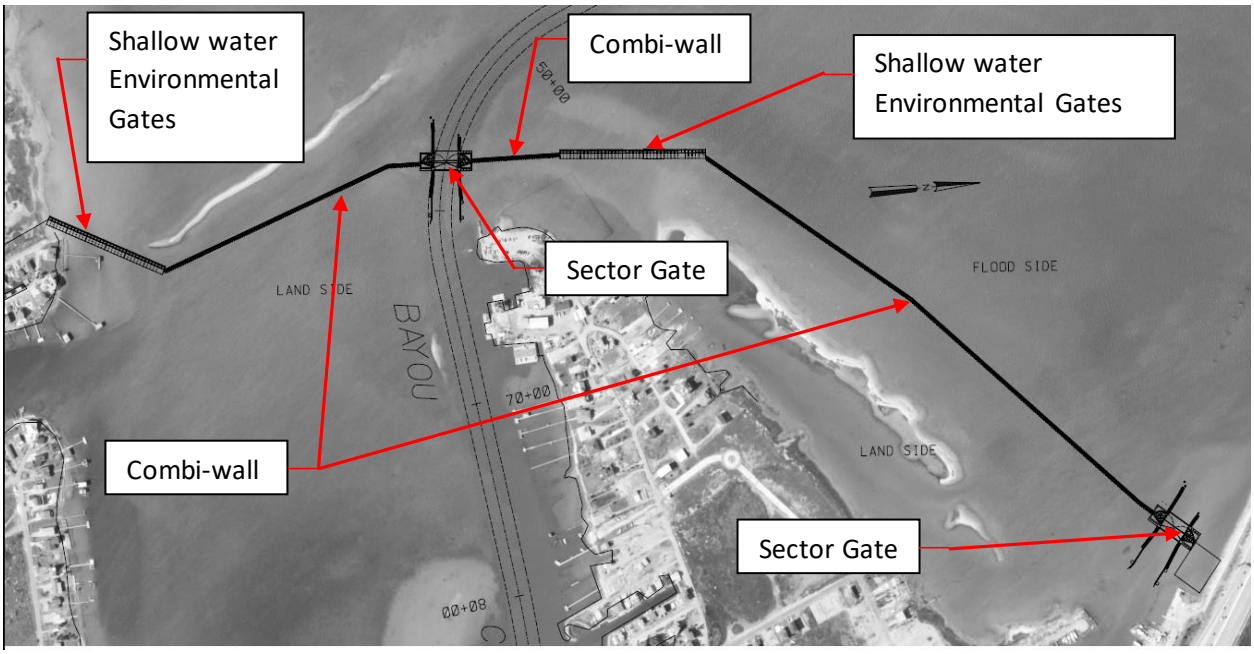

Figure 16. Offats Bayou Crossing

3.1.3.3 Seawall Improvements

The Galveston seawall improvement feature is a future adaptation to provide additional storm surge and wave overtopping reduction along Galveston Island, which will connect to the storm surge gate at Bolivar Roads and the beach dune system. The recommendation is to increase the height of 10 miles of the existing seawall to reach a uniform level of protection of 21.0 ft (NAVD88). The extension would go from the San Jacinto levee seawall tie-in to the west end tie in of the GRBS.

3.1.3.4 Dickinson Bay Gate

Features at Dickinson Bay west of Highway 146 consist of sector gate, associated combi-wall, and pump station. The current authorized dimensions of the channel are a 60-foot width and a depth of –9 feet MLLW, which includes an advanced maintenance depth. The alignment of the gates and associated wall would be along the abandoned railroad ROW. The gate opening across Dickinson Bay is at 100-foot to allow for additional flow area. End points for the combi-wall will be further analyzed during future analyses. The elevation of the wall and gate is 18.0 feet.

3.1.3.5 Clear Lake Channel and Gate

Features at Clear Lake Channel west of Highway 146 consists of sector gate across the channel, associated barrier wall and pump station. The current authorized dimensions of the channel are a 75 feet width and a depth of -10 feet MLLW, which includes an advanced maintenance depth. The Clear Lake Channel is currently not maintained. The alignment of the gates and associated wall will be along the abandoned railroad right-of-way (ROW). The elevation of the wall and gate is 17.0 feet.

3.1.4 Beneficial Impacts

The beach and dune component of the Galveston Bay Storm Surge Barrier System would have beneficial impacts the same as those described for the ER actionable measures involving beach and dune restoration. The other components of the system would reduce the risk of coastal storm damages to lives and property, but would in general not provide any significant benefit to ecosystems or federally-listed species habitat.

3.1.5 Adverse Impacts

The Galveston Bay Storm Surge Barrier System is expected to have adverse direct and indirect impacts, to aquatic and terrestrial organisms in the project area through behavioral changes, loss of habitat and changes in habitat quality. The measures would result in permanent loss of estuarine water column, estuarine mud and sand bottoms, marine water column, unconsolidated marine water bottoms, estuarine hard bottom substrate, estuarine emergent wetlands, and possibly seagrasses. Long-term effects on prey species and on individuals are anticipated due to the reduced flow, reduced tidal amplitude, and periodic high velocities through the navigation and environmental gates. These include a reduction in prey due to the mortality or displacement of benthic species associated with dredging, placement, and construction activities. The exact long-term impacts to the Galveston Bay system are uncertain, and additional studies will be required to best predict the impacts the structures may cause. These would completed during the Tier Two analyses, at which time additional consultation with USFWS and NMFS would be sought to ensure compliance with ESA.

Tidal Exchange/Amplitude and Velocities

The USACE Engineer Research and Development Center (ERDC) conducted 3D Adaptive Hydraulics (AdH) modeling for the Galveston Bay Storm Surge Barrier System for the 2018 design (McAlpin et al. 2019b) and updated it for the 2020 design. All model input conditions for this updated modeling match those for the present condition as referenced in McAlpin et al. 2019b. The updated AdH modeling showed that the 2020 design for the System would have lower changes to tidal prism, water velocities, and salinities in the Galveston Bay System. Using the present conditions (2019 water elevations/tides) with the 2020 Surge Barrier design, the model showed potential changes in tidal prism of 2.4-5.7% across all of the stations in Galveston Bay, which was equivalent to a 0.01-0.02 meter (0.4-0.8 inch) change (Lackey and McAlpin 2020).

The velocity magnitudes for the with-project condition do not vary greatly from the without-project condition at different locations in the bays. The velocity magnitudes do drop at most locations for both surface and bottom but the reduction in the mean velocity magnitude is less than 0.1 m/s and more typically 0.05 m/s or less. Locations in West Bay and on the western perimeter of Galveston Bay show a slight increase in velocity magnitude for surface or bottom but, again, the change in the mean velocity magnitude is less than 0.1 m/s.

To analyze the hydrodynamics of the 2020 Galveston Bay Storm Surge Barrier System design at the barrier location, a new arc was located within the proposed location of the outbound 650-foot-wide sector gate. Instead of running the analysis for the full time series the researchers choose the strongest tide cycle that was observed in the two year analysis. The transition between low and high tide showed the greatest jump in predicted velocities through the navigation structure can reach 2 m/s (6.6 ft/s) in places. This could result in the formation of eddies on the backside of the structures, which may have

impacts on navigation and could adversely impact organisms. The analysis does show that with this particularly strong tide cycle, once the transition period between low and high tide moves to the full incoming tide, the maximum velocities 0.75 m/s (2.5 ft/s) which was less than the 1.3 m/s (4.3 ft/s) seen in the without project condition during the tidal transition.

Eggs and larval stages of aquatic organisms can be affected by changes to tidal exchange/amplitude and velocities. These life stages are transported by currents, moving into the bay by the incoming tides. Larval forms of some species drop near the bottom on outgoing tides, particularly in the shallow areas of the nearshore to reduce transport out of the bay. Shallow water Environmental Gates (SWEG) along the shoreline of Bolivar Roads is expected to help alleviate some of the potential impacts to aquatic organisms that utilize shallow edge habitats.

With input from the resource agencies, the USACE used the Particle Tracking Model (PTM) to show indirect impacts, and the extent of those impacts, from constructing the storm surge barrier system at Bolivar Roads on the larval stages of the marine life that travel in and out of Galveston Bay. The PTM simulates the transport of particles, or local marine larval species, using environmental inputs such as circulation, salinity, currents, and water surface elevation from the 3D Adaptive Hydraulics Model and local marine species' transportation characteristics (e.g. bottom dwellers, top dwellers etc.). The particle movements represent a multitude of aquatic species including shrimp, blue crabs, and commercially and recreationally important finfish (e.g. spotted sea trout and flounder). Results showed that recruitment of larval species into the Bay were similar whether the proposed storm surge barrier system was implemented or not.

Salinity

During normal flow conditions, average salinities in the Galveston Bay System range from less than 10 ppt in upper Trinity Bay to 30 ppt at Bolivar Roads (Lester and Gonzalez, 2011). The updated modeling also showed that the predicted changes in salinity using the present conditions with the 2020 Galveston Bay Storm Surge Barrier design, were almost identical near the HSC entrance, they begin to diverge further into the system at Mid Bay Marsh and Morgan's Point. However, the change in the mean salinity between with and without project remains within 2 ppt and in most instances in the time series, the difference is less than 1 ppt for all of the stations across the bay.

Most organisms occupying these environments are ubiquitous along the Texas coast and can tolerate a wide range of salinities (Pattillo et al., 1997). Therefore, no adverse effects to aquatic species are anticipated from the 1-2 ppt change in salinity.

Habitat Loss

With the proposed Galveston Bay Storm Surge Barrier System, the Bolivar Roads Gate System, Clear Lake Gate System, Dickinson Bay Gate System, and the Galveston Ring Barrier System would impact a total of 167.6 acres of open-water habitat (Table 8). The majority would occur at Bolivar Roads, which would be covered by the support structures and gates. The current design of the Bolivar Roads Gate System indicates the support structures and gates would be 60 feet deep and 15 to 30 feet deep through the environmental gates. The Galveston Bay complex contains approximately 378,063 acres of open-bay habitat (Pulich, 2002). The 167.6 acres impacted is a very small fraction of the total available habitat within the entire Galveston Bay system.

There will be minor adverse temporary and permanent impacts on wildlife and terrestrial vegetation. Mechanized land clearing would be necessary for tying in the structures to existing CSRM features and construction access. Wildlife in the area is accustomed to urban/suburban environment and would likely avoid the areas during construction.

Long-term unavoidable impacts include the loss of 128 acres (11.8 average annual habitat units [AAHUs]) of Palustrine wetlands, 134 acres (59.9 AAHUs) of estuarine wetlands, 161.6 acres (18.1 AAHUs), and 6 acres (2.8 AAHUs) of oyster habitats. A Draft Mitigation Plan, which is included as Appendix J of the EIS, details proposed plans to replace the lost functions and values of the impacted areas through restoration activities that increase and/or improve the habitat functions and services within a mitigation site.

Fish and Wildlife Species

Minor to moderate, temporary and permanent adverse effects to fish and other aquatic organisms are expected as a result of construction of the all the features of the Galveston Bay Storm Surge Barrier System. During construction, noise and temporary minimal sedimentation due to disturbance of the bottom is expected, which could disrupt foraging, reproduction, and passage. Once completed, the storm surge barrier gates would remain open except during major storm events requiring closure. The gates would allow passage of aquatic organisms; however, passage and availability of prey species may be more restricted than under the existing conditions. Closures would temporarily cut off passage of all aquatic organisms. This would be mitigated to the greatest extent possible by constructing bypass channels.

If an extreme storm event were to occur, tide gates and surge barriers would be closed. During tide gate and surge barrier closures, tidal fluxes in water would cease for a period of time, potentially reducing water quality, salinity, and dissolved oxygen (DO), while increasing the number of harmful nutrients in the water. The changes in water quality, salinity, DO, and nutrients could cause increased stress levels to benthic resources and/or fish populations, which may lead to increased susceptibility to disease or even a mortality event, though this is relatively uncertain at this time (Tietze 2016; Bachman and Rand 2008). Based on modeling conducted by the VIMS, closure of the storm surge barriers at Pretty Lake and Broad Creek could potentially result in a freshwater pulse in the upstream areas of both Pretty Lake and Broad Creek. This may result in adverse effects to prey resources, potentially limiting forage opportunities of aquatic organisms trapped behind the storm surge barriers. Additionally, closure of the storm surge barriers and tide gates could result in a trapping effect by impeding passage of aquatic species that could be moving in and out of upstream estuarine areas to feed.

3.2 B-2 Follets Island Gulf Beach and Dune Restoration

This beach nourishment and dune restoration measure includes 1,113.8 acres/10.1 miles of dune/beach restoration along the Gulf shoreline on Follets Island in Brazoria County, Texas. The dune would have a crest elevation of 9 feet, width of 10 feet with 3H:1V slopes, and 200 feet of additional subaerial equilibrated beach. This measure would be constructed using the same methodology described in section 2.1.5 for the W-3 measure except with the above dimensions.

This measure is not considered an actionable measure because the borrow source location is uncertain at this time. The beach and dune restoration requires 802,000 CY of beach quality sand that will likely be

dredged from the Sabine and Heald Banks, as described in 3.1.2.2. Other potential nearshore sediment sources (e.g., nearshore sediment waves) would be further evaluated during Tier 2 analyses.

3.2.1 Beneficial Impacts

The beneficial impacts of completing this ER action would be nearly identical to those described in section 2.1.5. Implementation of the measure would create habitat, protect beaches and dunes from breaches and erosion caused by storm surge and RSLC, and would protect inland wetlands, seagrass meadows, and habitat along with back-bay marshes which would be harmed if the Gulf shoreline and dune system were breached. The placement of additional sediment will have the benefit of replacing sediment deficits on the upper coast.

This measure would also protects State Highway 257 which is the only road accessing and providing evacuation capability to the east towards Galveston Island and to the west towards Freeport. Follets Island protects Bastrop, Christmas, and Drum bays, and the Brazoria National Wildlife Refuge (NWR) on the mainland behind this bay system. This measure would also protect seagrasses in Christmas Bay, extensive marshes throughout the bay complex, and scattered residential developments. Christmas Bay is a designated Gulf Ecological Management Site because of its relatively undeveloped shorelines, high water quality, and unique mix of seagrass meadows, oyster reefs, and smooth cordgrass marsh; it is also a TPWD Coastal Preserve.

While future renourishment of this feature is not included, this feature is downdrift of the beach and dune nourishment for CSRM purposes along Bolivar and Galveston. Follets Island is likely to benefit throughout the period of analysis from the regional of beach nourishment.

3.2.2 Adverse Impacts

The adverse impacts of completing this ER action would be nearly identical to those described in section 2.1.5, except that there would be impacts associated with dredging at the borrow source which were not described in the actionable measure descriptions. The dredging impacts would be similar to those described in section 3.1.5 for dredging actions associated with the sector gates. Because of the distance from the shore, there are likely to be different marine species that could be impacted as compared to those found in and near Galveston Bay. These impacts would be further described once the Tier 2 analysis is completed.

3.3 General Description of the Tier 1 Action Areas

The following sections briefly describe the biological communities found in and near the Tier 1 action areas.

3.3.1 Galveston Bay

The Galveston Bay ecosystem applies to the Bolivar Roads Gate System, Galveston Ring Barrier System, Clear Lake and Dickinson Surge Gates.

Galveston Bay ranks high among the most significant bay systems in the nation. This premier Texas coastal resource provides substantial economic benefits. Remarkably, these benefits are self-sustaining as long as the bay remains healthy and productive. However, Galveston Bay, like many other U. S. bays, now faces significant problems related to habitat loss, water quality, and related species declines. Some

of these problems are only in their early stages, providing us with advanced warning in time to prevent larger disasters already seen in most of the world's principal fishing zones. Other problems in Galveston Bay such as wetlands loss, already exceed many other bays in severity.

Galveston Bay is an estuary, defined by D. W. Pritchard in 1967 as "a semi-enclosed body of water having a free connection with the open sea and within which seawater is diluted measurably by freshwater from land drainage." With all the physical forces at work in an estuary (the flow of rivers; the deposition of sediments; the ebb and flow of tides) conditions are constantly changing. Living species that evolved in estuaries are therefore adapted to tremendous variability and extreme conditions in their environment; they are robust. In fact, because of the dominance of natural change in estuaries, the whole system can absorb surprising perturbations from human activities. Although some individual resources in an estuary can be quite sensitive to perturbation (for example sea grasses), estuaries in general are not good examples of the "delicate balance of nature."

The Galveston Bay system contains a variety of habitat types, ranging from open water areas to wetlands to upland prairie. Regional habitats support numerous plant, fish, and wildlife species and contribute to the tremendous biodiversity found in the watershed. The maintenance of varied, abundant, and appropriate habitat is a requirement for the preservation of the characteristic biodiversity of the Galveston Bay system.

Wetlands, seagrass meadows, and oyster reefs are three important habitat types in Galveston Bay. Wetlands serve important hydrological and ecological functions in the bay ecosystem, but have experienced significant rates of loss over the past century (White et al. 1993). Seagrass meadows are a valuable but now rare habitat in the Galveston Bay system outside the Christmas Bay Complex (Pulich and White 1991; Pulich 1996; Williams 2007). Oyster reefs are important as indicators of the overall condition of the ecosystem and are the basis for an important commercial fishery. Oyster-shell reefs were dredged and exploited, with attendant ecological detriment, for many decades. Recently, oyster reefs bore the brunt of storm surge effects from Hurricane Ike and Hurricane Harvey. The description of wetlands, seagrass meadows and oyster reef habitats in Galveston Bay are very similar to those described for the Actionable Measures in section 2.2.

Bird populations have significant commercial, recreational, ecological, and aesthetic value to many users of the bay. In addition, they are important indicators of the health of the upper food web and the status of various bay habitats. Observers have noted 139 bird species associated with Galveston Bay wetlands and open-bay habitats. As most waterfowl breed elsewhere, control of Galveston Bay waterfowl by addressing local problems is limited. While the total number of colonial waterbirds has remained relatively stable since the early 1980s, there has been a decline for estuarine-dependent bird species which feed at the marshbay interface (i.e., tricolored herons, snowy egrets, black skimmers, roseate spoon bills, and great egrets). This could be the direct result of habitat losses, or the indirect result of declines in habitat-dependent species preyed upon by the birds. Inland colonial waterbirds (such as little blue herons, white ibises, cattle egrets, white-faced ibises, and great blue herons) showed no significant changes from 1973 to 1990. Open-water birds such as royal terns, Caspian terns, olivaceous cormorants, Forster's terns, and Sandwich terns showed increases in both the number of birds and the number of colonies over the same study period.

Other habitat types found in Galveston Bay includes: intertidal flats, open-bay bottoms and open-bay waters. The total Intertidal flats on Bolivar Peninsula and on either end of Galveston Island are the

primary habitats for migrating shorebirds and the bay supports more than five percent of all mid-continental shorebird populations during their annual migrations.

The open-bay bottoms in Galveston Bay include all unvegetated subtidal areas with various sediment types. They are open systems that greatly interact with the overlying waters and adjacent habitats. Mud and sandy mud are the dominant sediment types in this action area, with sand at bay margins. Sandy sediments are associated with flood-tidal deltas at Bolivar Roads and San Luis Pass and with modern barrier islands.

The open bay habitat contains nekton species (able to swim independently of currents) comprised mostly of crustaceans and finfish species. The diversity and distribution of fish species can be affected at any time during the year by migrations and spawning cycles (Armstrong, 1987). Newly spawned fish species begin migrating into the Bay in winter and early spring, with maximum biomass observed during the summer (Armstrong et al., 1978; Parker, 1965). Dominant finfish species inhabiting and caught in Galveston Bay include Atlantic croaker (*Micropogonias undulatus*), Gulf menhaden (*Brevoortia patronus*), bay anchovy (*Anchoa mitchilli*), sand seatrout (*Cynoscion arenarius*), gizzard shad (*Dorosoma cepedianum*), spot (*Leiostomus xanthurus*), and hardhead catfish (*Arius felis*).

Macrofaunal diversity within Galveston Bay is considered to be low or moderate compared to other estuaries in the Gulf of Mexico, with the highest diversity in areas with stable salinity regimes (e.g., near inlets such as Bolivar Roads and Rollover Pass). The Houston Ship Channel area of Galveston Bay generally has a lower species diversity compared to the more open bay stations (GBEP 2002).

Most of the area directly adjacent to the Bay is heavily developed with high and low intensity urban environments.

3.3.2 Beaches and Dunes

The beaches and dunes biological community applies to the Bolivar and West Galveston Beach and Dune, Galveston Seawall Improvements, and B-2. The community description described in section 2.2.2 applies to these three action areas.

The Bolivar and West Galveston Beach and Dune action area overlaps with the Galveston Seawall Improvements. This section of the action area is developed behind the dune, to where the action area at Folletts Beach (B-2) and areas outside the seawall action area is undeveloped or sparsely developed. Eroding shorelines along Galveston Island and Bolivar Peninsula are common with erosion rates ranging from about 1 to 12 feet (0.3 to 3.75 meters) per year. The only area of accretion is on both shorelines at the entrance to Galveston Bay at Bolivar Flats and along east beach. At Folletts Beach, erosion rates range from 0.25 to 7.5 feet (0.01 to 2.3 meters) per year.

4.0 LISTED SPECIES AND CRITICAL HABITAT IN THE ACTION AREA

Twenty-four ESA-listed, candidate or proposed for listing species have been identified in the 2017 Planning Aid Report (PAL), in the USFWS Official Species List dated December 30, 2019, and/or on the NMFS Texas' Threatened and Endangered Species List (Table 4). One additional species (least tern [*Sterna antillarum*]) was also listed as an endangered species potentially occurring in the action areas; however, consideration of this species is only necessary when wind energy projects are being proposed. Since this project is not a wind energy project, the species is not considered. One additional species (Eastern black rail) was not identified on any of the lists; however, USFWS strongly encouraged assessing the species due to its uncertainty in the region and recent listing status. CH has been designated for seven species; however, not all of the CH is found in or near the action areas.

Table 4. ESA-listed Species Identified by USFWS or NMFS as Potentially Occurring in the Action Area

Species	Scientific Name	Jurisdiction	Status	CH*
Birds				
Piping Plover	*Charadrius melodus*	USFWS	Threatened	Yes
Rufa Red Knot	*Calidris canutus rufa*	USFWS	Threatened	No
Whooping Crane	*Grus americana*	USFWS	Endangered	Yes
Northern Aplomado Falcon	*Falco femoralis septentrionalis*	USFWS	Endangered	No
Eastern black rail	*Laterallus jamaicensis jamaicensis*	USFWS	Threatened	No
Attwater's Greater Prairie-Chicken	*Tympanuchus cupido attwateri*	USFWS	Endangered	No
Clams				
Texas Fawnsfoot	*Truncilla macrodon*	USFWS	Candidate	No
Fish				
Oceanic Whitetip Shark	*Carcharhinus longimanus*	NMFS	Threatened	No
Giant manta ray	*Manta birostris*	NMFS	Threatened	No
Mammals				
Sei whale	*Balaenoptera borealis*	NMFS	Endangered	No
Bryde's Whale	*B. edeni*	NFMS	Endangered	No
Fin whale	*B. physalus*	NMFS	Endangered	No
Gulf Coast Jaguarundi	*Herpailurus (=Felis) yagouaroundi cacomitli*	USFWS	Endangered	No
Ocelot	*Leopardus (=Felis) pardalis*	USFWS	Endangered	No
Sperm whale	*Physeter macrocephalus*	NMFS	Endangered	No
West Indian Manatee	*Trichechus manatus*	UFWS/ NMFS	Threatened	Yes

Species	Scientific Name	Jurisdiction	Status	CH*
Plants				
Texas Ayenia	*Ayenia limitaris*	USFWS	Endangered	No
South Texas Ambrosia	*Ambrosia cheiranthifolia*	USFWS	Endangered	No
Slender Rush-pea	*Hoffmannseggia tenella*	USFWS	Endangered	No
Texas prairie dawn-flower	*Hymenoxys texana*	USFWS	Endangered	No
Reptiles				
Loggerhead sea turtle	*Caretta caretta*	USFWS/ NMFS	Threatened	Yes
Green sea turtle	*Chelonia mydas*	USFWS/ NMFS	Threatened	Yes
Leatherback sea turtle	*Dermochelys coriacea*	USFWS/ NMFS	Endangered	Yes
Hawksbill sea turtle	*Eretmochelys imbricata*	USFWS/ NMFS	Endangered	Yes
Kemp's Ridley sea turtle	*Lepidochelys kempii*	USFWS/ NMFS	Endangered	Proposed

* CH designated for the species; however a 'Yes' does not indicate presence in the action area. See Chapter 4.0 for presence/absence.

To assess the status of species in the action area and potential impacts of the action on ESA-listed species, several sources were consulted including: literature review of scientific data; interview of recognized experts on listed species including local and regional authorities and Federal (USFWS and NMFS) and State (TPWD) wildlife personnel; on-site inspections; and compiled lists of ESA-listed species. Significant literature sources consulted include the USFWS and NMFS species specific webpages, Federal status reports and recovery plans, TPWD species occurrence and monitoring reports, peer-reviewed journals, and other standard references.

During the review, it was found that 15 species have no potential to occur in any of the action areas because no suitable habitat exists (Table 5). Most of the USFWS managed species are upland species which would have no potential for surviving in or migrating/recruiting to emergent marsh, tidally influenced shorelines or open water areas found within the action areas. Many of the NMFS managed species are only found in deeper, clearer ocean waters of the Gulf of Mexico and the action areas are too shallow or turbid to support the species. As well, none of the 15 species have ever been documented in the action areas. Because each have these species have no potential to occur in the action areas, only a brief description of the species range and habitat has been provided to document consideration and show lack of suitable habitat. Applicable recovery plans and 5-year review reports were relied upon for range and habitat descriptions.

Table 5. Listed Species with No Potential to Occur in Any of the Action Areas

Species	Range and Habitat
Northern Aplomado Falcon (USFWS 2014)	Historically, the species' range extended from Trans-Pecos Texas, southern New Mexico and southeastern Arizona, to Chiapas and the northern Yucatan along the Gulf of Mexico and along the Pacific slope of Central America north of Nicaragua. By mid-century, the falcon was absent from most of its range in the US with very few sightings reported. Since their listing, there have been reintroduction efforts in west Texas, at the King Ranch in Kleberg County, Matagorda Island and Laguna Atascosa NWR. There are established nesting populations in Brownsville and on Matagorda Island in Texas. Matagorda Island was not historically associated with falcons and the population was established to improve survival success since the island was devoid of great-horned owls. The closest measures to Matagorda Island (CA-6) and Laguna Atascosa NWR (W-3 and SPI) are all >15 miles, which is more than likely outside their foraging range, especially given the lack of suitable habitat within the measure action areas. In the US, they are found along yucca-covered sand ridges in coastal prairies, riparian woodlands in open grasslands, and in desert grasslands with scattered mesquite and yucca from sea level to about 4,500 feet. Nest platforms of sticks or twigs are often placed in mesquite or tall yuccas, 10-14 feet above ground. Falcons have successfully nested on larger expanses of seasonally inundated salt prairire and vegetated by gulf cordgrass (*Spartina spartinae*), marshhay cordgrass (*S. patens*), gulf dune paspalum (*Paspalum monostachyum*), gulf bluestem (*Schizachyrium maritimum*), sea ox-eye daisy (Borrichia frutescens), and glasswart (*Salicornia sp.*). Woody vegetation on salt prairie is sparse, except where honey mesquite (*Prosopis glandulosa*) and huisache (*Acacia farnesiana*) occur more frequently at slightly higher elevations, and occasional small hills (lomas) unless controlled by periodic fire.
Attwater's Greater Prairie Chicken (USFWS 2010)	Historical accounts suggested a population of more than 1 million individuals on approximately 6 million acres of antive coastal prairie from south Texas to Louisiana. Historically they were found in all counties along the Texas-Louisiana Gulf coast, but has been extirpated from Louisiana since 1919. The population has steadily decreased from 8,000 individuals in 1937 to about 90 in 2009. A small population was introduced to the Texas City Prairie Preserve in 2008, but subsequent reintroduction efforts were discontinued. There are only two populations of the species in Texas: the Attwater's Prairie Chicken NWR in Colorado County and at release sites in Goliad, Refugio, and Victoria counties, all of which are substantially further inland than any of the action areas. The species is found only in the coastal prairie of Texas. Grass and open space are required. A mixture of native grasses of varying heights is optimum habitat. Short grass cover (less than 10 inches in height) is used for courtship, feeding, and to avoid moisture during heavy dew or after rains. Midgrass areas (10-16 inches in height) are used for roosting and feeding. Tall grass (16-24 inches in height) are used for nesting, loafing, and escape cover. Prime habitat consists of tall grass dominated by bunchgrasses, such as little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), and big bluestem (*Andropogon geradii*) along with flowering plants such as wild petunias (*Ruellia* spp.), yellow falsegarlic (*Nothoscordum bivalve*), and ragweed (*Ambrosia* spp.). They prefer open prairies without any wood cover and avoid areas with more than 25% shrub cover. Knolls and ridges with minor variations in topography and soils resulting in a variety of vegetation types are characteristic of preferred habitat.

Species	Range and Habitat
Texas Fawnsfoot	The species is endemic only to the Colorado and Brazos river basins; however, few have been documented. In the Colorado River basin, individuals were found in the lower Colorado River and in the San Saba River. In the Brazos system, the species persists in the mainstem of the Brazos River, Clear Fork Brazos River, Navasota River, Deer Creek, and the Little River. The species prefer large to moderate freshwater riverine environments with soft, sandy sediment and moderate water flow. The species seems to be intolerant of impoundments, as no individuals have been found in lakes, ponds, or reservoirs within its range. Adults appear to occur most often in bank habitat and occasionally in backwater, riffle, and point bar habitats with low to moderate water velocities and fine or coarse sediments.
Oceanic Whitetip Shark (Young et al. 2017)	The species is found in tropical and subtropical seas worldwide. The species is pelagic, generally remaining offshore in the open ocean, on the outer continental shelf, or around oceanic islands in water depths greater than 184 m (~604 feet). They have a strong preference for the surface mixed layer in warm waters above 20°C (68°F).
Giant Manta Ray (Miller and Klimovich 2017)	Within waters under US jurisdiction, the ray can be found along the east coast as far north as Long Island, NY; within the Gulf of Mexico, and off the coast of the US Virgin Islands, Puerto Rico, Hawaii, and Jarvis Island. Unconfirmed sightings have also been reported off the coast of the Northern Mariana Islands, Guam, and American Samoa. The species inhabits tropical, subtropical, and temperate bodies of water worldwide, and are commonly found offshore, in oceanic waters and near productive coastlines. The ray can be found in cool water, as low as 19°C (°F), although the temperature preference appears to vary by region. The species has also been observed in estuarine waters near oceanic inlets, with the use of these waters as potential nursery grounds. The closest known nursery to the Texas coast is over 100 miles offshore at NOAA's Flower Garden Sanctuary. As well, it is believed that much of the project area is too turbid for the species.
Sei Whale Bryde's Whale Fin Whale Sperm Whale	Each of these whales can be found in the warmer waters of the Gulf of Mexico on the continental shelf edge and slope. They are usually observed in deeper waters of oceanic areas far from the coastline.

Species	Range and Habitat
Gulf Coast Jaguarundi (USFWS 2013)	The US contains a small portion of the historical range, which ranged from the Lower Rio Grande Valley in southern Texas into the eastern portion of Mexico from Coahuila to Veracruz. The last confirmed sighting in Texas was from a road kill specimen in April 1986 found two miles east of Brownsville, TX. Several unconfirmed sightings have been reported, but none confirmed. The closest known population is approximately 95 miles southwest in Nuevo Leon, Mexico. Jaguarundi typically uses dense, thorny shrublands or woodlands and bunchgrass pastures adjacent to dense brush or woody cover. Typical habitat consists of vegetation such as brasil (*Condalia hookeri*), desert yaupon (*Schaefferia cunefolia*), Carolina wolfberry (*Lycium carolinianum*), lantana (*Lantana achyranthifolia*), and honey mesquite (*Prosopis glandulosa*). They are also known to use riparian corridor habitats along rivers and creeks.
Ocelot (USFWS 2016a)	Historically, the Texas-Tamaulipas ocelot inhabited southern and eastern Texas, north as far as Hedley, TX and west to Marfa, TX and may have ranged into western Louisiana, but verified records are lacking. Currently, the ocelot ranges from extreme southern Texas and southern Arizona through the coastal lowlands of Mexico to Central America, Ecuador, and northern Argentina. Since the 1960s, the ocelot was documented in TX by photographs or specimens from Cameron, Hidalgo, Jim Wells, Willacy, and Kenedy counties. Two populations occur in southern TX: one in Willacy and Kenedy counties primarily on private ranches and the other in eastern Cameron County, primarily on Laguna Atascosa National Wildlife Refuge. Individuals have occurred out of these two population, but there is no recent evidence that a breeding population occurs in other areas of Texas. The ocelot uses a wide range of habitats throughout its range; however, in south Texas the species occurs predominantly in dense thronscrub communities. Ocelot spatial patterns are strongly linked to dense cover or vegetation.
Texas Ayenia (USFWS 2016b)	Historically, the species was found in Hidalgo and Cameron counties, TX to Muzquiz, Coahuila, and Durango, Mexico. Currently there are extant populations in Cameron, Hidalgo, and Willacey counties at the Esterno Llano Grande State Park, Lower Rio Grande Valley NWR, C.B. Wood Municipal Park, and on private properties near Rio Hondo. Ten extant populations occur in Tamaulipas, Mexico. Occupied habitats are isolated fragments of Texas ebony – anacua/brasil woodlands and Texas ebony – snake-eyes shrublands in the deltas of rivers draining into the Gulf of Mexico. Individual plants occur in association with other shrub species and native grasses and forbs in a wide range of alluvial soil types, from fine sandy loan to heavy clay, and appear to require at least some direct sunlight for successful reproduction.

Species	Range and Habitat
South Texas Ambrosia (USFWS 2017)	Historically, the species occurred in Cameron, Jim Wells, Kleberg, and Nueces counties in South Texas and in Tamaulipas, Mexico. Currently, there are six verifiable sites that still contain the species found in scattered, fragmented areas of remaining habitat within Nueces and Kleberg counties. The plant grows at low elevations, typically on well-drained, heavy soils associated with subtropical woodland communities in openings of coastal prairies, savannas and grasslands scattered with mesquite. Most of the sites where the species is found contain only remnants of shortgrass prairie and are typically unplowed but mowed. In its native habitat, associated prairie species are often associated with ambrosia, but it is not the dominant species. Several native woody plants found within and adjacent to ambrosia include honey mesquite (*Prosopis glandulosa*), huisache (*Acacia*), huisachillo (*Acacia schaffneri*), brasil (*Condalia hookeri*), granjeno (*Celtis* spp.), and lotebush (*Ziziphus obtusifolia*). This species is commonly found with Slender Rush-Pea.
Slender Rush-Pea (USFWS 2017)	The species are found in Nueces and Kleberg counties, TX in coastal prairie habitat. The largest population can be found at the St. James cemetery in Bishop, TX. There have been no other populations reported outside the two counties. All documented sites occur in barren openings or patches of native remnants of shortgrass prairie and are associated with both short- and mid-grass species such as: buffalograss (*Buchloe dactyloides*), Texas wintergrass (*Stipa leucotrica*), and Texas grama (*Bouteloua rigidiseta*). Other species associations include: curly-mesquite (*Hilaria belangeri*), Texas wintergrass (*Nassella leucotricha*), sugar hackberry (*Celtis laevigata*), honey mesquite, and prickly pear (*Opuntia engelmannii*). Primary soils of rush-pea habitat are of the Victoria Association. Known extant and historic sites all occur near streams, where erosion may have exposed narrow bands of subsoil or different soil types that, due to their small size, are not indicated on soil maps. This species is commonly found with South Texas Ambrosia.
Texas Prairie Dawn-Flower (USFWS 2015)	There are 63 known occurrences of the species in 5 counties (Fort Bend, Gregg, Harris, Trinity, and Waller). Many historic sites were lost due to highway, residential and commercial development. Commonly found in fine sandy loam soils at the base of pimple mound. They are often associated with shortspike windmill grass (*Chloris subdolichostachys*), sicklegrass (*Parapholis incurve*), Gulf cordgrass (*Spartina spartinae*), bitterweed (*Helenium amarum*), and beared flatsedge (*Cyperus artistatus*).

4.1 Piping Plover

Piping plover is in the family Charadriidae, which is the second-largest family of shorebirds. Piping plovers are small, stocky shorebirds, typically about seven and a quarter inches long, with a wing span of 14 to 15.5 inches.

Wintering piping plover feed on a variety of invertebrates such as polychaete marine worms, various crustaceans, amphipods, terrestrial and benthic insects, and occasionally bivalve mollusks (Elphick at al 2001, Zonick and Ryan 1996), but diet varies by ecosystem and habitat. Polychaete worms and surface dwelling arthropods such as amphipods and insects are particularly important food sources. (USFWS 2008) Feeding activities occur during all hours of the day and night (Zonick 1997) and at all stages in the tidal cycle (USFWS 2009). Plovers forage on moist substrate features such as intertidal portions of ocean beaches, washover areas, mudflats, sand flats, algal flats, shoals, wrack lines, sparse vegetation, and shorelines of coastal ponds, lagoons, ephemeral pools adjacent to salt marshes (USFWS 2009, Zonick 1997).

Status

USFWS listed the piping plover (*Charadrius melodus*) on 11 December 1985 (50 FR 50726) as endangered in its breeding range and threatened throughout the remaining range. In the action area, piping plovers are listed as threatened.

Major threats to wintering piping plover that were identified at the time of listing included destruction or modification of beach and littoral habitat and human disturbance. Human-caused disturbance factors that may affect the survival of piping plover or utilization of wintering habitat include recreational activities, inlet and shoreline stabilization projects, dredging of inlets that can affect spit formation, beach maintenance and renourishment, and pollution. In some areas, natural erosion of barrier islands may also result in habitat loss. The construction of houses and commercial buildings on and adjacent to barrier beaches results in increased human disturbance and habitat loss.

Range and Habitat

Piping plovers breed in three areas in North America: the Great Plains, the Great Lakes, and the Atlantic Coast. They typically inhabit shorelines of oceans, rivers, and inland lakes. Nest sites include sandy beaches, especially where scattered tufts of grass are present; sandbars; causeways; bare areas on dredge-created and natural alluvial islands in rivers; gravel pits along rivers; silty flats; and salt-encrusted bare areas of sand, gravel, or pebbly mud on interior alkali lakes and ponds (Haig and Elliot-Smith 2004).

Migration to winter areas begins in late summer and continues through the fall. Piping plovers begin arriving on their wintering ground in late July, although most wintering birds arrive at the Texas coast in August and September. They begin leaving the wintering grounds in late February and by mid-May, almost all wintering birds have left the Texas coastal area for their nesting grounds. Because birds may cross over from the Gulf or Atlantic coasts, birds on Texas wintering grounds may be from any of the three breeding areas. (USFWS 2008)

Wintering habitat along the Texas coast can be broadly characterized as emergent tidal or washover areas that are unvegetated to sparsely vegetated with wet to saturated soils in close proximity to water (Zonick 2000). Wintering plover use coastal areas on the mainland and habitats on barrier islands, both

on the bay side (i.e. bayshore habitats) and on the ocean side (i.e. ocean beaches). Bayshore tidal sand and algal flats are primary areas used by plovers, but oceanside beaches, washover passes, and mainland tidal mud flats provide essential secondary habitat when bayshore tidal flats are submerged. Important components of the beach/dune ecosystem include surf-cast algae for feeding of prey; sparsely vegetated backbeach (beach area above mean high tide seaward of the dune line, or in cases where no dune exists, seaward of a delineating feature such as a vegetation line, structure, or road) for roosting and refuge during storms; and spits (a small point of land, especially sand running into water), salterns (bare sand flats in the center of mangrove ecosystems that are found above mean high water and are only irregularly flushed with sea water), and washover areas for feeding and roosting (USFWS 2003).

On the lower Texas coast, individual plovers are known to use areas about 3,000 acres in size, moving two miles or more between forgaging sites as tidal movements shift the availability of productive tidal flats (TPWD 2000). Recent studies show significantly more stringent site fidelity with individual birds returning to more precise locations (+/-400 feet in lateral distance on the beach) each year (USACE 2009)

Occurrence in the Action Area

Approximately 35 percent of the known global population of piping plovers winter along the Texas Gulf Coast, where they spend 60 to 70 percent of the year from about mid-July through April. Padre Island National Seashore (W-3), along with Galveston Island and Bolivar Flats Shorebird Sanctuary (G-28, the Galveston/Bolivar Peninsula Beach and Dune Improvements, Bolivar Roads Surge Gates, and Galveston Ring Levee), Bryan Beach (near but south of B-12), Mustang Island (near SP-1), and along the extensive wind-tidal flats of the lower Laguna Madre (W-3) and the extensive tidal flats on the west side of South Padre Island (near but outside of the South Padre Island Beach and Dune Improvement), all support wintering plover populations.

Within or near other Actionable and Tier 1 measure action areas, piping plover may be observed in small numbers during the winter feeding on invertebrates along exposed mud, sand, or algal flats or on wide Gulf beaches. In general, most actionable measure locations do not currently support high quality habitat due to highly erosive and narrow shorelines and presence of emergent vegetation or open water, the only exception being at the South Padre Island Beach Nourishment action area. The South Padre Island Beach Nourishment action area has not had any recorded use by plovers; however, the habitat appears suitable for roosting and foraging particularly after completion of past nourishment actions. Section 4.11 below indicates which measures are likely to have suitable habitat present.

Critical Habitat

CH for wintering piping plover was designated on July 10, 2001 (66 FR 36038) along several locations of the Texas coast. Designated wintering piping plover CH originally included 142 areas encompassing approximately 1,793 miles of mapped shoreline and 165,211 acres of mapped areas along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas.

The primary constituent elements (PCEs) for piping plover wintering habitat essential for the conservation of the species are those habitat components that support foraging, roosting, and

sheltering, and the physical features necessary for maintaining the natural processes that support these habitat components. The essential physical and biological elements of the habitat include:

1) Intertidal sand beaches including sand flats or mudflats between annual low tide and annual high tide with no or very sparse emergent vegetation for feeding
2) Unvegetated or sparsely vegetated sand, mud, or algal flats above annual high tide for roosting. Such sites may have debris or detritus and micro-topographic relief offering refuge from high winds and cold weather.
3) Surf-case algae for feeding.
4) Sparsely vegetated back beach which is the beach area above mean high tide seaward of the dune line, or in cases where no dunes exist, seaward of a delineating feature such as a vegetation line, structure, or road. Back beach is used by plovers for roosting and refuge during storms.
5) Spits, especially sand, running into water for foraging and roosting.
6) Unvegetated washover areas with little or no topographic relief for feeding and roosting. Washover areas are formed and maintained by the action of hurricanes, storm surges, or the extreme wave actions.
7) Natural conditions of sparse vegetation and little or no topographic relief mimicked in artificial habitat types (e.g. dredge spoil sites)

The units designated as CH are those areas that have consistent use by piping plovers and that best meet the biological needs of the species. The amount of wintering habitat included in the designation appears sufficient to support future recovered populations, and the existence of this habitat is essential to the conservation of the species.

Table 6 and Appendix B show the measures that are in close proximity to or that overlap CH. All other measures are greater than 1.0 mile from designated CH and would not be expected to be impacted either directly or indirectly by any action. Designated CH habitat in these areas include the land from the seaward boundary of mean low low water (MLLW) to where densely vegetated habitat begins and where the constituent elements no longer occur.

Table 6. Critical Habitat In and Near the Action Areas

Measure	CH Designation	Proximity
G-28	TX-37	OVERLAPS: Marsh restoration and GIWW armoring would overlap CH at Rollover Bay. All other areas are <1 mile from any CH
W-3	TX-3A, TX-3B, TX-3C	CLOSE PROXIMITY TX-3A: Dredging occurs in the break between CHs (CH boundaries end at the channel) and beach nourishment actions occur north (channel width) of TX-3A
Bolivar Roads Surge Gates	TX-36, TX-35	OVERLAPS TX-36: Approximately 40 acres of the tie-in structure would be constructed within CH at Bolivar Flats and near Beacon Bayou CLOSE PROSIMITY TX-35: The permanent area of disturbance for the gate openings and channel are within 1 mi

Measure	CH Designation	Proximity
South Padre Island Beach and Dune Improvements	TX-3A	CLOSE PROXIMITY TX-3A: The north edge of the nourishment project terminates at the boundary of CH
Bolivar and Galveston Beach and Dune Improvements	TX-34, TX-37, TX-38	OVERLAPS TX-34: Beach nourishment would occur from the most western boundary of nourishment near San Luis Pass eastward for 3 miles through CH. CLOSE PROXIMITY to TX-37: <0.15 miles south of the Rollover Pass CH location. OVERLAPS TX-38: Beach nourishment would occur from Bolivar Beach eastward for 0.33 miles through CH.

4.2 Red Knot

The rufa red knot (red knot) is a medium-size shorebird about 9 to 11 inches in length. The red knot is a specialized molluscivore, eating hard-shelled mollusks, sometimes supplemented with easily accessed and/or shallow-buried softer invertebrate prey, such as shrimp- and crab-like organisms, marine worms, and horseshoe crab (*Limulus polyphemus*) eggs (Piersma and van Gils 2011). Mollusk prey are swallowed whole and crushed in the gizzard (Piersma and van Gils 2011). Foraging activity is largely dictated by tidal conditions, as the red knot rarely wades more than 0.8 to 1.2 inches and cannot effectively dig deeper than 0.8 to 1.2 inches. It has been reported that Coquina clams (*Donax variabilis*) serve as a frequent and often important food resource for red knots along Gulf beaches.

Status

There are six recognized subspecies of red knots (*Calidris canutus*), and on December 11, 2014, the USFWS published a final rule in the Federal Register listing the rufa subspecies of red knot (*Calidris canutus rufa*) as a threated species under ESA (79 FR 73705—73748). Each subspecies is believed to occupy separate breeding areas, in addition to having distinctive morphological traits (i.e. body size and plumage characteristics), migration routes, and annual cycles. No CH has been proposed or designated for the red knot.

The rufa red knot subspecies is threatened due to loss of both breeding and nonbreeding habitat; potential for disruption of natural predator cycles on breeding grounds; reduced prey availability throughout the nonbreeding range; and increasing frequency and severity of asynchronies in the timing of the birds' annual migratory cycle relative to favorable food and weather conditions. Main threats to the rufa red knot in the United States include: reduced forage base at the Delaware Bay migration stopover; decreased habitat availability from beach erosion, sea level rise, and shoreline stabilization in Delaware Bay; reduction in or elimination of forage due to shoreline stabilization, hardening, dredging, beach replenishment, and beach nourishment in Massachusetts, North Carolina, and Florida; and beach raking which diminishes red knot habitat suitability. (USFWS 2014)

Range and Habitat

The red knot breeds in the central Canadian Arctic, primarily in Nunavut Territory, Canada, but with some potential breeding habitat extending into the Northwest Territories. Breeding territories are located inland, but near arctic coasts, and foraging areas are located near nest sites in freshwater wetlands (Niles et al. 2008). Breeding occurs in June when favorable conditions exist and snow-free habitat is available. Nests are found on dry, slightly elevated tundra sites, often on windswept slopes with little vegetation.

The red knot migrates annually between its breeding grounds in the Canadian Arctic and several wintering regions, including the Southeast United States, the Northeast Gulf of Mexico, northern Brazil, and Tierra del Fuego at the southern tip of South America. Departure from the breeding grounds begins in mid-July and continues through August. Red knots tend to migrate in single-species flocks usually with more than 50 birds per flock.

Red knots make one of the longest distance migrations known in the animal kingdom, traveling up to 19,000 miles annually, and may undertake long flights that span thousands of miles without stopping. Because stopovers are time-constrained, red knots require stopovers rich in easily digested food to achieve adequate weight gain (Niles et al. 2008) that fuels the next leg of migratory flight and, upon arrival in the Arctic, fuels a body transformation to breeding condition (Morrison 2006).

During both the northbound (spring) and southbound (fall) migrations, red knots use key staging and stopover areas to rest and feed. Major spring stopover areas along the Atlantic coast include Río Gallegos, Península Valdés, and San Antonio Oeste (Patagonia, Argentina); Lagoa do Peixe (eastern Brazil, State of Rio Grande do Sul); Maranhão (northern Brazil); the Virginia barrier islands (United States); and Delaware Bay (Delaware and New Jersey, United States) (Cohen et al. 2009; Niles et al. 2008). Important fall stopover sites include southwest Hudson Bay (including the Nelson River delta), James Bay, the north shore of the St. Lawrence River, the Mingan Archipelago, and the Bay of Fundy in Canada; the coasts of Massachusetts and New Jersey and the mouth of the Altamaha River in Georgia, United States; the Caribbean (especially Puerto Rico and the Lesser Antilles); and the northern coast of South America from Brazil to Guyana (Schneider and Winn 2010, Niles et al. 2008). However, large and small groups of red knots, sometimes numbering in the thousands, may occur in suitable habitats all along the Atlantic and Gulf coasts from Argentina to Canada during migration (Niles et al. 2008). Red knots occur primarily along the coasts during migration; however, small numbers of red knots are reported annually across the interior United States (i.e. greater than 25 miles from the Gulf of Mexico or Atlantic Coast) during spring and fall migration.

Red knots are restricted to the ocean coasts during winter from December to February, but may be present in some wintering areas as early as September or as late as May. Wintering areas for the red knot include the Atlantic coasts of Argentina and Chile (particularly the island of Tierra del Fuego that spans both countries), the north coast of Brazil (particularly in the State of Maranhão), the Northwest Gulf of Mexico from the Mexican State of Tamaulipas through Texas (particularly at Laguna Madre) to Louisiana, and the Southeast United States from Florida (particularly the central Gulf coast) to North Carolina (Niles et al. 2008). Smaller numbers of knots winter in the Caribbean, and along the central Gulf coast (Alabama, Mississippi), the mid-Atlantic, and the northeast United States.

Habitats used by red knots in migration and wintering areas are generally coastal marine and estuarine habitats with large areas of exposed intertidal sediments. In many wintering and stopover areas, quality high-tide roosting habitat (i.e. close to feeding areas, protected from predators, with sufficient space during the highest tides, free from excessive human disturbance) is limited. The supra-tidal (above high tide) sandy habitats of inlets provide important areas for roosting, especially at higher tides when intertidal habitats are inundated (Harrington 2008). In some localized areas, red knots will use artificial habitats that mimic natural conditions, such as nourished beaches, dredged spoil sites, elevated road causeways, or impoundments; however, there is limited information regarding the frequency, regularity, timing, or significance of red knot's use of such artificial habitats. Along the Texas coast, red knots forage on beaches, oyster reefs and exposed bay bottoms and roost on high sand flats, reefs, and other sites protected from high tides.

Except for localized areas, there have been no long-term systematic surveys of red knots in Texas or Louisiana. From survey work in the 1970s, Morrison and Harrington (1992) reported peak winter counts of 1,440 red knots in Texas, although numbers between December and February were typically in the range of 100 to 300 birds. Records compiled by Skagen et al. (1999) give peak counts of 2,838 red knots along the coast of Texas between January and June from 1980 to 1996, but these figures could include spring migrants. During the Christmas Bird Count of 2017, the nearest recorded observance was on Pelican Island at Galveston Bay where only one individual was reported. Other locations where the species was observed include: Powderhorn (53 individuals), Port Aransas (71 individuals), Mad Island Marsh—Matagorda County (4 individuals), Kennedy County Wind Turbines (18 individuals), and Flour Bluff in Corpus Christi (4 individuals).

Occurrence in the Action Area

Specifically within the action area, there have been no confirmed records of red knots in the action area or Jefferson County. However, suitable habitat exists, albeit not high quality, in and near the action area, so there is potential for the species to occur. Any occurrence would be expected to be in very small numbers.

4.3 Whooping Crane

The whooping crane (*Grus americana*) is the tallest North American bird with males approaching 1.5 meters in height, is snowy white with black primary feathers on the wings, and a bare red face and crown. Whooping cranes form monogamous pairs for life and all whooping cranes return to the same breeding territory in Wood Buffalo National Park, in Canada to nest in late April or May. Whooping cranes return to wintering grounds of Aransas NWR by late October to mid-November where they migrate singly, in pairs, in family groups or in small flocks and remain until March or April.

Whooping cranes are omnivorous and forage by probing and gleaning foods from soil, water, and vegetation. Summer goods include dragonflies, damselflies, other aquatic insects, crayfish, clams, snails, grasshoppers, cricket, frogs, mice, voles, small birds, minnows, reptiles, and berries. During the winter in Texas, they eat a wide variety of plan and animal foods, with blue crabs, clams, and berries of Carolina wolfberry (*Lycium carolinianum*) being predominant in the diet. Foods taken at upland sites include acorns, snails, crayfish, and insects. Waste grains, such as barley and wheat, form an important part of the diet during the spring and fall migrations (Lewis 1995, Campbell 2003, Canadian Wildlife Service [CWS] and USFWS 2007).

Status

The whooping crane was federally listed as endangered on March 11, 1967 (32 FR 4001). CH has been designated in Aransas, Calhoun, and Refugio counties in Texas, and includes the Aransas National Wildlife Refuge. There is no CH in or near the vicinity of the project area.

The main factors for the decline of the whooping crane were loss of habitat to agriculture (hay, pastureland, and grain production), human disturbance of nesting areas, uncontrolled hunting, specimen and egg collection, collisions with power lines, fences, and other structures, loss and degradation of migration stopover habitat, disease such as avian cholera, predation, lead poisoning, and loss of genetic diversity. Biological factors, such as delayed sexual maturity and small clutch size, prevent rapid population recovery. Drought during the breeding season presents serious hazards to the species. Exposure to disease is a special problem when large numbers of birds are concentrated in limited areas, as often happens during times of drought (Lewis 1995, Campbell 2003, CWS and USFWS 2007).

Range and Habitat

Whooping cranes were originally found throughout most of North America. In the nineteenth century, the main breeding area was from the Northwest Territories to the prairie provinces in Canada, and the northern prairie states to Illinois. Only four populations of whooping cranes exist in the wild, the largest of which is the Aransas-Wood Buffalo population, which breeds in isolated marshy areas of Wood Buffalo National Park in Canada's Northwest Territories. Each fall, the entire population of whooping cranes from this national park migrates some 2,600 miles (4,183 kilometers) primarily to the Aransas NWR and adjacent areas of the central Texas coast in Aransas, Calhoun, and Refugio counties, where it overwinters in oak savannahs, salt marshes, and bays (USFWS 1995). During migration they use various stopover areas in western Canada and the American Midwest. The three other wild populations have been introduced: an eastern population that migrates between Wisconsin and Florida and two non-migratory populations, one in central Florida, the other in Louisiana.

The natural wild population of whooping cranes spends its winters at Aransas NWR, Matagorda Island, Isla San Jose, portions of Lamar Peninsula, and Welder Point on the east side of San Antonio Bay (CWS and USFWS 2007). The main stopover points in Texas for migrating birds are in the central and eastern Panhandle (USFWS 1995).

USFWS reintroduced a non-essential experimental population (NEP) to Vermillion Parish in southwestern Louisiana in 2011. The reintroduced population was designated as NEP under section 10(j) of the Endangered Species Act of 1973 (ESA), as amended. A NEP population is a reintroduced population believed not be essential for the survival of the species, but important for its fully recovery and eventual removal from the endangered and threatened list. Since 2011, 10-16 hatched juveniles have been released annually at White Lake Wetlands Conservation Area, and in 2016 a new release area was added 19 miles to the south at Rockefeller Wildlife Refuge. The NEP is approximately 175 miles from the action area.

Nesting habitat in northern Canada is in poorly drained region of freshwater marshes and wet prairies interspersed with numerous potholes and narrow-wooded ridges. Whooping cranes use a variety of habitats during migration, including freshwater marshes, wet prairies, inland lakes, small farm ponds, upland grain fields, and riverine systems. Shallow flooded palustrine wetlands are used for roosting, while croplands and emergent wetlands are used for feeding. Riverine habitats, such as submerged sandbars, are often used for roosting. The principal winter habitat in Texas is brackish bays, marshes, and salt flats, although whooping cranes sometimes feed in upland sites characterized by oak mottes, grassland swales, and ponds on gently rolling sandy soils (Lewis 1995, Campbell 2003, CWS and USFWS 2007).

Occurrence in the Action Area

All marsh areas have the potential to support foraging or resting birds. CA-5 and CA-6 are near CH, but only CA-6 has work that would be completed within the preferred habitat.

4.4 Eastern Black Rail

The eastern black rail is the most secretive of the secretive marsh birds and one of the least understood species in North America. The sparrow-sized bird with slate gray plumage and red eyes lives in remote wetlands of the Midwest and along the coasts of the Atlantic and Pacific oceans and the Gulf of Mexico. Because it only comes out at night, prefers to walk hidden in tall grasses instead of fly and rarely makes a call, very little is known about its behavior and habitat needs.

Not much is known about the subspecies diet but they are probably opportunistic foragers. Their bill shape suggests generalized feeding methods such as gleaning or pecking at individual items, thus a reliance on sight for finding food. Examination of specimens collected indicates a diet of small aquatic and terrestrial invertebrates, as well as small seeds. Foraging most likely occurs on or near the edges of stand of emerging vegetation -- both above and below the high water line.

Status

The eastern black rail was listed as threatened on October 8, 2020 with a Section 4(d) Rule (FR 63764). No CH has been designated for the species. The Section 4(d) Rule allows the Service to establish prohibitions or exceptions to prohibitions for threatened species while providing for the conservation of a threatened species by allowing flexibility under ESA. Prohibitions under the species-specific 4(d) rule include:

- purposeful "take" of eastern black rail, to include capture, handling, or other activities;
- incidental take from prescribed burns (unless utilizing BMPs), mowing, haying, and other mechanical treatment activities in the bird's habitat during the nesting or brooding periods; grazing on public lands that occur in the bird's habitat and do not support the maintenance of dense overhead cover in at least 50% of habitat in any given calendar year within a management boundary; and long-term or permanent damage, fragmentation, or conversion of habitat and the contiguous wetland-upland transition zone to other habitat types (such as open water) that do not support the bird;
- possession and other acts with unlawfully taken eastern black rails;
- import or export of eastern black rails;

- possession of unlawfully taken specimens of eastern black rails or conducting any other acts with unlawfully taken specimens of eastern black rails;
- engaging in interstate or foreign commerce of eastern black rails in the course of commercial activity; or
- selling eastern black rails or offering eastern black rails for sale.

The 4(d) rule also exempts some activities from take including:

- activities expressly permitted by 50 CFR §17.32 such as permits issued for scientific purposes, enhancement of propagation or survival, economic hardship, zoological exhibition, educational purposes, incidental taking, or special purposes;
- "Take" of an eastern black rail during the course of official duties by any employee or agent of the Service, NMFS, or a state conservation agency, operating a conservation program for the bird;
- Incidental take resulting from haying, mowing or other mechanical treatment activities in persistent emergent wetlands during the nesting and brooding periods that is a maintenance requirement to ensure safety and operational needs including: maintaining existing infrastructure such as fire-breaks, roads, rights-of-way, levees, dikes, fence lines, airfields, and surface water irrigation infrastructure;
- Incidental take resulting from haying, mowing or other mechanical treatment activities in persistent emergent wetlands during the nesting and brooding periods and occur from the control of woody encroachment and other invasive plant species in order to restore degraded eastern black rail habitat;
- Incidental take resulting from actions taken to control wildfires;
- Incidental take resulting from the establishment of new fire-breaks and new fence lines; or
- Incidental take resulting from prescribed burns, grazing, and mowing or other mechanical treatment activities in existing moist soil management units or prior converted croplands (e.g. impoundments for rice or other cereal grain production).

The primary threats to eastern black rail are: (1) Habitat fragmentation and conversion, resulting in the loss of wetland habitats across the range; (2) sea level rise and tidal flooding; (3) land management practices (*i.e.*, incompatible fire management practices, grazing, and haying/mowing/other mechanical treatment activities); and (4) stochastic events (*e.g.*, extreme flooding, hurricanes). Human disturbance, such as birders using excessive playback calls of black rail vocalizations, is also a concern for the species. Additional stressors to the species (including oil and chemical spills and environmental contaminants; disease, specifically West Nile virus; and predation and altered food webs resulting from invasive species (fire ants, feral pigs, nutria, mongoose, and exotic reptiles) introductions.

Range and Habitat

All of the information found in this section were summarized from Watts (2016), unless otherwise indicated.

The eastern black rail is a widely distributed, secretive marsh bird with little known about its population structure and dynamics. The subspecies is broadly distributed, living in salt and freshwater marshes in portions of the United States, Central America, and South America. The species is partially migratory wintering in the southern part of its breeding range.

The eastern black rail has a broad but poorly known breeding range that includes the Atlantic and Gulf Coasts of North America, parts of Colorado, Oklahoma and the mid-west, the West Indies including Cuba, Jamaica and historically Puerto Rico and parts of Central America from Mexico through Panama (Eddleman et al. 1994). A total of 1,937 occurrence records were found within this area between 1836 and 2016. Credible evidence of occurrence was found for 21 of the 23 states including 174 counties, parishes and independent cities and 308 named properties. Based on breeding evidence and seasonality of occurrence 34 (19%) counties were classified as confirmed, 97 (56%) as probable breeding and 43 (25%) as possible breeding. Many of the named properties are well-known conservation lands including 46 (15%) national wildlife refuges, 44 (14%) state wildlife management areas, 26 (8%) state and municipal parks and many named lands managed by non-governmental conservation organizations.

Since 2010, 247 black rail occurrences have been recorded within 11 of the 23 states in the study area. Records were found for 53 counties, parishes and independent cities (Figure 17). Based on breeding evidence and seasonality of occurrence 2 (4%) counties were classified as confirmed, 35 (66%) as probable breeding and 16 (30%) as possible breeding. Records were found for 92 named properties including 2 (3%) properties classified as confirmed, 73 (79%) as probable breeding and 17 (18%) properties classified as possible breeding.

The eastern black rail is a wetland dependent bird requiring dense overhead cover and soils that are moist to saturated (occasionally dry) and interspersed with or adjacent to very shallow water (typically ≤3 cm) to support its resource needs. Eastern black rails occur across an elevational gradient that lies between lower and wetter portions of the marsh and their contiguous uplands. Their location across this gradient may vary depending on the hydrologic conditions. These habitat gradients have gentle slopes so that wetlands are capable of having large areas of shallow inundation (sheet water). These wetlands are able to shrink and expand based on hydrologic conditions and thus provide dependable foraging habitat across the wetted areas and wetland-upland transition zone for the subspecies. Eastern black rails also require adjacent higher elevation areas (i.e., the wetland-upland transition zone) with dense cover to survive high water events due to the propensity of juvenile and adult black rails to walk and run rather than fly and chicks' inability to fly. (USFWS 2019)

The subspecies requires dense vegetation that allows movement underneath the canopy, and because are found in a variety of salt, brackish, and freshwater wetland habitats that can be tidally or non-tidally influenced, plant structure is considered more important than plant species composition in predicting habitat suitability. In terms of nest success, nests must be well hidden in a dense clump of vegetation over moist soil or shallow water to provide shelter from the elements and protection from predators. Flooding is a frequent cause of nest failure; therefore, water levels must be lower than nests during egg-laying and incubation in order for nets to be successful. In addition, shallow pools that are 1-3 cm deep may be the most optimal for foraging and for chick-rearing. (USFWS 2019)

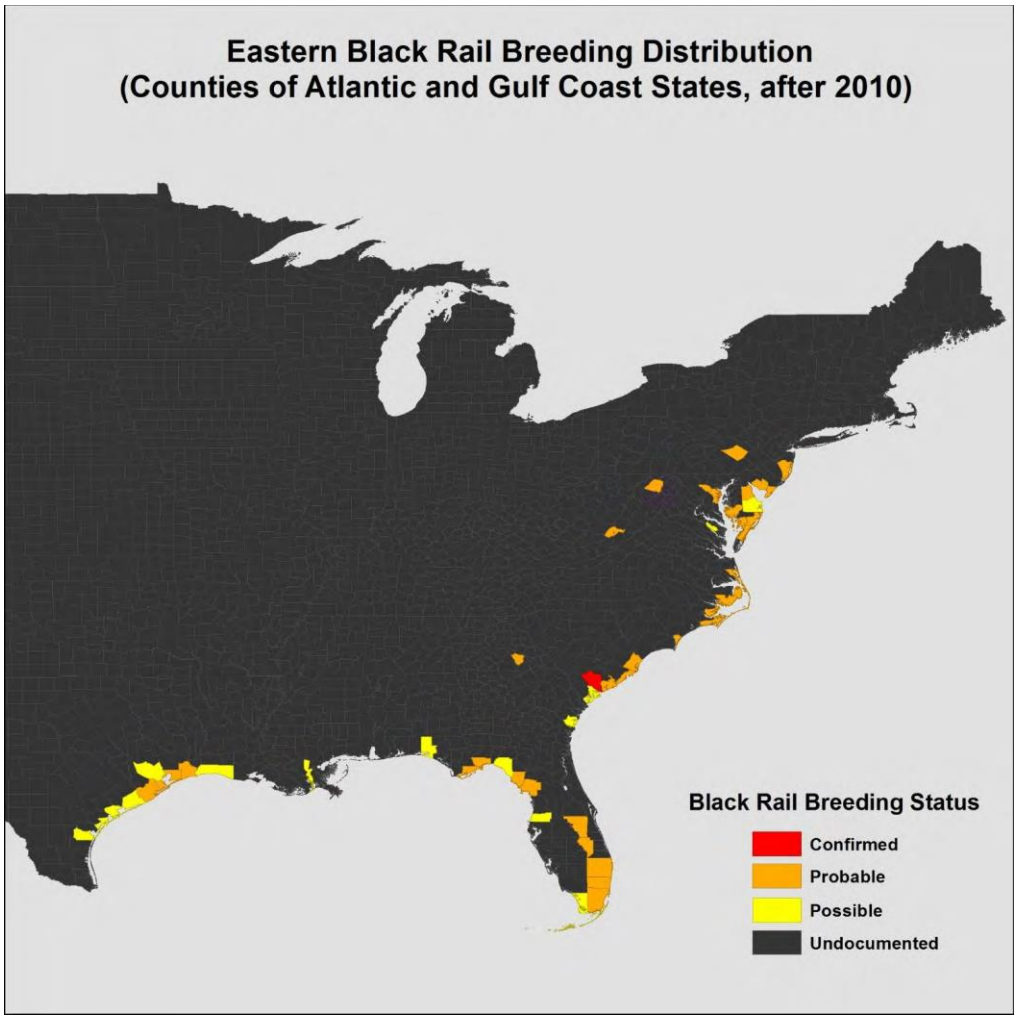

Figure 17. Map of Counties with Recent (2011-2016) credible records of eastern black rails during the breeding period (01 April to 31 August) (Watts 2016)

Occurrence in the Action Area

All information in this section was summarized from Watt (2016).

Texas is a black rail crossroad making it difficult to differentiate breeders from winter residents from migrants. Black rail in Texas use tidal salt marshes along the barrier islands and the mainland fringe, as well as, drier coastal prairie.

The upper Texas coast (Jefferson, Chambers, Galveston, Harris, and Brazoria counties) has a long history of black rail records that are concentrated within national wildlife refuges and state wildlife management areas. Much of the black rail activity along the upper Texas coast has been concentrated on the Bolivar Peninsula and Brazoria, Anahuac and San Bernard National Wildlife Refuges.

The central Texas coast (Matagorda, Calhoun, Aransas, San Patricio, Nueces, and Kleberg counties) does not appear to receive the same level of visitation from the bird-watching community as the upper coast. Exploration of black rails in this region seems to begin in the early 1990s with surveys by Ortego. Properties with significant black rail histories include Matagorda Island Wildlife Management Area, Mad

Island Wildlife Management Area, Aransas National Wildlife Refuge and the Magnolia Beach Wetlands where birds have been detected during breeding bird surveys for many years.

The south Texas coast (Kenedy and Cameron counties) has had few reports of black rails. Whether this is due to a lack of effort to find them or their absence is not clear. Black rails have been detected by McKinney on 19 May, 1995 and again on 3 July, 2005 around South Padre Island Nature and Birding Center in Cameron County (Lockwood et al. 2005). Freeman had a single black rail calling on 28 April, 2001 on Kenedy Ranch in Kenedy County.

Black rails have been reported from 13 counties and 35 identified properties. Breeding has been confirmed in Brazoria and Galveston counties and eight of the remaining 11 counties were classified as probable including: Aransas, Calhoun, Cameron, Chambers, Jefferson, Matagorda, Nueces, and San Patricio counties. Harris, Kenedy, and Kleberg counties are classified as possible breeding sites.

Texas, along with Florida, appear to be strongholds for the entire range based on occurrences within surveyed locations and the large coverage of potential habitat that remains to be fully assessed A loose population estimate for the state is set to 100 to 500 pairs with high uncertainty. Additional survey effort focused on population estimated is needed to improve the population estimates.

Specifically within the action areas, G-28, B-12, CA-6, and M-8 would have work that would be completed within marsh habitat that is considered degraded and not marginal at best due to presence of deep open water habitats intermixed within the marsh and daily tidal influences. Some areas are densely vegetated but are far from the upland transition the birds require to escape tidal influences. While other action areas are near marsh, the occurrence of birds immediately near the action areas (e.g. at the edge of marsh habitats) are highly unlikely due to the presence of deeper water and waters that are highly tidally influenced to an extent greater than the species is likely to tolerate.

4.5 West Indian Manatee

Manatees are large, elongated marine mammals with paired flippers and a large, spoon-shaped tail. They can reach lengths of over 14 feet and weights of over 3,000 pounds. Manatees are herbivores that feed opportunistically on a wide variety of submerged, floating, and emergent vegetation.

Status

USFWS listed the West Indian manatee as endangered on March 11, 1967 (32 FR 4001) and later received protection under ESA in 1973. On May 5, 2017, the species was reclassified from endangered to threatened because the endangered designation no longer reflected the status of the species at the time of reclassification (82 FR 16668). CH for the Florida manatee subspecies (*Trichechus manatus latirostris*) was designated in 1976 (41 FR 41914).

The major threats faced by manatees today are many fold. Collisions with watercraft account for an average of 24-30 percent of the known manatee deaths in Florida annually. Deaths attributed to water control structures and navigational locks represent four percent of known deaths.

There are also threats to their habitat as a result of intensive coastal development throughout much of the manatee's range. As well, the availability of warm-water refuges for manatee is uncertain if minimum flows and levels are not established for the natural springs on which many manatees depend

and as deregulation of the power industry in Florida occurs. There are also threats from natural events such as red tide and cold events. (USFWS 2001b)

Range and Habitat

The West Indian manatee was historically found in shallow coastal waters, bays, lagoons, estuaries, rivers, and inland lakes throughout much of the tropical and sub-tropical regions of the New World Atlantic, including many of the Caribbean islands. However, at the present time, manatees are now rare or extinct in most parts of their former range. Today, manatees occur primarily in Florida and southeastern Georgia, but individuals can range as far north as Rhode Island on the Atlantic coast (Reid 1996) and as far west as Texas on the Gulf coast.

Manatees live in marine, brackish, and freshwater systems in coastal and riverine areas throughout their range. Preferred habitats include areas near the shore featuring underwater vegetation like seagrass and eelgrass. They feed along grass bed margins with access to deep water channels, where they flee when threatened. Manatees often use secluded canals, creeks, embayments, and lagoons, particularly near the mouths of coastal rivers and sloughs, for feeding, resting, cavorting, mating, and calving (Marine Mammal Commission 1986). In estuarine and brackish areas, natural and artificial fresh water sources are sought by manatees.

When ambient water temperatures drop below 68 degrees Fahrenheit in autumn and winter, manatees aggregate within the confines of natural and artificial warm-water refuges or move to the southern tip of Florida (Snow 1991). Most artificial refuges are created by warm-water outfalls from power plants or paper mills. The largest winter aggregations are at refuges in Central and Southern Florida. The northernmost natural warm-water refuge used regularly on the west coast is at Crystal River and at Blue Springs in the St. Johns River on the east coast. Most manatees return to the same warm-water refuges each year; however, some use different refuges in different years and others use two or more refuges in the same winter (Reid and Rathbun 1986, Reid et al. 1995). Many lesser known, minor aggregation sites are used as temporary thermal refuges. Most of these refuges are canals or boat basins where warmer water temperatures persist as temperatures in adjacent bays and rivers decline.

As water temperatures rise manatees disperse from winter aggregation areas. While some remain near their winter refuges, others undertake extensive travels along the coast and far up rivers and canals. On the east coast, summer sightings drop off rapidly north of Georgia (Lefebvre et al. 2001) and are rare north of Cape Hatteras (Schwartz 1995); the northernmost sighting is from Rhode Island (Reid 1996). On the west coast, sightings drop off sharply west of the Suwannee River in Florida (Marine Mammal Commission 1986). Rare sightings also have been made in the Dry Tortugas (Reynolds and Ferguson 1984) and the Bahamas (Lefebvre et al. 2001).

During the summer, manatees may be commonly found almost anywhere in Florida where water depths and access channels are greater than one to two meters (3-6 feet) (O'Shea 1988). Manatees can be found in very shallow water. In warm seasons, they usually occur alone or in pairs, although interacting groups of five to ten animals are not unusual.

Occurrence in the Action Area

The West Indian manatee historically inhabited the Laguna Madre, the Gulf, and tidally influenced portions of rivers. It is currently, however, extremely rare in Texas waters and the most recent sightings

are likely individuals migrating or wandering from Mexican waters. Historical records from Texas waters include Cow Bayou (outside any of the action areas), Sabine Lake (outside any of the action areas), Copano Bay, the Bolivar Peninsula (G-28), and the mouth of the Rio Grande (Schmidly 2004, Würsig 2017). Despite a couple of sightings off the coast of Galveston Island in the Gulf of Mexico, as recently as 2019, and intermittent sightings occurring as far back as 1995 of a manatee occurring in Buffalo Bayou a tributary to Galveston Bay, the Galveston Bay and upper coast in general is lacking preferred habitat and food sources as compared to the lower coast. When the sightings have occurred, the bay and other areas had a higher incidence of water hyacinth from rain and flooding and was thought to be the reason the individuals were attracted to the area. None of the individuals stayed in the area for any substantial length of time and none are expected to regularly frequent the upper coast.

In 2005, 2007, and 2019, an individual manatee were spotted in or near the W-3 action area of the Laguna Madre and Mansfield Pass. In 2019, it is believed the same manatee observed near the pass was also observed off the coast of South Padre Island. The lower coast, particularly the W-3 action area, generally supports more preferred habitat than any of the other action areas due to the abundance of seagrass meadows in the Laguna Madre.

Due to the species' extreme rarity in the action area, its presence is highly unlikely; however, with historic and recent records from some of the action areas, it cannot be ruled out with certainty that the species could not occur in the action areas. If a manatee were to occur in any of the action areas, it is anticipated it would be a lone individual when water temperatures are warmer (late spring to early fall).

4.6 Loggerhead Sea Turtle

The loggerhead sea turtle is a medium to large turtle. Adults are reddish-brown in color and generally 31 to 45 inches in shell length with the record set at more than 48 inches. Loggerheads weigh between 170 and 350 pounds with records set at greater than 500 pounds. Loggerhead turtles are essentially carnivores, feeding primarily on sea urchins, sponges, squid, basket stars, crabs, horseshoe crabs, shrimp, and a variety of mollusks. Adults are primarily bottom feeders, although they will also eat jellyfish and mangrove leaves obtained while swimming and resting near the sea surface. Presence of fish species, such as croaker in stomachs of stranded individuals may indicate feeding on the by-catch of shrimp trawling (Landry 1986). Young feed on prey concentrated at the surface, such as gastropods, fragments of crustaceans, and sargassum.

Status

USFWS listed the loggerhead sea turtle as threatened throughout its range on July 28, 1978 (43 FR 32808). Although the loggerhead is the most abundant sea turtle species in US coastal waters (NMFS 2006), the decline of the species, like that of most sea turtles is the result of overexploitation by man, inadvertent mortality associated with fishing and trawling activities, and natural predation. The most significant threats to its population are coastal development, commercial fisheries and pollution (NMFS 2006)

Range and Habitat

Loggerhead sea turtles occur throughout the temperate and tropical regions of the Atlantic from Nova Scotia to Argentina, Gulf of Mexico, Pacific and Indian oceans (although it is rare in eastern and central Pacific), and the Mediterranean (Iverson 1986). This species may be found hundreds of miles out to sea,

as well as in inshore areas such as bays, lagoons, salt marshes, creeks, and the mouths of large rivers. Loggerhead sea turtles are considered turtles of shallow water. Juvenile loggerheads are thought to utilize bays and estuaries for feeding, while adults prefer water less than 165 feet deep (Nelson 1986).

Adults occupy various habitats from turbid bays to clear waters of reefs. Sub-adults occur mainly in nearshore and estuarine waters, while hatchlings move directly to the sea after hatching, and often float in masses of sargassum. They remain associated with sargassum for as long as 3 to 5 years (NFMS and USFWS 1991a).

In the continental US, loggerheads nest along the Atlantic coast from Florida to as far north as New Jersey (Musick 1979) and sporadically along the Gulf Coast. In recent years, a few have nested on barrier islands along the Texas coast. Nesting usually occurs on open sandy beaches above the high-tide mark and seaward of well-developed dunes. They nest primarily on high-energy beaches on barrier islands adjacent to continental land masses in warm-temperate and subtropical regions. Steeply sloped beaches with gradually sloped offshore approaches are favored. In Florida, nesting on urban beaches was strongly correlated with the presence of tall objects (trees or buildings), which apparently shield the beach from city lights (Solmon et al. 1995).

Occurrence in the Action Area

The loggerhead is the most abundant turtle in Texas marine waters, preferring shallow inner continental shelf waters, and occurring only very infrequently in the bays. It often occurs near offshore oil rig platforms, reefs, and jetties. Loggerheads are probably present year-round but are most noticeable in the spring when a favored food item, the Portuguese man-of-war (*Physalia physalis*), is abundant. Loggerheads constitute a major portion of the dead or moribund turtles washed ashore (stranded) on the Texas coast each year.

Several nests have been recorded along the Texas coast; however, nesting is uncommon. In 1999, two loggerhead nests were confirmed in Texas, while in 2000, five loggerhead nests were confirmed. In 2014 only two nests were found along Texas beaches (NPS, 2015) while in 2015 this number increased to eight nests (NPS, 2016), with six occurring at Padre Island National Seashore and two found on San Jose Island. Between 2015 and 2020, nesting occurred in four of the six years with between 2 and 5 nests recorded each year at Padre Island National Seashore. During that same period, no nesting was documented in the same two years as at Padre Island National Seashore and in nesting years only 1 nest was found except for in 2018 when two nests were recorded at South Padre Island. (Turtle Island Restoration 2020)

Nesting within or near the other action areas has not been recorded; however, there is potential for the species to occur in any of action areas with a higher likelihood of occurrences along the lower Texas coast.

4.7 Green Sea Turtle

Green turtles are the largest of all the hard-shelled sea turtles, but have a comparatively small head. Adult turtles are unique among sea turtles in that they only eat plants; they are herbivorous, feeding primarily on seagrasses and algae. While juveniles consume some invertebrates including seagrasses, macroalgae and other marine plants, mollusks, sponges, crustaceans, and jellyfish (Mortimer 1982).

Status

The green sea turtle was listed on July 28, 1978, as threatened except for in Florida and the Pacific Coast of Mexico (including the Gulf of California) where it was listed as endangered (43 FR 32808). In 1998, NMFS designated CH to include the coastal waters around Culebra Island, Puerto Rico (63 FR 46693). On May 6, 2016, NMFS and USFWS revised the listing to identify 11 green sea turtle distinct population segments (DPS) worldwide. The proposed DPS would list the North Atlantic DPS as threatened.

The principal cause of the historical, worldwide decline of the green turtle is long-term harvest of eggs and adults on nesting beaches and juveniles and adults on feeding grounds. These harvests continue in some areas of the world and compromise efforts to recover the species. Other threats include incidental capture in fishing gear, primarily gillnets, but also in trawls, traps and pots, longlines, and dredges, as well as nesting habitat loss and disturbance from recreational use of beaches, development, erosion, and vegetation changes. Green turtles are also threatened, in some areas of the world especially in Hawaii and Florida, by a disease known as fibropapillomatosis, or "tumor" infections.

Range and Habitat

The green sea turtle is a circumglobal species in tropical and subtropical waters. In the US, it occurs in Atlantic waters around the US Virgin Islands, Puerto Rico, and continental US from Massachusetts to Texas. Major nesting activity occurs on Ascension Island, Aves Island (Venezuela), Costa Rica, and in Suriname. Relatively small numbers nest in Florida, with even smaller numbers in Georgia, North Carolina, and Texas (NFMS and USFWS 1991b, Hirth 1997).

The green turtle primarily utilized shallow habitats such as lagoons, bays, inlets, shoals, estuaries, and other areas with an abundance of marine algae and seagrasses. Hatchlings often float in masses of sea plants (e.g. rafts of sargassum) in convergence zones. Coral reefs and rocky outcrops near feeding pastures often are used as resting areas.

Terrestrial habitat is typically limited to nesting activities (Balazs 1980) that occur during the summer from June to September. They prefer high energy beaches with deep sand, which may be coarse to fine, with little organic content. Most green sea turtles nest in Florida and in Mexico and nests in Texas are rare (Shaver and Amos 1988). More recently, green turtle nests were documented in Texas, of which all but one were from Padre Island National Seashore. In 2012, six green turtle nests were reported from Padres Island National Seashore and two from South Padre Island.

Occurrence in the Action Area

The green sea turtle is the most common sea turtle in Texas. The Gulf of Mexico, Laguna Madre and Mansfield Channel waterways (W-3) serve as vital developmental habitat for juvenile green sea turtles. Green sea turtles forage through the prominent seagrass meadows and algae that thrive in inshore bays and passes in the lower coast. During maintenance dredging operations between November 2019 and March 2020, a total of eight green turtle takes were recorded and three confirmed incidents with green sea turtle were recorded, with an additional 4 incidents recorded that were likely green sea turtle.

In harsh winter weather, cold stunned green sea turtles are frequently found floating alive but unable to swim in the Laguna Madre and other inshore waters and are unable to escape to warmer waters further

offshore and south in the Gulf of Mexico. In the winter of 2017-2018, nearly 4,000 green sea turtles were stranded and rescued in Texas inshore waters.

All recorded green sea turtle nests in Texas have occurred on the lower Texas coast at South Padre Island and Padre Island National Seashore, which would be in or near the action area for W-3 and South Padre Island Beach Nourishment. In 1987, the first confirmed nesting of a green sea turtle on the Texas coast was recorded (Shaver and Amos 1988). More recently, two green turtle nests were documented in 2006 and three is 2007; all but one in 2007 were from Padre Island National Seashore. In 2011 and 2012, six green sea turtle nests were reported from Padre Island National Seashore and two from South Padre Island. The 2020 nest total set a new record for the number of nests documented in Texas with 28 nests recorded at Padre Island National Seashore and 7 reported from South Padre Island. (Turtle Island Restoration 2020)

Green sea turtles are very likely to be encountered within the W-3 and South Padre Island Beach Nourishment action areas. Although green sea turtle nests have not been documented in or near other action areas and many of these action areas support little to no seagrass meadows, it remains possible that the species could occur as a transient species.

4.8 Leatherback Sea Turtle

Leatherback sea turtles are named for their appearance. They do not have shells as other sea turtles do. Instead, their backs are covered by a slate black to bluish-black leathery skin with irregular white or pink patches. They are the largest turtles in the world, reaching over 6 feet in length and weigh 650-1,200 pounds (NPS 2013). Despite their large size, the diet of leatherbacks consists largely of jellyfish and sea squirts. They also consume sea urchins, squid crustaceans, fish, blue-green algae, and floating seaweed (NFWL 1980).

Status

The leatherback sea turtle was listed as endangered throughout its range on June 2, 1970 (35 FR 8495), with CH designated at Sandy Point, St. Croix in the US Virgin Islands on March 23, 1979 (44 FR 17710). NMFS established a leatherback conservation zone extending from Cape Canaveral to the Virginia-North Carolina border and includes all inshore and offshore waters.

Leatherback sea turtles face threats on both nesting beaches and in the marine environment. The greatest causes of decline and the continuing primary threats to leatherbacks worldwide are long-term harvest and incidental capture in fishing gear. Harvest of eggs and adults occurs on nesting beaches while juveniles and adults are harvested on feeding grounds. Incidental capture primarily occurs in gillnets, but also in trawls, traps and pots, longlines, and dredges. Additionally, leatherbacks are threatened by the existence of marine debris such as plastic bags and balloons, which they often consume after mistaking them for their preferred prey, jellyfish.

Range and Habitat

The leatherback sea turtle is mainly pelagic, inhabiting the open ocean, and seldom approaches land except for nesting (Eckert 1992). It is most often found in coastal waters only when nesting or when following concentrations of jellyfish (TPWD 2006), when it can be found in inshore waters, bays, and

estuaries. The leatherback typically nests on beaches with a deepwater approach (Pritchard 1971). It dives almost continuously, often to great depths.

The leatherback is probably the most wide-ranging of all sea turtle species. It occurs in the Atlantic, Pacific and Indian Oceans, as far north as British Columbia, Newfoundland, Great Britain, and Norway; as far south as Australia, Cape of Good Hope, and Argentine; and in other water bodies such as the Mediterranean Sea (NFWL 1980). Leatherbacks nest primarily in tropical regions with major nesting beaches in Malaysia, Mexico, French Guiana, Suriname, Costa Rica, and Trinidad (Ross 1982). Leatherbacks nest only sporadically in some of the Atlantic and Gulf states of the continental US, with one nesting reported as far north as North Carolina (Schwartz 1976). In the Atlantic and Caribbean, the largest nesting assemblages occur in the US Virgin Islands, Puerto Rico, and Florida (NMFS 2006).

The leatherback migrates farther and ventures into colder water than any other marine reptile. Adults appear to engage in routine migrations between boreal, temperate, and tropical waters, presumably to optimize both foraging and nesting opportunities. During the summer, leatherbacks tend to occur along the East Coast of the US from the Gulf of Main south to the middle of Florida.

Apart from occasional feeding aggregations reported off Port Aransas in December 1956 (Leary 1957), or possible concentrations in the Brownsville Eddy in winter (Hildebrand 1983), leatherbacks are rare along the Texas coast, tending to keep deeper offshore waters where their primary food source, jellyfish, occurs. In the Gulf, the leatherback is often associated with two species of jellyfish including the cabbagehead (*Stomolophus sp.*) and the moon jellyfish (*Aurelia sp.*) (NMFS and USFWS 1992).

According to USFWS (1981), leatherbacks have never been common in Texas waters. No nests of this species have been recorded in Texas for at least 70 years (NPS 2006). The last two, one from the late 1920s and one from the mid-1930s, were both from Padre Island (Hildebrand 1982, Hildebrand 1986).

Occurrence in the Action Area

There is only on recorded nest of leatherback sea turtles in Texas that occurred in 2008 at Padre Island National Seashore (Turtle Island Restoration 2020); however, the proximity to the W-3 location is unknown. Due to the species preference for deep marine waters, it is highly unlikely that the species would occur in any of the action areas; however, because there is a fairly recent record of nesting near W-3, the remote chance that a turtle could occur in the any of the action areas along the southern coast cannot be ruled out with certainty.

4.9 Hawksbill Sea Turtle

The hawksbill sea turtle is a small to medium-sized marine turtle with an elongated oval shell with overlapping scutes on the carapace, a relatively small head with a distinctive hawk-like beak, and flippers with two claws. An adult may reach up to 3 feet in length and weigh up to 300 pounds, although adults more commonly average about 2.5 feet in length and typically weigh around 176 pounds. While the species is omnivorous, it prefers invertebrates, especially encrusting organisms, such as sponges, tunicates, bryozoans, mollusks, corals, barnacles, and sea urchins. Pelagic species consumed jellyfish and fish, and plant material such as algae, sea grasses, and mangroves, have been reported as food items for this turtle (Mortimer 1982). The young are reported to be somewhat more herbivorous than adults (Ernst and Barbour 1972).

Status

The hawksbill sea turtle was federally listed as endangered on June 2, 1970 (35 FR 8495) with CH designated in Puerto Rico on May 24, 1978 (43 FR 22224). In 1998, NMFS designated additional CH near Isla Mona and Isla Monito, Puerto Rico, seaward to 3.9 miles (63 FR 46693—46701).

The greatest threat to this species is harvest to supply the market for tortoiseshell and stuffed turtle curios (Meylan and Donnelly 1999). Hawksbill shell (bekko) commands high prices. Japanese imports of raw bekko between 1970 and 1989 represented the loss of more than 670,000 turtles. The hawksbill is also used to manufacture leather oil, oil, perfume, and cosmetics (NMFS 2006).

Other threats include destruction of breeding locations by beach development, incidental take in lobster and Caribbean reef fish fisheries, pollution by petroleum products (especially oil tanker discharges), entanglement in persistent marine debris (Meylan 1992), and predation on eggs and hatchlings.

Range and Habitat

Hawksbill generally inhabit coastal reefs, bays, rocky areas, passes, estuaries, and lagoons, where they occur at depths of less than 70 feet. Like some other sea turtle species, hatchlings are sometimes found floating in masses of marine plants (e.g. sargassum rafts) in the open ocean (NFWL 1980). Hawskbills reenter coastal waters when they reach a carapace length of approximately 7.9 to 9.8 inches. Coral reefs are widely recognized as the resident foraging habitat of juveniles, subadults, and adults. This habitat association is undoubtedly related to their diet of sponges, which need solid substrate for attachment. Hawksbills also occur around rocky outcrops and high-energy shoals, which are optimum sites for sponge growth. In Texas, juvenile hawksbills are often associated with stone jetties (NMFS 2006).

Terrestrial habitat is typically limited to nesting activities. The hawksbill, which is typically a solitary nester, nests on undisturbed, deep-sand beaches, from high-energy ocean beaches to tiny pocket beaches about 10 feet wide bound by crevice of cliff walls. Typically, the sand beaches are low energy, with woody vegetation, such as sea grape (*Coccoloba uvifera*), near the waterline (NRC 1990).

The hawksbill is circumtropical, occurring in tropical and subtropical seas of the Atlantic, Pacific, and Indian oceans (Witzell 1983). This species is the most tropical of all marine turtles, although it does occur in many temperate regions. The hawksbill sea turtle is widely distributed in the Caribbean Sea and western Atlantic Ocean, with representatives of at least some life history stages regularly occurring in southern Florida and the northern Gulf (especially Texas), south to Brazil (NMFS 2006).

In the continental US, the hawksbill largely nests in Florida where it is sporadic at best (NFWL 1980). A major nesting beach exists on Mona Island, Puerto Rico and elsewhere in the western Atlantic, hawksbills nest in small numbers along the Gulf Coast of Mexico, the West Indies, and along the Caribbean coasts of Central and Southern America (Musick 1979).

Texas is the only state outside of Florida where hawkbills are sighted with any regularity. Most of these sightings involve posthatchlings and juveniles, and are primarily associated with stone jetties. These small turtles are believed to originate from nesting beaches in Mexico (NMFS 2006). On June 13, 1998, the first hawksbill nest was recorded on the Texas coast near Padre Island National Seashore. This nest remains the only documented hawksbill nest on the Texas coast (Shaver 2006, NPS 2020).

Occurrence in the Action Area

Stranding data from 2004 through 2007 show that 59 hawksbill were found along Texas waters or shorelines. Of the hawksbill strandings reported during that period, 17 were from zone 21, which extends from the mouth of the Rio Grande to the vicinity of Yarborough Pass near Baffin Bay and includes the action areas of.

The further up coast, hawksbill sea turtles become rarer with the species having never been recorded from the upper coast region. No hawksbills have been killed or captured during relocation trawls or dredging operations since record-keeping began in 1995 at any of the dredging locations (USACE 2019).

The hawksbill sea turtle has a higher likelihood of occurrence within the W-3 and South Padre Island Beach Nourishment than any of the other action areas. Despite the lack of occurrence in many of the action areas, the species could occur in any of the action areas.

4.10 Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle is the smallest of the sea turtles, with adults reaching about 2 feet in length and weighing up to 100 pounds. The species has a triangular-shaped head and a slightly hooked beak with large crushing surfaces. The turtle's diet consists mainly of swimming crabs, but may also include fish, jellyfish, sea stars, snails, bivalves, shrimp, sea urchins, an array of mollusks, and occasional marine plants (NMFS et al. 2011).

Status

Kemp's ridley sea turtle was listed as endangered throughout its range on December 2, 1970 (35 FR 18320). Populations of the species have declined since 1947, when an estimated 42,000 females nested in one day (Hildebrand 1963), to a total nesting population of approximately 1,000 in the mid-1980s. The decline of the species was primarily due to human activities including collection of eggs, fishing for juveniles and adults, killing adults for meat and other products, and direct take for indigenous use.

Threats affecting Kemp's ridley are often specific to life stages and the habitats where they occur. On the shoreline (nesting beach) threats to the species include: illegal harvest; beach cleaning; human presence during recreation or construction; recreational beach use; beach vehicular driving; construction activities such as beach nourishment, shoreline stabilization, and development; energy exploration, development and removal; ecosystem alterations such as beach erosion, vegetation composition changes, and invasive species; pollution from oil spills, exposure to toxins and chemicals from illegal dumping and garbage, and light; predation; and disease (NMFS et al. 2011).

In open water, sea turtles caught in commercial and recreational fisheries are often injured or killed. Of all commercial and recreational fisheries in the US, shrimp trawling has had the greatest effect on the status of sea turtle populations, followed by dredges, longlines, nets, and traps/pots. Entanglement in fishing gear can lead to abrasions, restrictions, tissue necrosis, and drowning. Turtles are also susceptible to illegal harvest and boat strikes while in the water (NMFS et al. 2011).

Range and Habitat

Kemp's ridleys inhabit shallow coastal and estuarine waters, usually over sand or mud bottoms. Models indicate that the most suitable habitats are less than 32 feet (10 m) in bottom depth with sea surface

temperatures between 71.6° and 89.6°F (22° and 32°C) (Coyne et al. 2000). Kemp's ridleys utilize seagrass beds, mud bottom, and live bottom substrates as important developmental habitats (Schmid and Barichivich 2006). Post-nesting Kemp's ridleys travel along coastal corridors that are generally shallower than 164 feet (50 m) in bottom depth (Schmid and Barichivich 2006). Females lay their eggs on coastal beaches where they incubate eggs in sandy nests. After embryonic development, the hatchlings emerge and swim offshore into deeper, ocean water where they feed and grow until returning at a larger size to nearshore coastal habitats. This life history is characterized by three basic ecosystem zones: (1) terrestrial zone (supralittoral) – the nesting beach where both oviposition and embryonic development occur; (2) neritic zone – the nearshore (including bays and sounds) marine environment (from the surface to the sea floor) where water depths do not exceed 200 meters, including the continental shelf; and (3) oceanic zone – the vast open ocean environment (from the surface to the sea floor) where water depths are greater than 650 feet (200 meters) (NMFS et al. 2011).

Kemp's ridleys nest on beaches from April to July. Nesting is essentially limited to the beaches of the western Gulf of Mexico, primarily in Tamaulipas, Mexico. Nesting also occurs in Veracruz and a few historical records exist for Campeche, Mexico (Marquez 1994). Nesting also regularly occurs in Texas and infrequently in a few other US states. However, historic nesting records in the US are limited to south Texas (Hildebrand 1963). Several scatted isolated nesting attempts have occurred from North Carolina to Colombia.

Kemp's ridley occurs in Texas in small numbers and in many cases may well be in transit between crustacean-rich feeding areas in the northern Gulf and breeding grounds in Mexico. It has nested sporadically in Texas over the last 50 years. The number of nestings have increased over the last couple of decades (NPS 2012 and 2013), although some of these nests were from headstarted ridleys. The majority of Kemp's ridley nests recorded in Texas were at the Padre Island National Seashore (PINS) (Shaver 2006). Such nestings, together with the proximity of the Rancho Nuevo rookery, probably account for the occurrence of hatchlings and subadults in Texas.

Occurrence in the Action Area

The upper Texas coasts are important foraging and inter-nesting habitats for the species. Satellite-tracking studies conducted by Texas A&M University at Galveston on the Kemp's ridleys nesting on Bolivar, Galveston, and Surfside beaches indicate that nesters remain in near-shore waters of the upper Texas coast during their 3.5 month-long nesting season (April through mid-July) (Seney and Landry 2008). Between 1990 and 2010 ten Kemp's ridley nests were documented on Bolivar Peninsula and 37 Kemp's ridley nests were documented on Galveston Island (USACE 2010). Between 2017 and 2019, six nests were found on Bolivar and 13 nests were found on Galveston Island (Turtle Island Restoration 2020).

A record number of Kemp's ridley nests were recorded in 2017, with 353 nests being in Texas, of which 219 were recorded from Padre Island National Seashore (W-3). Nesting dropped in 2018 and 2019, which is typical due to the reproduction biology of the species (females nest approximately every 2-3 years). For the 10-year period 2010 to 2019, an average of 110 nests were recorded annually at Padre Island National Seashore.

Of all the sea turtles potentially present within the action areas, Kemp's ridley has the highest potential for occurrence based on habitat requirements, nesting records, and research. Table 7 shows the nesting

activity at locations in or near some of the action areas where beach work would be completed and nesting impacts would be considered. The action areas on or near Galveston Island and Bolivar Peninsula where sufficient beach width exists could provide suitable nesting habitat. For areas where beaches are narrower or where recreational use is high, nesting is less likely. The B-2 and W-3 action areas are severely sediment starved and as a result have fairly narrow beaches. Given the quality of the habitat, it is likely that nesting at nearby sites would be preferred over the action areas. Within the South Padre Island Beach Nourishment action area, there is high potential for Kemp's ridley nests to be found.

For all other actions and action areas, Kemp's ridley turtles are likely to forage, rest, or move in and near the action area, but are unlikely to nest due to the lack of suitable nesting habitat.

Table 7. Nesting Locations of Kemp's Ridley Sea Turtles (Turtle Island Restoration 2020)

Nesting Location	Measure Association	2015	2016	2017	2018	2019	2020
Bolivar Peninsula	Bolivar Roads Gate System, Bolivar and West Galveston Beach and Dune System, Galveston Seawall Improvements, Galveston Ring Barrier System	5	0	3	0	3	0
Galveston Island		3	0	5	0	4	1
Brazoria County, north of Surfside	B-2	1	0	0	0	0	1
Padre Island National Seashore	W-3	101	89	219 (area record)	35	117	136
South Padre Island	South Padre Island Beach Nourishment	34	63	70	21	41	72 (area record)

4.11 Summary of Species Found in the Action Area

Table 8 provides a summary of which species are listed for each measure and their potential for occurring in the action area of the applicable measure. A total of 10 species have the potential to occur in at least one of the action area locations, while 15 were identified as not likely to occur in the action area due to lack of suitable habitat.

CH for piping plover overlaps four measures (G-28, South Padre Island [SPI] Beach and Dune Improvements, Bolivar Roads Surge Gates, and Bolivar Peninsula and Galveston Island Beach and Dune Improvements). Designated CH for the remaining six species does not overlap any of the action areas.

Table 8. Summary of Suitable Habitat Found in the Action Areas

Species	Actionable								Tier 2				
	G-28	B-12	CA-5	CA-6	M-8	SP-1	W-3	SPI	B-2	Bolivar Roads Surge Gate	Bolivar Peninsula/ Galveston Beach & Dune	Galveston Ring Levee	Clear Creek & Dickinson Surge Gates
Birds													
Piping plover	✓	M	NSH	M	M	M	✓	✓	✓	✓	✓	M	NSH
Red knot	✓	M	NSH	M	M	M	✓	✓	✓	✓	✓	M	NSH
Whooping crane	✓	✓	✓	✓	✓	✓	✓	--	✓	--	--	--	--
Northern aplomado falcon	--	NSH	NSH	NSH	NSH	NSH	NSH	NSH	--	--	--	--	--
Eastern black rail[+]	M	M	NSH	M	M	NSH	NSH	NSH	NSH	NSH	NSH	M	NSH
Attwater's greater prairie-chicken	NSH	--	--	--	--	--	--	--	--	NSH	NSH	NSH	NSH
Clams													
Texas fawnsfoot	--	NSH	--	--	--	--	--	--	--	--	--	--	--
Fish													
Oceanic whitetip shark	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH
Giant manta ray	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH
Mammals													
Sei whale	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH
Bryde's Whale	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH
Fin whale	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH
Gulf Coast jaguarundi	--	--	NSH	NSH	--	NSH	NSH	NSH	--	--	--	--	--

Species	Actionable								Tier 2				
	G-28	B-12	CA-5	CA-6	M-8	SP-1	W-3	SPI	B-2	Bolivar Roads Surge Gate	Bolivar Peninsula/ Galveston Beach & Dune	Galveston Ring Levee	Clear Creek & Dickinson Surge Gates
Ocelot	--	--	--	--	--	NSH	NSH	NSH	--	--	--	--	--
Sperm whale	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH	NSH
West Indian manatee	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Plants													
Texas ayenia	--	--	--	--	--	--	NSH	NSH	--	--	--	--	--
South Texas ambrosia	--	--	--	--	--	NSH	--	NSH	--	--	--	--	--
Slender rush-pea	--	--	--	--	--	NSH	--	--	--	--	--	--	--
Texas prairie dawn-flower	--	--	--	--	--	--	--	--	--	--	--	--	NSH
Reptiles													
Loggerhead sea turtle	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Green sea turtle	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Leatherback sea turtle	M	M	M	M	M	M	M	M	M	M	M	M	M
Hawksbill sea turtle	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Kemp's Ridley sea turtle	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Species	Actionable								Tier 2				
	G-28	B-12	CA-5	CA-6	M-8	SP-1	W-3	SPI	B-2	Bolivar Roads Surge Gate	Bolivar Peninsula/ Galveston Beach & Dune	Galveston Ring Levee	Clear Creek & Dickinson Surge Gates

-- : Not Listed ✓: Quality Habitat, High Potential to Occur in the Action Area M: Marginal Habitat, Low Potential to Occur in the Action Area

X: No Suitable Habitat, no potential to occur in the action area

+: Species is not listed on the IPaC reports as occurring in the project areas; however, the Service strongly encouraged USACE to consider the species

5.0 EFFECTS OF THE ACTIONABLE MEASURES

Fifteen species that were identified on at least one of the three sources sought during species identification were determined to not be present in the study area because their known range does not overlap the action area or suitable habitat does not exist in the action area (Table 5). Therefore, the proposed action would have ***no effect*** on the northern aplomado falcon, Attwater's prairie chicken, Texas fawnsfoot, oceanic whitetip shark, giant manta ray, sei whale, Bryde's whale, fin whale, Gulf Coast jaguarundi, ocelot, sperm whale, Texas ayenia, South Texas ambrosia, slender rush pea, and Texas prairie dawn flower. These species will not be discussed in further detail.

This BE will only address activities that would occur after the material has been dredged (e.g. transportation and placement of dredged material, construction activities, plantings, invasive species removal, etc.). Because nearly all of the fill material would come from maintenance dredging of existing navigation channels and follow the maintenance plan as described in GRBO, the analyses completed for that Biological Assessment (BA) and associated BO are sufficient for the dredging portions of this project. For all actionable measures that would utilize dredged material from the surge gate location, the impacts associated with that dredging operation would be assessed in a separate BA and BO during Tier 2 analysis. The actionable measures dependent on the surge gate material would not be implementable until Section 7 consultation is complete for that action.

The only exception to dredging impact assessment is for the South Padre Island offshore borrow source. This location is not part of GRBO and would not be subject to future Tier 2 analyses and Section 7 consultation, so this BE documents the impacts of dredging the offshore borrow source location, in addition to the placement of material, construction activities, and long-term operations.

For the GRBO BO, NMFS determined that the proposed action of each of the projects were *likely to adversely affect but were not likely to jeopardize* the continued existence of loggerhead, Kemp's ridley and green sea turtle and would have *no effect* on leatherback sea turtles or West Indian manatee due to lack of suitable habitat or regular occurrence within the action areas. Conservation measures and an incidental take statement were issued for the three turtle species. Any dredging operations that would occur for this project would be subject to conservation measures and terms and conditions identified in the GRBO or future Tier 2 Section 7 consultation documents.

5.1 Piping Plover and Rufa Red Knot

Because both of the species share very similar foraging and roosting behaviors and share similar coastal habitats within the action area, the effects of the action on the two species is expected to be very similar and will, therefore, be discussed together.

The primary effects of the actionable measures are to piping plover and red knot foraging and roosting habitat, and these effects are typically limited to the first year following project construction and would be further minimized through implementation of the conservation measures. In the long-term, sand placement activities will add sediment to the system that could otherwise be removed as part of inlet maintenance, and increase the availability of suitable habitat for the species. Therefore, implementation of the any of the actionable measures ***may affect, but is not likely to adversely affect*** wintering piping plovers and rufa red knots.

All Measures

All actionable measures, except CA-5, support or are in close proximity (<0.5 miles) to landscape features that may be attractive to piping plover and rufa red knot, albeit marginal in most action areas due to the degraded existing quality. Since both species could be present within or immediately near the action area from mid-July to April, construction is likely to occur while the species are utilizing the beaches and associated habitats in or near the action areas. Heavy machinery and equipment (e.g., trucks and bulldozers operating in the action area) may adversely affect the two species through disturbance and disruption of normal activities such as roosting and foraging and possibly force birds to expend valuable energy reserves to seek available habitat elsewhere. Due to the birds' mobility, loss of individuals is highly unlikely, especially with the conservation measures that would be put in place during construction to further minimize potential impacts (section 7.2).

Because of the low quality of potential suitable habitat in the action areas, direct effects to the species would be expected to be limited to a few incidental individuals stopping through the area during migration or to forage or rest while enroute to higher quality areas. Temporary loss of habitat during construction would be negligible and not cause a loss of any high quality foraging or roosting habitat.

GIWW Armoring/Oyster Reef Restoration/Hydrologic Restoration

None of the landscape features attractive to plovers or red knot are present within the action area of any of these restoration actions and would therefore have no direct or indirect effect on either species beyond the potential habitat avoidance described as common to all measures.

Marsh Restoration

At best marginal habitat may be present along the shorelines of the marsh restoration units. It is unlikely that any construction activities would affect piping plover or red knot from a noise disturbance or habitat avoidance standpoint, since no individuals have been documented foraging in marsh or permanently inundated open water areas. Additionally, no dredged disposal placement areas, which are sometimes used by both species, would be affected by restoration measures. Implementation of marsh restoration measures would not be expected to have measurable effects on piping plover or rufa red knot and the impacts would be primarily limited to the habitat avoidance impacts described as common to all measures.

Rookery Island Restoration

Piping plovers and red knots may be present on islands where exposed land remains. However, their presence is very unlikely since their preferred habitat is not present within any of the disturbance areas. Specific conservation measures would be incorporated to cover all activities associated with the actions to avoid individual birds and ensure no adverse impacts would occur. If individuals are present and disturbed by the noise, they would have access to nearby habitat that is within their normal flying distances for daily foraging movement.

Beach and Dune Restoration/Nourishment

W-3 and South Padre Island Beach Nourishment actionable measures would occur within habitat that is marginal to suitable habitat for wintering piping plover and red knots.

Beneficial Effects: Sand placement along highly eroded beaches would have a beneficial effect on the habitat's ability to support wintering piping plovers and rufa red knots. Narrow beaches that do not support a productive wrack line, as many of the areas proposed for nourishment, may see an improvement in foraging habitat available to piping plovers and red knots following sand placement. The addition of sand to the sediment budget may also increase a sand-starved beach's likelihood of developing habitat features valued by the two species, including washover fans and emergent nearshore sand bars.

Direct Effects: Since piping plovers and red knots could be present on the beaches for up to 10 months per year, construction is likely to occur while the two species are utilizing the beaches and associated habitats. Short-term and temporary impacts could result from construction actions occurring on the beach that flushes birds from roosting or foraging habitat. Any long-term impacts, such as a hindrance in the ability of wintering birds to recuperate from their migratory flight from their breeding grounds or their ability to survive on their wintering areas or build fat reserves in preparation for migration, is highly unlikely given the extent of quality habitat available on adjacent beaches that are well within the species foraging range.

During sand placement actions, burial and suffocation of invertebrate species would occur. For W-3, the direct effects would be expected to occur only one time along 9.5 miles of Padre Island National Seashore. For SPI, direct effects would be expected to occur every 10 years along 2.9 miles of South Padre Island. The duration of the impact can adversely affect piping plovers because of their high site fidelity. Delayed recovery of the benthic prey base or changes in their communities due to physical habitat changes may affect the quality of the foraging habitat. It is anticipated that benthic recruitment and reestablishment following sand placement would be between six months and two years (Thrush et al. 1996, Bishop et al. 2006, Peterson et al. 2006).

As well, placement of material on the beach may affect the physical environment. If the material used in a sand placement project does not closely match the native material on the beach, the sediment incompatibility may result in modifications to the macroinvertebrate community structure, because several species are sensitive to grain size and composition (Rakocinski et al. 1996; Peterson et al. 2006; Peterson and Bishop 2005; Colosio et al. 2007; Defeo et al. 2009).

Tilling to loosen the compacted sand, as would be required following beach nourishment to minimize the effects to nesting sea turtles, may affect wrack that has accumulated on the beach. However, tilling is usually conducted above the wrack line, so the potential to affect feeding and roosting habitat is remote and unlikely.

Restoration of beaches through sand placement may increase recreational pressures within the project area. Recreational activities, including increased pedestrian use, have the potential to adversely affect piping plovers through disturbance and through increased presence of predators, including both domestic animals and feral animals attracted by the presence of people and their trash. Disturbance from recreational use reduces the time migrating shorebirds spend foraging (Burger 1991). Pfister et al. (1992) implicate disturbance as a factor in the long-term decline of migrating shorebirds at staging areas. In many cases, dogs accompany pedestrians to the beach. Shorebirds are more likely to flush from the presence of dogs than people, and breeding and nonbreeding shorebirds react to dogs from farther distances than people (Lafferty 2001a, 2001b; Lord et al. 2001; Thomas et al. 2003).

An increase in recreational pressure within the W-3 action area is highly unlikely given that access to the site requires driving over 50 miles along the beach in a four-wheel drive vehicle. At South Padre Island, the action would include plugging existing holes in the dune that are currently serving as vehicle and pedestrian access points. Access would be generated through the installation of walkover paths, which would minimize the ability to drive along the beach thereby reducing the potential for bird-vehicle collisions. As well, South Padre Island has been nourished in the past and increases in recreational pressure would likely have already been observed. Overall, the potential to increase or change recreational pressures is minimal and would therefore have minimal to no effect on piping plover and red knot and may even benefit the species.

Hydrologic Connection

Typically, inlet dredging activities would be considered an indirect effect because alterations in water circulation patterns and sediment transport pathways could modify mud flats in the action area. However, reopening Mansfield Pass would maintain the water circulation patterns and sediment dynamics of shorelines along the Laguna Madre thereby maintaining the condition that was present while the channel was being regularly maintained.

5.2 Piping Plover Critical Habitat

W-3 and South Padre Island are in close proximity to piping plover CH. The indirect impacts of beach nourishment, such as change in long-shore sediment transport, would not have any effect on the beach profile of CH. Beach nourishment actions would increase the amount of sediment available for erosion, which could then be transported onto CH beaches to help maintain that beach's profile. All hardened structures would constructed along the GIWW and would not affect long-shore sediment transport or any tidal flat building processes.

For G-28 measures that overlap CH, no marsh restoration or GIWW armoring would be placed in the tidal flats areas of the action area and all work would be restricted to existing degraded marsh areas. Therefore, there would be no change to any PCE of the CH.

Implementation of any of the ER measures would have ***no effect*** on piping plover CH.

5.3 Whooping Crane

The USACE has determined implementation of any of the actionable measures ***may affect, but is not likely to adversely affect*** the whooping crane because the temporary adverse impacts are anticipated to be insignificant and discountable, especially since conservation measures have been incorporated into the plan, and the overall beneficial impacts would far outweigh any negative impacts.

Common to All Measures

Attempts would be made to avoid construction from October 1 through April 15 when birds are most likely to be present. If construction must be completed during this time in order to take advantage of the dredging windows, potential impacts to whooping cranes include noise disturbance during foraging activities or habitat avoidance while construction equipment is operating. Impacts to the species would cease after construction is complete. It is highly unlikely that mortality of any individuals were to occur

during construction due to their ability to avoid the construction area. However, additional voluntary conservation measures have been incorporated into the plan and are described in section 7.3.

GIWW Armoring/Oyster Reef Restoration/Beach and Dune Restoration/Nourishment/Hydrologic Restoration

None of the landscape features attractive to whooping crane are present within the action area of any of these restoration actions and would therefore have no direct or indirect effect on either species beyond the potential habitat avoidance described as common to all measures.

Marsh Restoration

Beneficial Effects: Implementation of this plan will indirectly contribute to recovery of the species through marsh restoration and protection from future development. The International Recovery Plan lists several recovery actions including protecting wintering habitat to accommodate expanding crane populations (CWS and US Fish and Wildlife Service 2007. By restoring marsh habitat at least two identified recovery actions have been addressed (1.5.3.6—Better manage deposition of dredge material, 1.5.5—Create wetland habitat). In general, marsh restoration actions would be beneficial to the whooping crane through an increase in quality foraging habitat and at some point in the future could serve as a wintering site.

Direct Effects: Direct effects to the species would be limited to the impacts described as common to all measures.

5.4 Eastern Black Rail

The USACE has determined implementation of any of the actionable measures ***may affect, but is not likely to adversely affect*** the Eastern black rail because the temporary adverse impacts are anticipated to be insignificant and discountable, especially since conservation measures have been incorporated into the plan, the overall beneficial impacts would far outweigh any negative impacts, and the likelihood of the species occurring in the action areas is extremely low.

GIWW Armoring/Oyster Reef Restoration/Beach and Dune Restoration/Nourishment/Hydrologic Restoration

None of the landscape features attractive to Eastern black rail are present within the action area of any of these restoration actions and would therefore have no direct or indirect effect on the species. The likelihood of the species being in close proximity to be indirectly affected by noise from construction activities is extremely remote and is considered negligible and discountable because all of these actions are completed in or near deep water that is tidally influenced. Marsh habitat immediately adjacent to these sites (at least several hundred feet away from the active construction site) is severely eroded and in general maintains a deeper water level than is preferred by the eastern black rail. The nearest suitable habitat would be well outside the range of potential disturbance for noise; therefore, the listed actions in this section are expected to have no effect on the species.

Marsh Restoration

Beneficial Effects: Implementation of this ER measure will indirectly contribute to recovery of the species through marsh restoration and protection from future development. Marsh restoration would

restore the balance between open water and vegetation and reestablish elevations that would be less tidally influenced and more conducive to foraging and breeding without concern for frequent flooding.

Direct Impacts: None of the prohibitions of the Section 4(d) rule are triggered through implementation of the ER measures.

Attempts would be made to avoid construction during the breeding season (April 01 through August 31). If construction must be completed during this time in order to take advantage of the dredging windows, potential impacts to Eastern black rail include noise disturbance during foraging activities or habitat avoidance while construction equipment is operating. Impacts to the species would cease after construction is complete.

In general, the habitat where marsh restoration would be completed is considered degraded and marginal at best and is not in or near any of the locations where confirmed or probable nesting has occurred. The restoration units lack connectivity to upland areas and open water deeper than a few centimeters is extremely common making nesting very unlikely. If birds are present in the action area, they are expected to be incidental birds stopping over during migration. It is highly unlikely that mortality of any individuals were to occur during construction due to lack of suitable habitat; however, voluntary conservation measures, such as biological monitors and nest avoidance measures, have been incorporated into the plan to further minimize any potential for impacts (section 7.4)

5.5 West Indian Manatee

Due to the rarity of the manatee in the action areas and the conservation measures that would be implemented, implementation of any of the actionable measures ***may affect, but is not likely to adversely affect*** the West Indian manatee.

Beneficial Effects: Ecosystem restoration measures such as island restoration and breakwater construction would protect existing seagrass meadows and increase suitable habitat for reestablishment of seagrass meadows resulting in an increase in available suitable habitat for foraging if a manatee were to occur in the action area.

Direct Effects: In the rare instance that a manatee is found in or near any of the action areas, in-water work during placement of pipelines, operation of watercraft to move material or equipment, etc. could impact manatees. Impacts could include temporary habitat avoidance, exposure to underwater sound, and visual disturbances, which would all cease after construction is complete. The most extreme impact could include entrapment and/or collision with pipes, silt barriers, pumps, placement equipment, support watercraft or other in-water construction equipment. Although this is unlikely due to the extremely rare occurrence of West Indian manatee in any of the action areas, conservation measures are being incorporated into the plan to avoid harassment and take of manatee, see Section 7.5.

Indirect Effects: Implementation of any of the actionable measures would not alter marine habitats or food sources, such as seagrass or other aquatic food plants, in the action area.

5.6 Sea Turtles

Green, Kemp's ridley, loggerhead and hawksbill sea turtle are abundant in many of the action areas throughout the year. Of the five species of sea turtle known to potentially occur in Texas waters, the leatherback is the least likely to occur due to its pelagic nature.

Overall, implementation of the proposed action ***may affect, but is not likely to adversely affect*** the loggerhead, green, leatherback, hawksbill, and Kemp's ridley sea turtles, and may ultimately be beneficial through creation of suitable nesting habitat. Mitigation measures such as seasonal-timing restrictions if nesting is identified and reassessment of sand fences would eliminate the potential for take of the species.

GIWW Armoring/Oyster Reef Restoration

Beneficial Effects: Rock and hard substrate material that is placed as part of the GIWW armoring and oyster reef restoration would encourage restoration of previously lost productive reef habitat. The complex reef habitat associated with both structures, although more so with oyster reefs, would support many of the food sources sea turtles forage on such as sponges, tunicates, bryozoans, mollusks, corals, barnacles, and sea urchins. Additionally, some of the proposed armoring and reef restoration areas are intended to preserve seagrass meadows which green sea turtles rely on.

Direct Effects: Construction activities from setting pipelines and movement of personnel and equipment during placement of oyster or rock material could create activity, noise and vibrations that the species find undesirable. Sea turtles are highly mobile and will likely avoid the area due to any project activity and noise. Likewise there is sufficient nearshore habitat that temporary avoidance of the area would not be expected to affect foraging ability. Normal behavior patterns of sea turtles are not likely to be significantly disrupted because of the short-term localized nature of the action and the ability of sea turtles to avoid the immediate area.

Indirect Effects: No indirect effects are anticipated because no nesting or foraging habitat would be modified.

Marsh Restoration/Island Restoration/Hydrologic Restoration

Beneficial Effects: Marsh restoration is not expected to provide any measurable benefit to sea turtles. Island restoration may increase the extent of seagrass meadows as a result of the increase in nutrients from colonial waterbirds defecating in the water.

The hydrologic restoration would at a minimum maintain the existing Lower Laguna Madre habitat, which is well known for its seagrass meadows that green sea turtles rely on. It is more likely that opening Mansfield Pass would improve and expand the extent of the seagrass meadows, while also facilitating a sea turtle access to the lagoon.

Direct Effects:

The potential impacts of setting pipes and movement of vessels in open water areas were addressed in the GRBO. Despite some minor changes in placement of dredged material location (i.e. marsh restoration units instead of upland PAs or offshore locations), which affects location of placement pipes

and the movement of personnel and equipment, the impacts described here versus in GRBO are not greater than described and consulted on. Therefore, the GRBO would cover these impacts.

Beach Nourishment – Onshore Activities

Under the proposed action, dredged material would be beneficially used to nourish 3.1 miles of beach; which could impact sea turtle nesting; therefore, additional consultation with USFWS is required because sea turtles on land fall under the purview of that agency.

Beneficial Effects: Sea turtle nesting has not been documented in the W-3 action area and nesting is uncertain in the South Padre Island Beach Nourishment action are; however, beach nourishment and dune construction is expected to increase the suitability of the action area's beaches for sea turtle nesting by reducing the dry foredune habitat, utilizing naturally occurring beach sediment and profiles comparable to the existing condition and other successful nest sites, and implementation of escarpment and compaction remediation measures.

Because nest-site selection by female turtles is poorly understood, it is difficult to predict any effect that changes induced by nourishment could have on selection of a nest site (Crain et al 1995). If nesting were to occur it would most likely be by Kemp's ridley, and to a lesser degree loggerhead and green sea turtles, because each have historically nested on beaches of Padre Island National Seashore and South Padre Island.

Additionally, these projects have been fully coordinated with the Division of Sea Turtle Science and Recovery at Padre Island National Seashore. They fully support the use of beach nourishment to restore the beach and dune profile.

Direct Effects: Potential adverse effects during the project construction phase include disturbance of existing nests, which may have been missed by surveyors and thus not marked for avoidance, disturbance of females attempting to nest, and disorientation of emerging hatchlings. In addition, heavy equipment will be required to construct the beach profile. This equipment will have to traverse the beach portion of the action area, which could result in harm to nesting sea turtles, their nests, and emerging hatchlings. The potential for adverse impacts to individuals is remote.

Within the W-3 action area, the presence of sea turtles is highly unlikely because this section of beach is sediment starved, has a long history of erosion, the beach profile is currently only marginal at best for nesting, and nesting has not been recorded in the action area. No future re-nourishment actions are proposed, so any sea turtle nesting that occurs after the initial placement would not be affect by this project.

For the South Padre Island Nourishment actionable measure, placement activities would only occur outside of the nesting season and would therefore avoid any direct adverse effects to individuals. The South Padre Island Nourishment project has been ongoing for a number of years and a Biological Opinion was issued in 2010, which authorized take for 3 adult Kemp's ridley sea turtle and 3 nests per year, including all hatchlings and/or eggs (up to approximately 200 eggs per nest), 1 adult loggerhead sea turtle and 1 nest, including all hatchlings and/or eggs (up to approximately 200 eggs per nest), and 1 adult green sea turtle and 1 nest, including all hatchlings and/or eggs (up to approximately 200 eggs per nest). To date, no take has been reported and this trend of 0 take would be expected to continue with

each future re-nourishment especially with the conservation measures that have been committed to (section 7.6) and the seasonal restrictions put in place.

Indirect Effects: Beach profile and sediment composition changes as a result of renourishment activities may act as an impediment to a nesting female resulting in a false crawl or nesting females may choose marginal or unsuitable nesting areas. Based on the available literature, it appears that these impacts are, in many cases, site specific and even species specific depending on their preference for nest location.

Slope and Escarpment

Adult female turtles survey a nesting beach from the water before emerging to nest (Carr and Ogren, 1960; Hendrickson, 1982). Parameters considered important to beach selection include the geomorphology and dimensions of the beach (Mortimer, 1982; Johannes and Rimmer, 1984) and bathymetric features of the offshore approach (Hughes, 1974; Mortimer, 1982). The proposed beach nourishment designs aim to equilibrate the existing beach profile to a more natural profile over time relative to the wave climate of a given area, which would result in more suitable habitat for sea turtle nesting. However, changes in beach slope as well as the development of steep escarpments may develop along the mean high water line as the constructed beach adjusts from a construction profile to a natural beach profile (Nelson et al., 1987). Though escarpment formation is a natural response to shoreline erosion, the escarpment formation as a result of the equilibration process during a short period following a nourishment event may have a steeper and higher vertical face than natural escarpment formation and may slough off more rapidly landward. Escarpments can hamper or prevent access to nesting sites (Nelson and Blihovde 1998) and can cause adult females to choose unsuitable nesting areas, such as seaward of an escarpment, that are subjected to prolonged tidal inundation and erosion, which results in nest failure. Additionally, if a female is capable of nesting landward of the escarpment prior to its formation, as the material continues to slough off and the beach profile approaches a more natural profile, there is a potential for an incubating nest to collapse or fallout during the equilibration process.

Loggerheads preferentially nest on the part of the beach where the equilibration process takes place (Brock, 2005; Ecological Associates, Inc., 1999) and are more vulnerable to fallout during equilibration. According to Brock (2005), the return of loggerhead nesting success to equivalent rates similar to those on the adjacent non-nourished beach and historical rates two seasons post-nourishment were observed and are attributed to the equilibration process of the seaward crest of the berm. Brock (2005) also noted that the majority of green turtle nests are placed on the foredune and; therefore, the equilibration process of the nourished substrate may not affect green turtles as severely.

Management techniques would be implemented to reduce the impact of escarpment formations. For completed sections of beach during beach construction operations, and for subsequent years following as the construction profile approaches a more natural profile, visual surveys for escarpments would be performed. Escarpments that are identified prior to or during the nesting season that interfere with sea turtle nesting (exceed 18 inches in height for a distance of 100 ft.) would be leveled to the natural beach for a given area. If it is determined that escarpment leveling is required during the nesting or hatching season, leveling actions would be directed by the US Fish and Wildlife Service.

Compaction

In addition to escarpment formation, the use of heavy machinery can cause sand compaction (Nelson et al. 1987, Nelson and Dickerson 1988). Significant reductions in nesting success (i.e., false crawls occurred more frequently) have been documented on severely compacted beaches (Fletemeyer 1980, Nelson and Dickerson 1987, Nelson et al. 1987), and increased false crawls may result in increased physiological stress to nesting females. Additional management techniques, such as raking, would be taken to loosen compacted sands prior to the nesting season.

Drift Fences

Drift fences, also commonly called sand fences, may be erected to help build and stabilize the newly constructed dune. Improperly placed, broken, or abandoned drift fences can impede nesting attempts and/or trap emergent hatchlings and nesting females. If sand fences are erected, monitoring of the site would occur to ensure that the sand fence is maintained and functions properly. If turtle nesting is observed in Jefferson County, the sand fence would be reassessed to determine if its presence could hinder nesting at the site. At that time, removal, modification, or no action would be taken to ensure the sand fence does not present a threat to potential nesting in the area.

Lighting

The presence of artificial lighting on or within the vicinity of nesting beaches is detrimental to critical behavioral aspects of the nesting process including nesting female emergence, nest site selection, and the nocturnal sea-finding behavior of both hatchlings and nesting females. Though nesting females prefer darker beaches (Salmon et al., 1995), given the increased development and associated lighting on most beaches, many do nest on lighted shorelines, similar to those found in the South Padre Island action area. If emergence, nest site selection, and oviposition does occur, lighting does not affect nesting behavior (Witherington and Martin, 2003). Upon completion of the nesting process by adult female sea turtles and during the emergence process by baby sea turtles, artificial lighting may affect their orientation and sea-finding ability, which causes individuals to expend more time and energy to find the ocean and could result in exhaustion, dehydration, and predation.

The W-3 action area and area behind the action area is federally owned by the National Park Service and would not be open to future development that would involve construction of artificial lighting. Along the South Padre Island action area, beach nourishment would not be expected to induce additional development or increase the amount of artificial lighting in or near the nesting beach. Therefore, the impacts of artificial lighting would not be expected to be greater than the existing condition.

Beach Nourishment – Off-Shore Activities

Placed material for the South Padre Island Beach Nourishment actionable measure may utilize a borrow source that is not covered under GRBO; therefore, this effects analysis describes the potential impacts of dredging at the borrow sources.

<u>*Direct Effects:*</u> The sea turtles that may occur in waters in or near the borrow location are green, Kemp's ridley, and loggerhead sea turtles. Dredging activities would be conducted using hydraulic cutterhead dredges (non-hopper), which move at sufficiently slow speeds that turtles would be able to avoid the cutterhead. Additionally, GRBO concluded that non-hopper dredges are not known to take sea turtles.

Sea turtles may be directly affected by construction activities through habitat avoidance and behavior modification. Sea turtles are likely to avoid foraging in or near an active construction zone because of noise, vibration, and light disturbances. However, the disturbance is not expected to be detrimental to the sea turtle population since, plenty of directly adjacent foraging habitat would be available during the temporary construction period.

Indirect Effects: Indirect impacts would be limited to temporary changes in water quality including turbidity, which could reduce visibility for foraging, and cause lower dissolved oxygen levels, which would affect their ability to breathe. Minor elevations of TSS would be temporary (lasting approximately two weeks) and similar to natural levels during periods of heavy wave action. The depth of dredging at the borrow source is shallow and would not be expected to result in long-term dissolved oxygen levels. In general, there is sufficient quality habitat in and near the borrow source location well within the turtles' movement capabilities that the temporary reduction in available habitat would be insignificant and discountable.

5.7 Cumulative Effects of the Actionable Measures

Actionable measures would be implemented on federal and non-federal lands. Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action areas. Future Federal actions that are unrelated to the actionable measures are not considered in this section, because they require separate consultation pursuant to Section 7 of the Act. It is reasonable to expect continued shoreline stabilization, maintenance dredging, sand or dredged material placement projects, construction and long-term operation of storm risk reduction and resiliency features, and navigational and urban development along the Texas shoreline in the future. However, all of these future actions that are reasonably certain to occur would require a Clean Water Act (CWA) Section 404 permit issued by USACE. As part of the process to secure a permit, separate Section 7 consultation would be required.

6.0 EFFECTS OF THE TIER 1 MEASURES

The following section describes the anticipated effects of the Tier 1 measures; however, USACE is not seeking consultation Section 7 consultation on these actions, so no effects determinations are made. Instead, USACE is seeking technical assistance to help identify additional potential impacts to listed species that may have been missed or that are poorly understood, recommendations to avoid or minimize potential impacts, and to document what questions remain that need to be answered prior to initiating official Section 7 consultation on these actions in the future.

6.1 Piping Plover and Rufa Red Knot

The direct and indirect impacts anticipated from completing the dune and beach nourishment actions would be the same as those described for the Actionable Measures. In general the impacts are considered short-term and temporary during and immediately after construction activities to include habitat avoidance and temporary loss of forage species. The nourishment actions would be completed in phases and would therefore allow adjacent areas to remain as suitable habitat while the active construction site and recently nourished areas are recovering. It is assumed that the phasing would be completed in such a way that suitable habitat would be available within the flight capabilities of the species; however, this would be further investigated during the Tier 2 analyses.

Construction of the surge gates and ring barrier in and near the species' preferred habitat would result in habitat avoidance. Construction activities on the beach and tidal areas may cause an increase in noise and light, which may disturb individuals, decrease nesting success, and impact foraging. It is not anticipated that the long-term presence of the structures would result in any modification of the beach and dune; however, additional investigation is needed to determine the indirect effects of long-shore sediment transport. The permanent structures would be placed adjacent to existing roadways, which would help avoid further habitat fragmentation on the Bolivar Peninsula and Galveston Island as a result of increased development.

6.2 Piping Plover Critical Habitat

The current alignment of the tie-in feature on Bolivar Peninsula includes direct impacts to critical habitat for piping plover at Bolivar Flats. Piping plover critical habitat is found within the Coastal Barrier measure (USFWS, 2017). Physical alterations to piping plover critical habitat include grubbing, levelling, and discharge of fill on loafing and foraging areas. Some of the CSRM features would directly impact 35 acres of designated piping plover critical habitat near Bolivar Roads on Bolivar Peninsula, Unit TX-36: Bolivar Flats during construction of the tie in structure. Portions of critical habitat would be permanently impacted from the long-term presence of the combi-wall and levee that comprise the feature. Adjacent critical habitat would be temporarily impacted by earth moving activity, placement of fill material, and burial of resources.

The tie in structure that directly impacts 35 acres of critical habitat was necessary in order to avoid hundreds of acres of impact to the critical habitat if the project extended the dual-purpose beach and dune system across the critical habitat.

There are also potential indirect impacts to piping plover critical habitat from the Bolivar Roads Surge Barrier System. Big Reef, Unit TX-35 is an acreationary zone adjacent to and north of the Galveston South Jetty and would be on the Gulf side of the Gate System. Once the gate designs are further developed, sediment transport modeling will be key to understanding how the gate structures could impact sediment transport to Big Reef. If the system impacts sediment delivery to Big Reef, several possible solutions have been preliminarily discussed and those include groin structures or breakwaters to protect Big Reef and encourage continued sediment deposition. Sediment transport modeling for the final designs will be conducted and the analysis on the impacts to sediment transport and the effects to Big Reef will be included in the Tier Two Study.

6.3 Eastern Black Rail

Marshes in the action areas are in urbanized environments and are less likely to support black rails than other marshes along Galveston and Bolivar Penninsula. Site specific surveys would be required to fully understand the impacts that could potentially occur to rail habitat. In general the impacts described for the actionable measures are expected to be similar to these measures with the exception that beneficial impacts are not likely to be realized and there would be a net loss of habitat, which would be replaced by mitigation, although at an off-site location.

6.4 West Indian Manatee

During the construction phase, dredging and other marine construction activities in Galveston Bay and along the Houston Ship Channel could potentially impact manatees if they should occur in or near the bay. The construction of the navigational and environmental gates across the bay could impair and prevent manatee migration and feeding between the Gulf and Galveston Bay. The gates would create a constriction between Galveston Bay and the Gulf, increasing traffic between construction vehicles, ships, and barges through the Houston Ship Channel and increasing the likelihood of collision with slower-moving species including manatees (Department of Environmental Resources Management, 1995; NOAA, 2017k).

Construction can produce underwater vibrations and noise at many different low and high frequencies, which could disrupt manatee communication (Peng et al., 2015) and cause injury if they should be in the immediate vicinity of the high frequency actions, such as pile driving.

Despite all these potential impacts, the likelihood of a manatee occurring in or near the action areas is very low due to the rare occurrence in Galveston Bay. Conservation measures would be employed to minimize the potential impacts to the species should they be present.

6.5 Sea Turtles

Open Water Activities -- Dredging

The sea turtles that may occur in the bay waters in or near the action area are green, Kemp's ridley, and loggerhead sea turtles. Dredging required to construct the Bolivar Roads Surge Gate, a temporary bypass channel for the Houston Ship Channel, and potentially B-2 would be conducted using hydraulic cutterhead and clamshell dredges, which move at sufficiently slow speeds that turtles would be able to avoid the cutterhead or clamshell bucket. Additionally, GRBO concluded that non-hopper dredges are

not known to take sea turtles. A hydraulic cutterhead dredge and the clamshell dredge are non-hopper type of dredge.

The use of hopper dredging may affect and likely to adversely affect sea turtle species during dredging operations. GRBO authorizes take levels for sea turtles by hopper dredging (NMFS 2016) with reasonable and prudent measures (Best Management Practices) to reduce the impacts of hopper dredging to sea turtles. Such measures include dedicated protected species observers, inflow and outflow screening, as well as turtle deflection devices installed on dragheads, implementing strategic use of dredge pumps at the start and end of dredging operations to minimize suction from dragheads to avoid sea turtles, trawling and relocation of endangered species as necessary, and training for personnel on dredging operations that would minimize takes of sea turtles.

Sea turtles are likely to avoid foraging in or near an active construction zone because of noise, vibration, and light disturbances. These impacts would be very similar to the maintenance dredging operations that occur periodically within the Bay, resulting in sea turtles avoiding the area because of noise, vibration and light disturbances. However, the disturbance is not expected to be detrimental to the sea turtle population since, plenty of directly adjacent foraging habitat would be available during the temporary construction period.

If dredging were to occur during the nesting season window (March 15–September 30), Kemp's ridley hatchlings, if present, could be adversely affected by disorientation from bright lights generated by hopper dredges or by temporarily elevated levels of total suspended solids during placement of material. Typically, hatchlings take the shortest route to water; however, bright lights can cause hatchlings to move toward the lights rather than the water, resulting in disorientation and increased danger from predators. Minor elevations of TSS would be temporary (lasting approximately two weeks) and similar to natural levels during periods of heavy wave action.

Open Water Activities – Construction of Structures

Sheet piles would be needed to construct the Bolivar Roads Gate System, Galveston Ring Barrier, Clear Lake Surge Gate and Dickinson Lake Surge Gate. The driving of sheet piles creates intense noise levels. Peng et al 2015, cites intensity levels in between 131-135 decibels referenced to 1 microPascal (dB re 1 µPa) with frequencies between 30-40 Hertz (Hz). This is within the reported range of hearing reported for sea turtles (Samuel et al 2005). Dahl (2015) in his review of other studies, noted that impact driving occurs at 220 dB at an approximate range of 10 meters from driving 0.75 meter diameter piles and that an underwater sound of 200 dB can occur at a range of 300 meters from piles that are five meters in diameter. Piles used in this study would be less than five meters in diameter, so it is anticipated lower underwater sound levels than those analyzed by Dahl (2015) would be expected.

Best management practices and mitigation measures would be implemented, to the extent practicable, to avoid impacts to listed species in the Action Area; for example, cofferdams may be used during construction to reduce underwater noise and environmental impacts. Bellmann (2014) noted in that cofferdams could reduce underwater pile driving noise by more than 20 dB.

Additionally, sound does not propagate well in shallow environments such as Galveston Bay, which has an average depth of 8 feet. The sound is scattered and attenuated by the waves on the surface and soft muddy bottom. The sound could follow the existing channels, but the continuous operations within the

Houston Ship Channel, which is nearest to the Bolivar Roads Gate System, creates noise levels from tanker and container ships (180-205 dB re 1 µPa with frequencies between 6.8-70 Hz) and other small ship traffic such as tugboats (170-180 dB re 1 µP with frequencies between 20-1000 Hz) that would be sufficiently high enough that it would be expected that sea turtles would avoid these areas.

Where pile driving is necessary, there is a high likelihood of turtles occurring near each of these action areas. Exposure to underwater noise levels of 180 dB_{RMS} can result in injury, and exposure to 166 dB_{RMS} can result in behavioral disturbances to sea turtles. Due to the relative uncertainty of piles and hammer type to be used for the gates and ring barrier until more refined designs are developed, it is assumed that pile driving could emit underwater noise levels that could cause behavioral disturbances, such as avoidance or disruption of foraging, or injury. Temporary or intermittent noise generated from pile driving above the 166 dB_{RMS} noise threshold would be expected to avoid or move out of the action area and away from the sound source. Turtles would be considered highly unlikely to occur in the action area where pile driving would occur, and any movement or avoidance behavior would be too small to be meaningfully measured or detected and the effects would be discountable. Additionally, the surrounding Galveston Bay and offshore areas are sufficiently large enough to support foraging, resting, and/or movement of any turtle avoiding the action areas.

Vessel interactions, or propeller/hull strikes, are a proven source of anthropogenic mortality and/or injury for sea turtles. None of the Tier 1 measures would permanently increase vessel traffic in the action area. Construction of the Tier 1 measures would temporarily increase the number of vessels transiting the action areas, which are already highly utilized by commercial and recreational vessels. Implementation of the Tier 1 measures would result in a slightly increased risk of vessel interactions with sea turtles, as barges and support watercraft would be used during construction operations. The risk of a vessel strike would be low because of the limited number of barges and/or vessels associated with construction and maintenance of features and controlled slow speeds of project vessels. It is estimated that during most operating conditions, vessels would travels at a speed of 10 knots or less. Additionally, open water conservation measures would be in place to further minimize the potential for impacts to the species. Therefore, it is not anticipated that any potential vessel interactions with sea turtles would be unlikely and would not result in any take.

Open Water Activities – Long-Term Operation of the Structures

Long-term operation of the structures are predicted to be greatest during the operation and maintenance of built structures. Extreme storm and high tide events would trigger the closure of the gates and surge barriers, causing shifts in water quality and flow rates. During closures, tidal fluxes in water would cease for a period of time, potentially reducing water quality and dissolved oxygen (DO), while increasing the number of harmful nutrients in the water. The changes in water quality, DO, and nutrients could have compound and/or cumulative interactions, causing increased stress levels to fish populations, which may lead to increased susceptibility to disease or even a mortality event (Tietze 2016; Bachman and Rand 2008).

Closure of the tide gates and/or surge barriers and operation of the pumps may also cause entrainment of sea turtles. Impediment of movement and/or migration of turtles trapped behind closed gates is also possible. During a closure, turtles could be trapped for a few days. Changes is water quality are not expected degrade to the point of causing mortality of sea turtles, but may affect breeding and/or

foraging behaviors; however, this is one area where additional modeling may be required to better understand the potential water quality changes while the gates are closed.

Additionally, periodic maintenance of the structures would be necessary over time; the maintenance would likely result in localized disturbances caused by increased underwater noise and turbidity.

During normal conditions, when the gates are open, modeling indicates that the constriction anticipated by the structures is not expected to cause significant changes to salinity or tidal amplitude. The expected changes are within the natural variability of the bay and are therefore not expected to cause long-term declines in food sources or create conditions which sea turtles cannot tolerate. The gate openings are sufficiently wide enough and have environmental openings that would be expected to allow movement in and out of Galveston Bay with minimal impact, as indicated by the sediment particle transport model results. However, this potential impact will need to be reassessed as the design is modified.

Onshore Activities

Onshore activities would be expected to have similar impacts as those described for the Actionable Measures regarding the presence of construction equipment, noise, vibration, and lighting. Increased artificial lighting on the construction beachfront may potentially disorient nesting and hatching sea turtles. Sea turtles lured towards parking lots, streets, and other developed areas risk dehydration, vehicle collision, and depredation (NOAA, 2014b). Artificial lighting would be added to some areas of the structure such as at the navigation gates, which could cause disorientation of nesting sea turtles should they try to nest in or near these areas. When designing the structures, artificial lighting would be designed in such a way to limit outward exposure of light to minimize the extent of potential impact.

Physical modification of the beachface may be required, but at this time it is unknown the extent of the potential changes. Most of the work would be completed towards the backbeach or landward of the dune in order to preserve the natural protection beaches and dunes provide. To some degree, levees, seawalls, and floodwalls may benefit sea turtles when they are landward of their preferred nesting sites. This is because the barrier would prevent the turtles from moving landward instead of seaward and expending energy going in the wrong direction and risking increased human interaction.

Entrainment of the sea turtles at pump stations is not expected since these are located outside of their preferred habitat. Additionally, the pipes can be designed with grates or other devices that would reduce the opening size to smaller than the comparatively large size of adult or juvenile sea turtles if they do happen to be in the vicinity of the pump stations.

6.6 Uncertainties

The effects of construction activities on the federally-listed species are fairly well understood. However, there is uncertainty in the long-term effects of operating and maintaining the various gate structures and the ring barrier system. USACE requests USFWS and NMFS technical assistance on answering the following questions:

- Would the presence of the structures (open) affect the foraging or migration patterns within, into or out of Galveston Bay?

- Would sea turtles and manatees be able to find their way through bypass channels, the gate structures, or other openings?
- Would temporary closure of the gates impact turtles or manatees within the bay? If so, how?
- Some level of change in salinity and long-shore sediment transport is anticipated. How can the impacts be minimized? What is considered an acceptable change that would not result in long-term adverse changes in habitat quality? What mitigation may be required to offset losses?
- Is there a way to further minimize the potential adverse effects of construction and long-term operation in piping plover CH? Can the beach and dune activities be considered as an offset to the long-term impacts (e.g. could new CH be established to offset the loss)?

7.0 VOLUNTARY CONSERVATION MEASURES AND MONITORING

7.1 General Conservation Measures

The following conservation measures would be incorporated into operations for the protection of all listed species:

- All personnel (contractors, workers, etc.) will attend training sessions prior to the initiation of, or their participation in, project work activities. Training will include: 1) recognition of piping plovers, rufa red knot, whooping cranes, Eastern black rail, West Indian manatee, and sea turtles, their habitat, and sign; 2) impact avoidance measures; 3) reporting criteria; 4) contact information for rescue agencies in the area; and 5) penalties of violating the ESA.
- Project equipment and vehicles transiting between the staging area and restoration site will be minimized to the extent practicable, including but not limited to using designated routes and confining vehicle access to the immediate needs of the project.
- The contractor will coordinate and sequence work to minimize the frequency and density of vehicular traffic within and near the restoration unit(s) and limit driving to the greatest extent practicable.
- Use of construction lighting at night shall be minimized, directed toward the construction activity area, and shielded from view outside of the project area to the maximum extent practicable.
- A designated monitor(s) will be identified who will act as the single point of contact responsible for communicating and reporting endangered species issues throughout the construction period.

7.2 Piping Plover and Red Knot

The following conservation measures would be implemented to minimize the potential for adverse effect to piping plover and red knot:

- Material placed on the beach should be beach quality sand consistent with grain, size, color and composition with the existing beach sand and free of hazardous contaminants.
- Should would be placed and maintained at a gradual slope to minimize scarping.
- After project completion, mud or wind tidal flats and/or project sites seaward of the mean high tide would be restored to pre-construction contours.
- If beach nourishment is conducted during the piping plover and red knot wintering season (August 1 to May 1), surveys for individuals would be completed and the results would be provided to USFWS prior to placement of material. A monitoring plan would be developed in coordination with USFWS and will include pre-, concurrent, and post-construction surveys.
- If long-term maintenance of the beach (e.g. mechanical cleaning, grading, etc.) is undertaken, washover areas and potential bird roosting and feeding areas would be protected and

mechanical cleaning of the dry sand portion of the beach would be limited to areas landward of the primary wrack line. Wrack (sargassum) would be indiscriminately left in place as it is a primary constituent element for foraging piping plover and red knots. Trash and litter within the wrack line area may be manually removed, there are health and safety concerns related to manually removing the waste. If mechanical removal is deemed necessary within the wrack line, the USFWS would be notified via phone or electronic mail prior to commencing work.

- Notices would be posted notifying beachgoers of the ordinance prohibiting unleashed dogs on the beach at each beach access point within the project area. Warnings and citations would issued when appropriate to minimize harassment of piping plovers, red knots, and other shore birds.

7.3 Whooping Crane

The following conservation measures would be implemented to minimize the potential for adverse effect to whooping crane:

- Seasonal timing restriction between October 1 and April 15 in which construction should be avoided to the greatest extent practicable. If the seasonal timing restriction cannot be avoided:
    - A biological monitor qualified in identifying whooping cranes and with stop work authority will be on site while construction is in progress.
    - A 1,000 foot-radius of the work site would be delineated before work begins. If a whooping crane is observed within the 1,000-foot radius, the biological monitor shall halt construction activities, including shutting down any running equipment until the bird has vacated the radius.
    - If construction equipment is over 15 feet tall, the equipment must be laid down at dusk.

7.4 Eastern Black Rail

The following conservation measures would be implemented to minimize the potential for adverse effects to Eastern black rail:

- Qualified biologists will monitor for the presence of black rail during placement of material where dense overhead canopy cover is present at any time of the year.
    - If birds are observed within 1,000-feet of the active construction site, the biological monitor shall halt construction activities, including shutting down any running equipment until the bird has vacated the radius.
    - If it appears the bird is not going to vacate the radius within a reasonable time (to be determined by the Service and USACE prior to construction), the Service will be contacted and instructions on how to proceed will be provided and could include delineating a “no work” area around the site.
- Seasonal timing restrictions between April 1 and August 31 in which construction should be avoided to the greatest extent practicable. If the seasonal timing restriction cannot be avoided:

- Nest surveys would be completed in or near densely vegetated areas. The extent of the survey area, duration and timing of the surveys (e.g. daily, weekly, morning, evening, daytime, etc.) and methodology would be coordinated with the Service prior to work commencing.
- If nests are found, a boundary around the nest site would be established prior to construction beginning which would prohibit any construction activities within the radius. The size of the boundary would coordinated with the Service prior to construction.

- Dense overhead cover that meets the target marsh elevation should be avoided to the greatest extent practicable during placement of material and when siting temporary access routes, pipeline routes, and staging areas.

7.5 West Indian Manatee

The following conservation measures would be implemented to minimize the potential for adverse effects to manatees:

- Qualified biologists will monitor for the presence of manatee during phases which involve open water areas capable of supporting manatees.
- Before activities occur in open water areas, a 50-foot radius of the work area should be delineated. If a manatee is observed within the 50-foot radius, the biological monitor shall halt construction activities, including shutting down any running equipment until the animal has moved beyond the radius, either through sighting or by waiting until enough time has elapsed (approximately 15 minutes) to assume that the animal has moved beyond the buffer.
- If a manatee is sighted within 100 yards of the active work zone, vessels will operate at no wake/idle speeds.
- If siltation barriers are used, they will be made of material in which manatees cannot become entangled, should be properly secured, and regularly monitored to avoid entrapment. Barrier should not impede manatee movement.
- Any manatee sightings will be immediately reported to the U.S. Fish and Wildlife Service Houston Ecological Services Office.

No additional monitoring would be required pre- or post-construction, due to the extremely low potential for the species to occur in the action area.

7.6 Sea Turtles

Open Water Activities

Under GRBO, the following reasonably and prudent measures/terms and conditions were incorporated into the final BO: use of temporal dredging windows, when possible; intake and overflow screening; use of sea turtle deflector dragheads; observer reporting requirements; and sea turtle relocation/abundance trawling. These measures would be incorporated during any dredging activities that would occur in the

SNWW and for which dredged material could be beneficially used for this project. Each of these have largely been incorporated in USACE regulatory and civil works projects throughout the Gulf for more than a decade.

Onshore Activities

The following measures would be implemented to avoid sea turtles that may be present onshore:

- Material placed on the beach would be beach quality sand consistent with grain, size, color and composition with existing beach sand and free of hazardous contaminants.
- Sand would be placed and maintained at a gradual slope to minimize scraping.
- After project completion, mud or wind tidal flats and/or project sites seaward of the mean high tide would be restored to pre-construction contours.
- Beach nourishment activities would not occur during the turtle nesting season (March 15 to October 1), to the maximum extent possible. If beach nourishment activities must occur within sea turtle nesting season, then the following onshore conservation measures would be followed:
    - Daily turtle patrols of the beach nourishment area would be conducted at dawn until the project is complete or sea turtle nesting season has ended.
    - A qualified biological monitor would be onsite during all construction activities to monitor for sea turtles or their nests.
        - If a turtle or turtle nest is found, construction activities would immediately cease within 100 feet of the sighting location. The biological monitor would call Sea Turtle Inc. to report the sighting or notify an appropriate responder that has been trained on the appropriate course of action by Sea Turtle Inc.
        - Construction activities would not commence within 100 feet of the nest site until a designee from Sea Turtle Inc. has arrive on site and given approval to do so.
    - Ruts and berms created by construction equipment would be smoothed out to a target height of 2 inches or less each day so that turtle tracks ca be better identified and to prevent small turtles from becoming entrapped. If ruts are to be smoothed with a backhoe or tract, a patroller will check for nesting turtles or tracks prior to smooth the area.
    - Construction equipment and pipes would be stored in a manner that would minimize impacts to sea turtles to the maximum extent practicable.
    - Lighting associated with the project would be minimized to reduce the possibility of disrupting and disorienting nesting and/or hatchling sea turtles.
    - If pipes or other linear pieces of equipment are to be stored on the beach overnight, then they would be stored perpendicular to the shoreline.

- Immediately after completion of the beach nourishment project and prior to the next turtle nesting seasons, beach compaction would be monitored and tilling would be conducted as required by March 15 of the next turtle nesting season to reduce the likelihood of impacting sea turtle nesting and hatching activities.
    - If a sand compaction study is performed, compaction would be monitored in accordance with a protocol agreed to by the USFWS. A report on the results of compaction monitoring would be submitted to USFWS prior to any tilling actions being taken.
    - The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post-construction compaction levels.
    - All tilling activity would be completed prior to March 15 of the next nesting season and would occur landward of the wrack line and avoid all vegetated areas. A root rake with tines at least 42 inches long and less than 36 inches apart pulled through the sand is recommended for compacted beaches.
- Immediately after completion of the beach nourishment project and prior to March 15 of the next turtle nesting season, monitoring in the form of visual surveys would be conducted to determine if escarpments are present. All escarpments would be leveled or the beach profile reconfigured to minimize escarpment formation.
- Public education signs would be posted at strategic locations in the project area. Information to be included on the signs and placement locations would be coordinated with the Sea Turtle Coordinator at the Padre Island National Seashore. These signs shall contain information on both the importance of protecting sea turtles and on what to do and whom to call in the event of a turtle sighting.

8.0 CONCULSION

Based upon the findings of this BE, USACE has made the following effects determination for species that were identified as occurring or potentially occurring in the action area:

Species	Scientific Name	Jurisdiction	Conclusion
Birds			
Piping Plover	*Charadrius melodus*	USFWS	NLAA
Rufa Red Knot	*Calidris canutus rufa*	USFWS	NLAA
Whooping Crane	*Grus americana*	USFWS	NLAA
Northern Aplomado Falcon	*Falco femoralis septentrionalis*	USFWS	No effect
Eastern black rail	*Laterallus jamaicensis jamaicensis*	USFWS	NLAA
Attwater's Greater Prairie-Chicken	*Tympanuchus cupido attwateri*	USFWS	No effect
Clams			
Texas Fawnsfoot	*Truncilla macrodon*	USFWS	No effect
Fish			
Oceanic Whitetip Shark	*Carcharhinus longimanus*	NMFS	No effect
Giant manta ray	*Manta birostris*	NMFS	No effect
Mammals			
Sei whale	*Balaenoptera borealis*	NMFS	No effect
Bryde's Whale	*B. edeni*	NFMS	No effect
Fin whale	*B. physalus*	NMFS	No effect
Gulf Coast Jaguarundi	*Herpailurus (=Felis) yagouaroundi cacomitli*	USFWS	No effect
Ocelot	*Leopardus (=Felis) pardalis*	USFWS	No effect
Sperm whale	*Physeter macrocephalus*	NMFS	No effect
West Indian Manatee	*Trichechus manatus*	UFWS/ NMFS	NLAA
Texas Ayenia	*Ayenia limitaris*	USFWS	No effect
South Texas Ambrosia	*Ambrosia cheiranthifolia*	USFWS	No effect
Slender Rush-pea	*Hoffmannseggia tenella*	USFWS	No effect
Texas prairie dawn-flower	*Hymenoxys texana*	USFWS	No effect
Reptiles			

Species	Scientific Name	Jurisdiction	Conclusion
Loggerhead sea turtle	*Caretta caretta*	USFWS/ NMFS	**On land:** No effect **In water:** LAA*
Green sea turtle	*Chelonia mydas*	USFWS/ NMFS	**On land:** No effect **In water:** LAA*
Leatherback sea turtle	*Dermochelys coriacea*	USFWS/ NMFS	**On land:** No effect **In water:** LAA*
Hawksbill sea turtle	*Eretmochelys imbricata*	USFWS/ NMFS	**On land:** No effect **In water:** LAA*
Kemp's Ridley sea turtle	*Lepidochelys kempii*	USFWS/ NMFS	**On land:** No effect **In water:** LAA*

NLAA= Not likely to adversely affect **LAA***= Likely to adversely affect, covered by GRBO

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Appendix A: Maps and Conceptual Designs of the Proposed Actions

Attachment A

Conceptual Designs and Map Book of Measures

Actionable Measures Map Book and Conceptual Designs

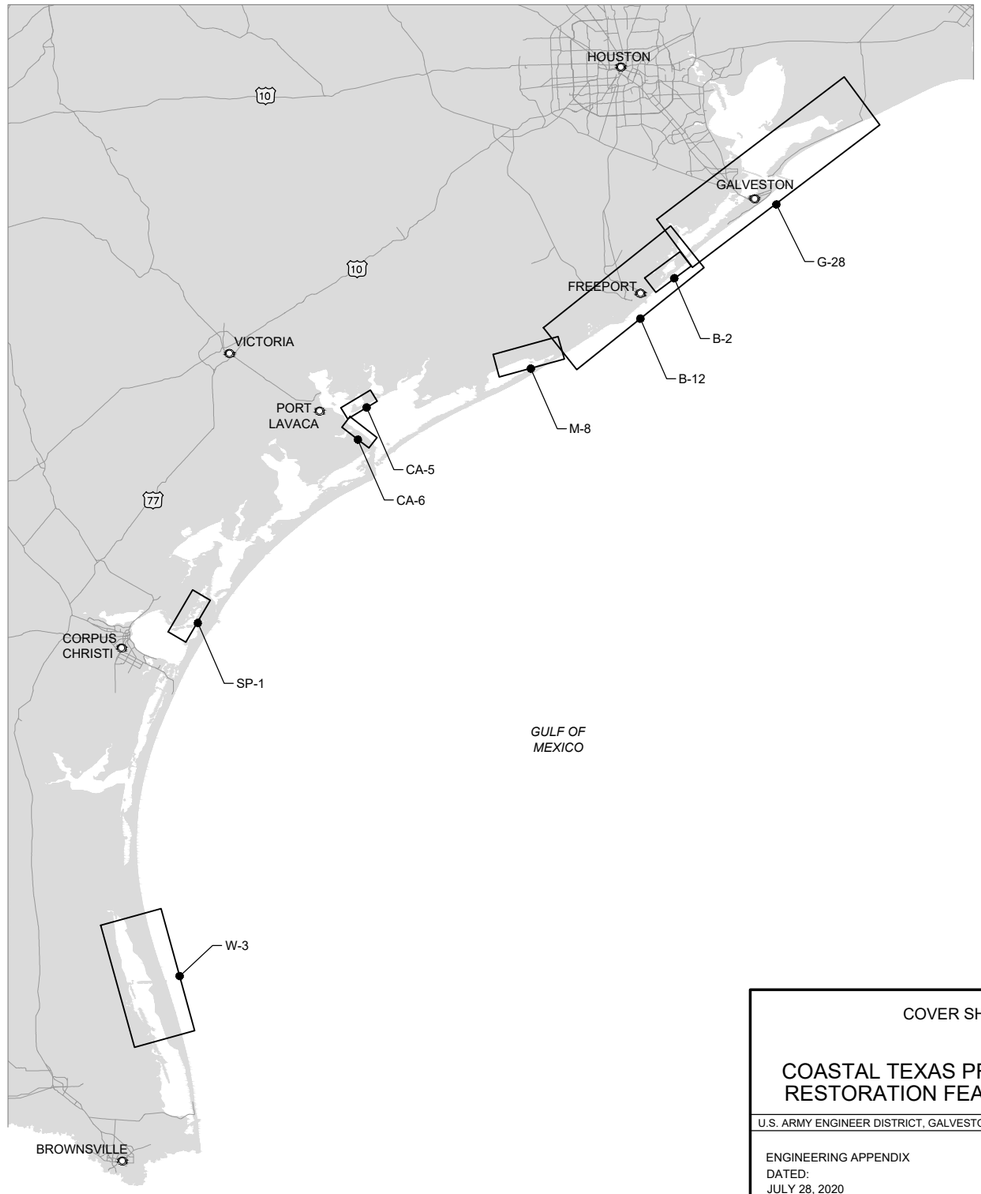
COASTAL TEXAS
PROTECTION AND RESTORATION FEASIBILITY STUDY

ECOSYSTEM RESTORATION CONCEPTUAL DRAWINGS

VICINITY MAP

(NOT TO SCALE)

SHEET INDEX	
SHEET NO.	TITLE
1	COVER SHEET
2	B-2: FOLLETS ISLAND GULF BEACH & DUNE RESTORATION
3	G-28: BOLIVAR PENINSULA & WEST BAY GIWW SHORELINE & ISLAND PROTECTION (WEST)
4	G-28: BOLIVAR PENINSULA & WEST BAY GIWW SHORELINE & ISLAND PROTECTION (WEST)
5	G-28: BOLIVAR PENINSULA & WEST BAY GIWW SHORELINE & ISLAND PROTECTION (WEST)
6	G-28: BOLIVAR PENINSULA & WEST BAY GIWW SHORELINE & ISLAND PROTECTION (EAST)
7	G-28: BOLIVAR PENINSULA & WEST BAY GIWW SHORELINE & ISLAND PROTECTION (EAST)
8	B-12: BASTROP BAY, OYSTER LAKE, WEST BAY, & GIWW SHORELINE PROTECTION
9	B-12: BASTROP BAY, OYSTER LAKE, WEST BAY, & GIWW SHORELINE PROTECTION
10	M-8: EAST MATAGORDA BAY SHORELINE PROTECTION
11	M-8: EAST MATAGORDA BAY SHORELINE PROTECTION
12	M-8: EAST MATAGORDA BAY SHORELINE PROTECTION
13	CA-5: KELLER BAY RESTORATION
14	CA-6: POWDERHORN SHORELINE PROTECTION & WETLAND RESTORATION
15	CA-6: POWDERHORN SHORELINE PROTECTION & WETLAND RESTORATION
16	SP-1: REDFISH BAY PROTECTION & ENHANCEMENT
17	SP-1: REDFISH BAY PROTECTION & ENHANCEMENT
18	SP-1: REDFISH BAY PROTECTION & ENHANCEMENT
19	W-3: PORT MANSFIELD CHANNEL, ISLAND ROOKERY & HYDROLOGIC RESTORATION
20	W-3: PORT MANSFIELD CHANNEL, ISLAND ROOKERY & HYDROLOGIC RESTORATION

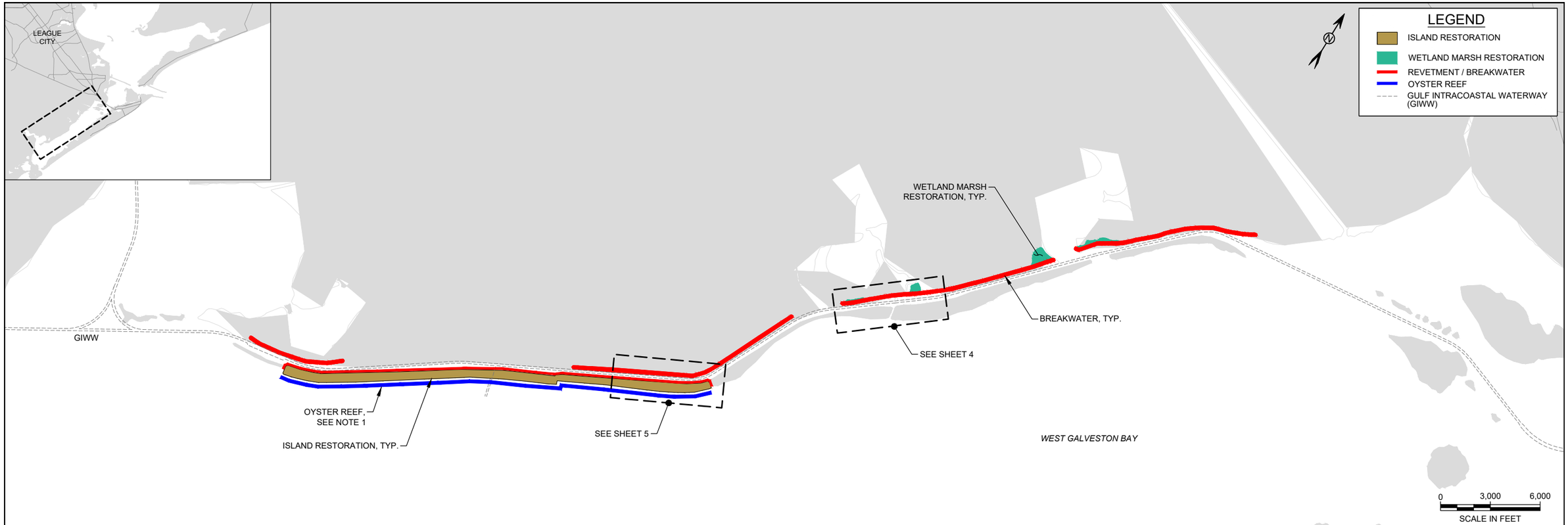


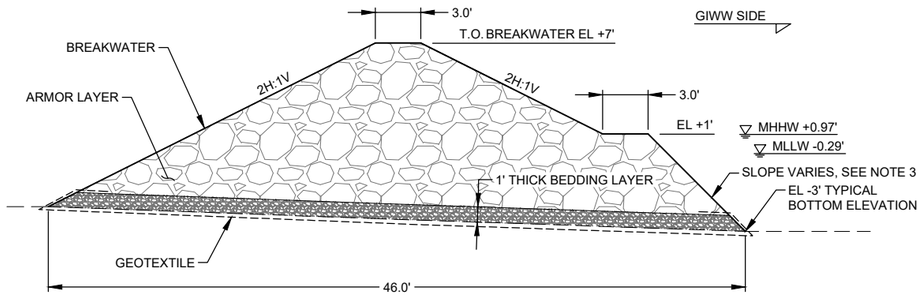
COVER SHEET

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

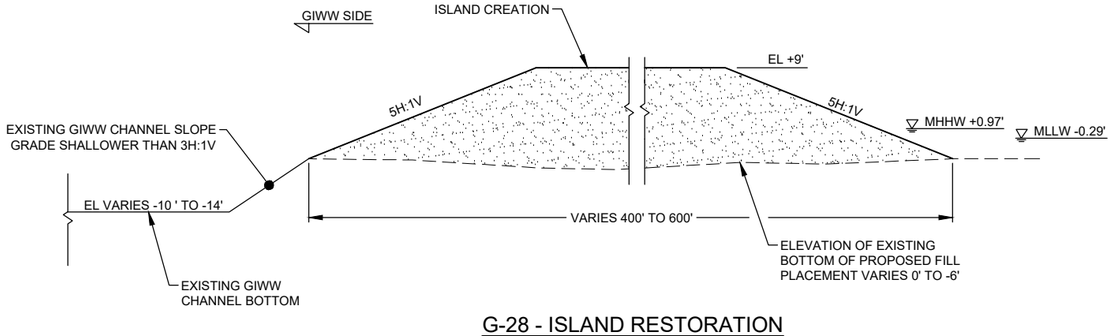
U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

ENGINEERING APPENDIX
DATED:
JULY 28, 2020
MOTT MACDONALD

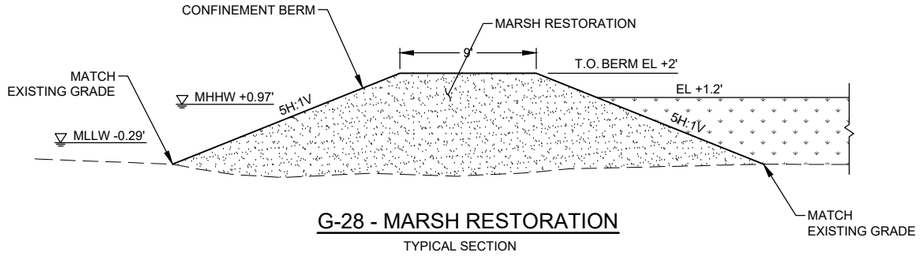




G-28 - BREAKWATER
TYPICAL SECTION



G-28 - ISLAND RESTORATION
TYPICAL SECTION



G-28 - MARSH RESTORATION
TYPICAL SECTION

NOTES:

1. OYSTER CULCH TO BE PLACED WITHIN OYSTER REEF TEMPLATE. FINAL ELEVATION AND SLOPES OF OYSTER CULCH PLACEMENT TO BE DETERMINED DURING FINAL DESIGN.
2. ALL ELEVATIONS IN FEET NAVD88.
3. DATUMS FROM NOAA GAGE 8771486 GALVESTON RAILROAD BRIDGE, TX

G-28: BOLIVAR PENINSULA & WEST BAY GIWW SHORELINE & ISLAND PROTECTION (WEST)

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

ENGINEERING APPENDIX
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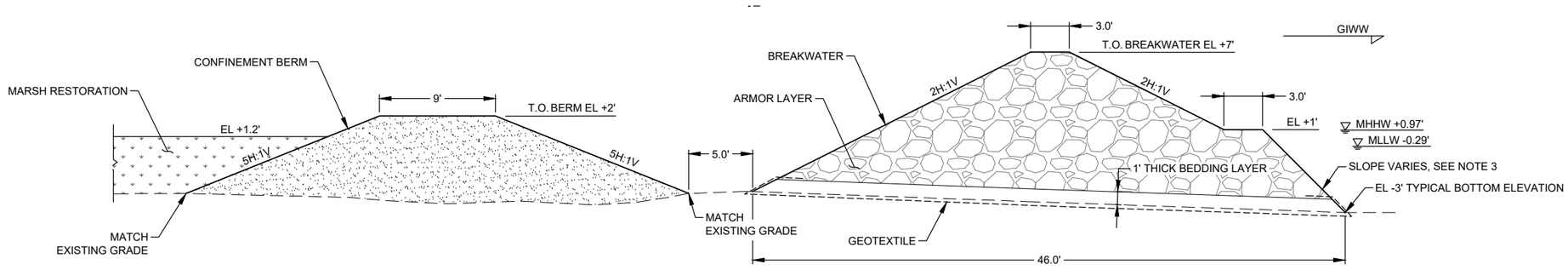
JULY 28, 2020

MOTT MACDONALD



A
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G-28: COMBINED BREAKWATER & MARSH RESTORATION SECTION

TYPICAL SECTION

NOTES:

1. ALL ELEVATIONS IN FEET NAVD88.
2. DATUMS FROM NOAA GAGE 8771486 GALVESTON RAILROAD BRIDGE, TX.

G-28: BOLIVAR PENINSULA & WEST BAY GIWW SHORELINE & ISLAND PROTECTION (WEST)

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

ENGINEERING APPENDIX
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JULY 28, 2020
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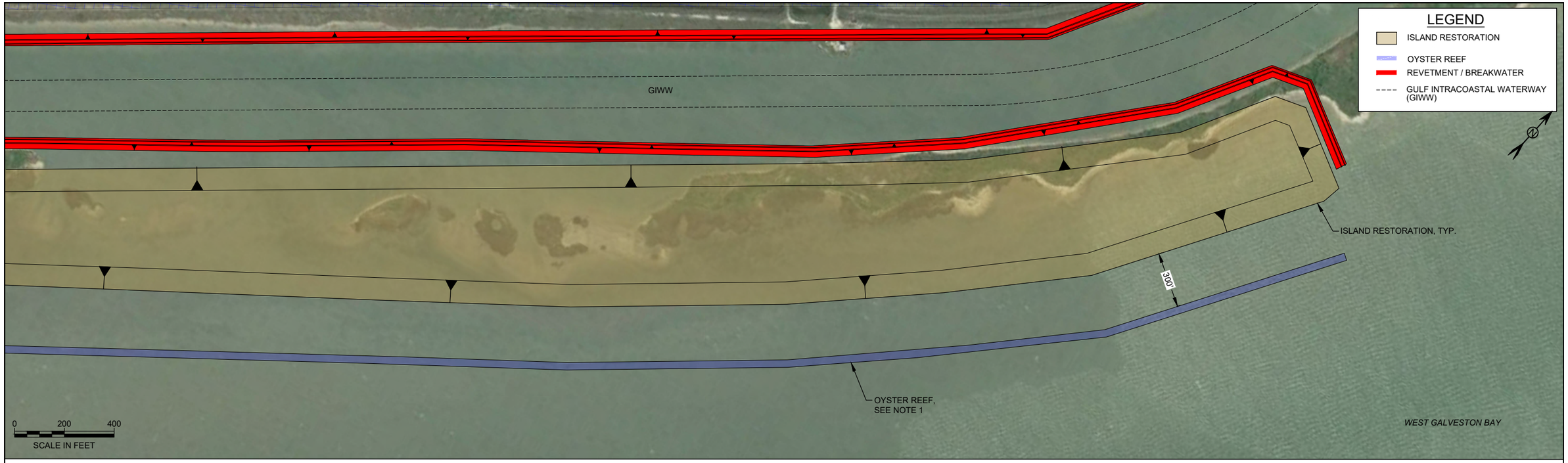

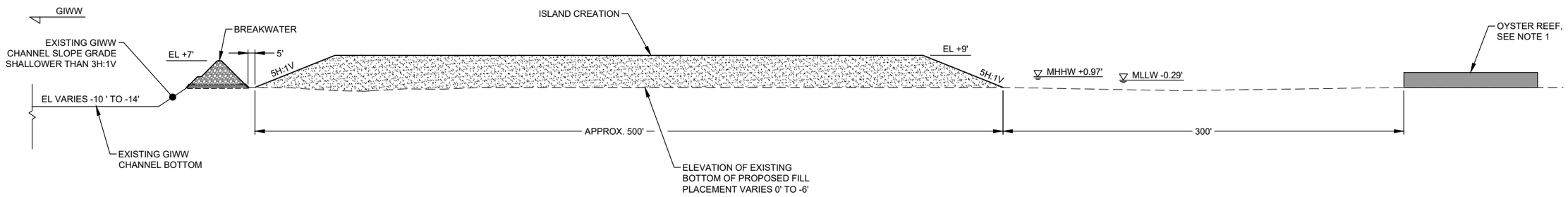

B
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G-28: COMBINED ISLAND RESTORATION AND OYSTER CULTCH SECTION

TYPICAL SECTION

NOTES:

1. OYSTER CULCH TO BE PLACED WITHIN OYSTER REEF TEMPLATE. FINAL ELEVATION AND SLOPES OF OYSTER CULCH PLACEMENT TO BE DETERMINED DURING FINAL DESIGN.
2. ALL ELEVATIONS IN FEET NAVD88.

G-28: BOLIVAR PENINSULA & WEST BAY GIWW SHORELINE & ISLAND PROTECTION (WEST)

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

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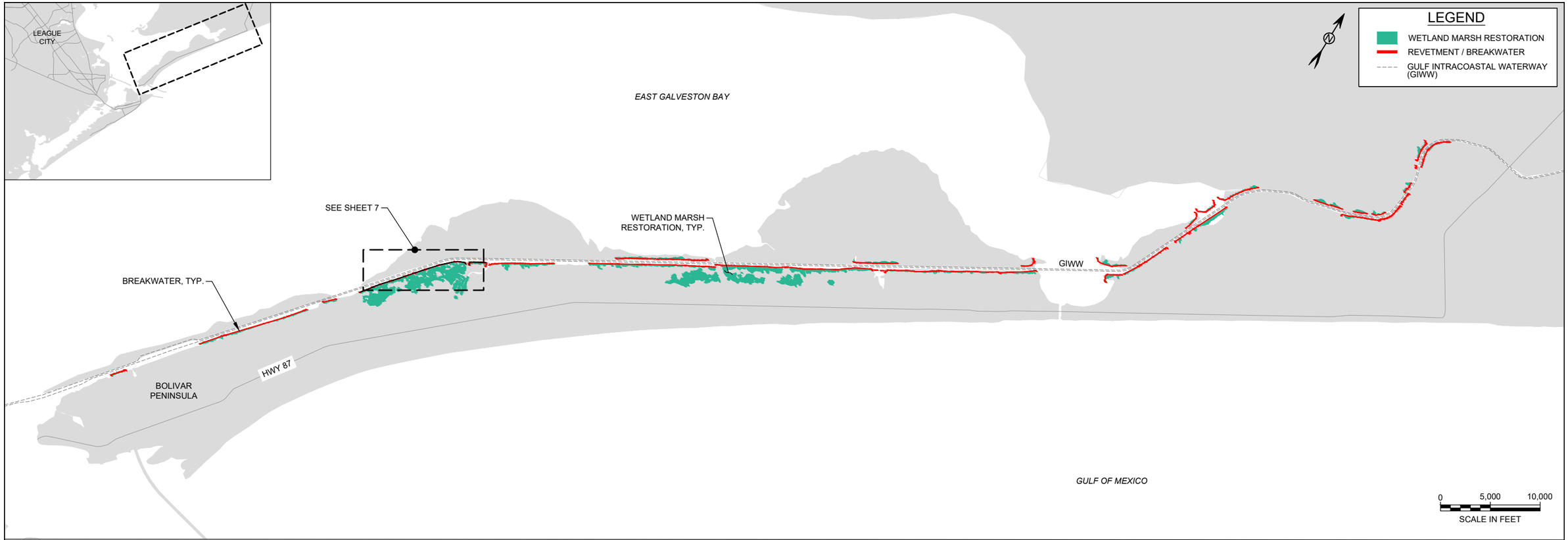
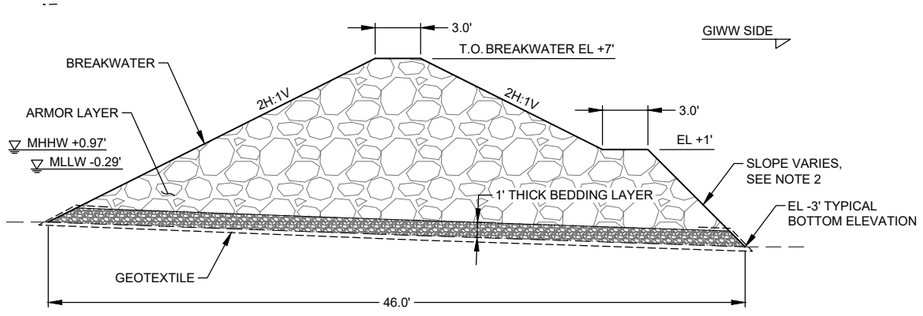
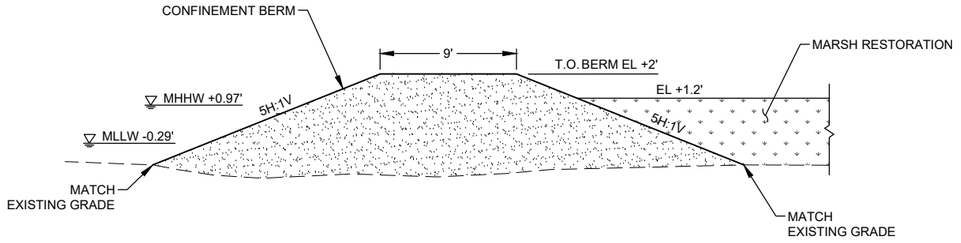




G-28 - BREAKWATER
TYPICAL SECTION



G-28 - MARSH RESTORATION
TYPICAL SECTION

NOTES:

1. ALL ELEVATIONS IN FEET NAVD88.
2. VARY SLOPE OF BREAKWATER TOE SO THAT STONE IS PLACED WITHIN THE 46.0' WIDE BREAKWATER TEMPLATE.
3. DATUMS FROM NOAA GAGE 8771486 GALVESTON RAILROAD BRIDGE, TX.

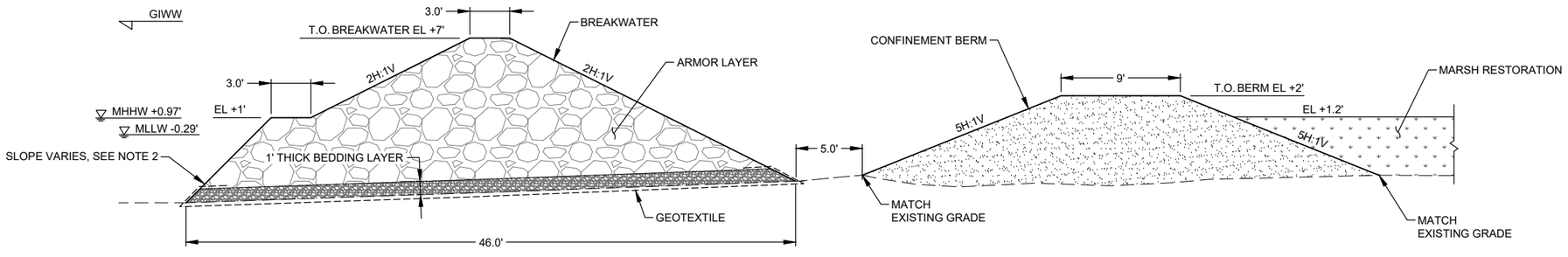
G-28: BOLIVAR PENINSULA & WEST BAY GIWW SHORELINE & ISLAND PROTECTION (EAST)

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

ENGINEERING APPENDIX
DATED:
JULY 28, 2020

MOTT MACDONALD



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G-28: COMBINED BREAKWATER & MARSH RESTORATION

TYPICAL SECTION

NOTES:

1. ALL ELEVATIONS IN FEET NAVD88.
2. VARY SLOPE OF BREAKWATER TOE SO THAT STONE IS PLACED WITHIN THE 46.0' WIDE BREAKWATER TEMPLATE.
3. DATUMS FROM NOAA GAGE 8771486 GALVESTON RAILROAD BRIDGE, TX.

G-28: BOLIVAR PENINSULA & WEST BAY GIWW SHORELINE & ISLAND PROTECTION (EAST)

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

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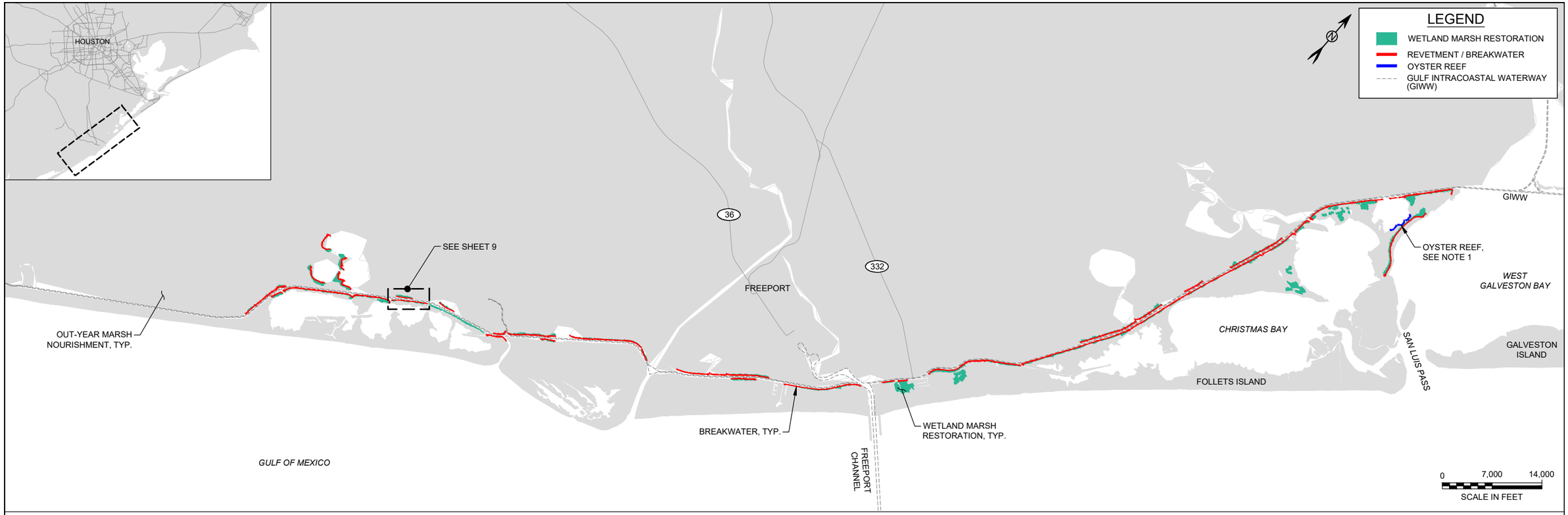
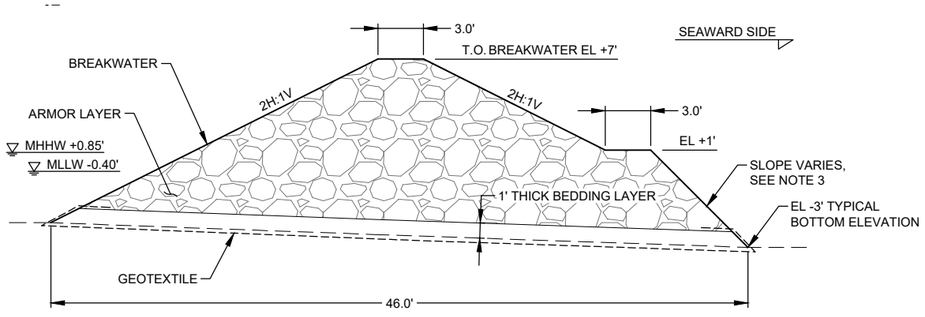
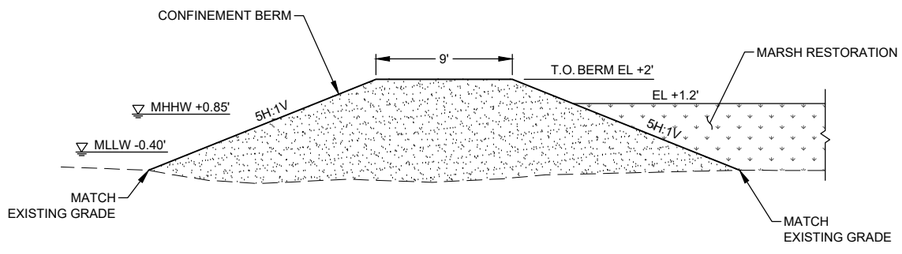




B-12- BREAKWATER
TYPICAL SECTION



B-12 - MARSH RESTORATION
TYPICAL SECTION

NOTES:

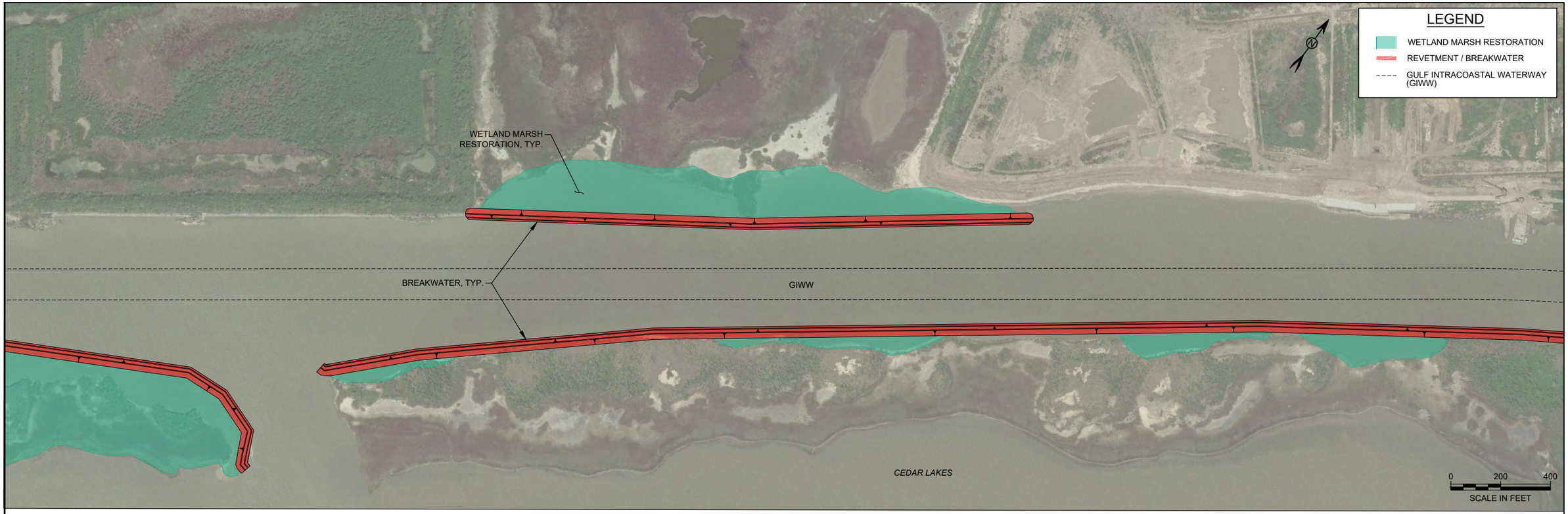
1. OYSTER CULCH TO BE PLACED WITHIN OYSTER REEF TEMPLATE. FINAL ELEVATION AND SLOPES OF OYSTER CULCH PLACEMENT TO BE DETERMINED DURING FINAL DESIGN.
2. ALL ELEVATIONS IN FEET NAVD88.
3. VARY SLOPE OF BREAKWATER TOE SO THAT STONE IS PLACED WITHIN THE 46.0' WIDE BREAKWATER TEMPLATE.
4. DATUMS FROM NOAA GAGE 8771972, SAN LUIS PASS, TX.

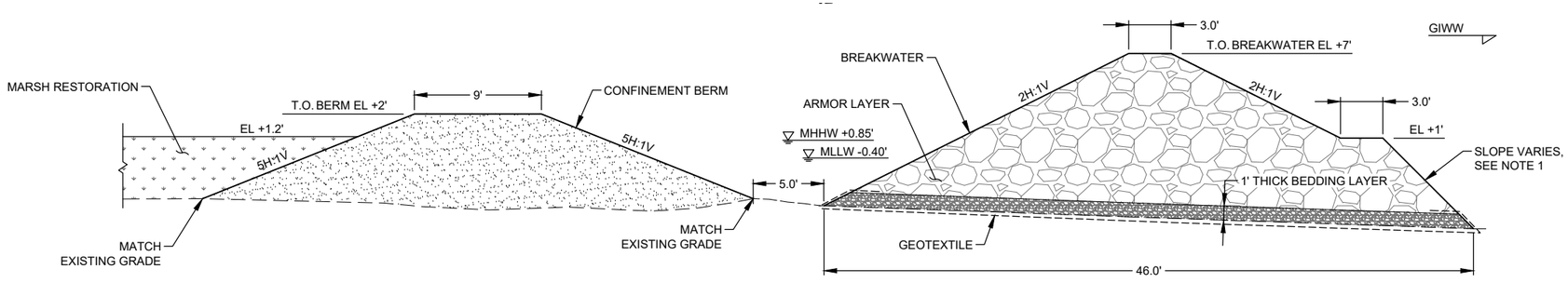
B-12: BASTROP BAY, OYSTER LAKE, WEST BAY, & GIWW SHORELINE PROTECTION

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

ENGINEERING APPENDIX
DATED:
JULY 28, 2020
MOTT MACDONALD





D
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B-12: COMBINED BREAKWATER & MARSH RESTORATION

TYPICAL SECTION

NOTES:

1. ALL ELEVATIONS IN FEET NAVD88.
2. VARY SLOPE OF BREAKWATER TOE SO THAT STONE IS PLACED WITHIN THE 46.0' WIDE BREAKWATER TEMPLATE.
3. DATUMS FROM NOAA GAGE 8771972, SAN LUIS PASS, TX.

B-12: BASTROP BAY, OYSTER LAKE, WEST BAY, & GIWW SHORELINE PROTECTION

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

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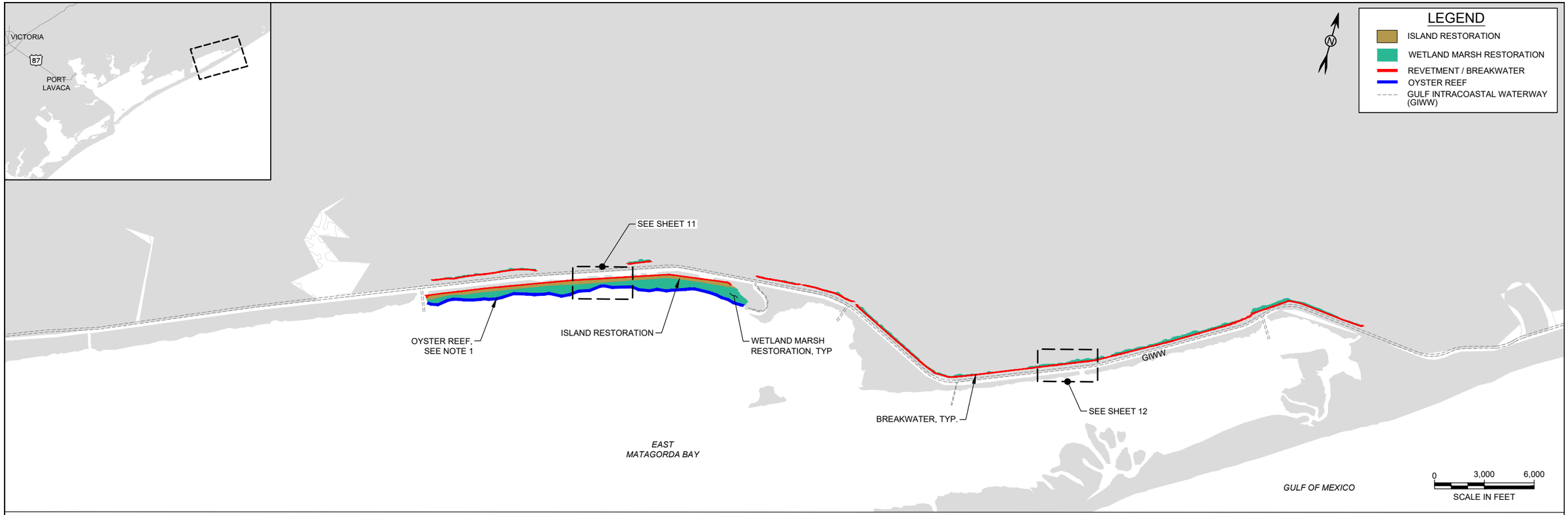
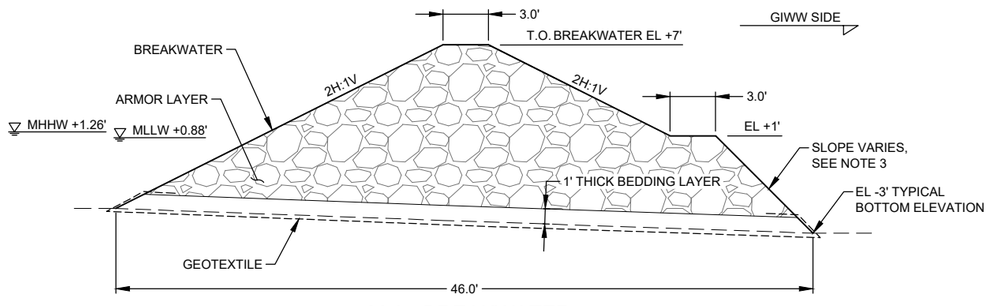
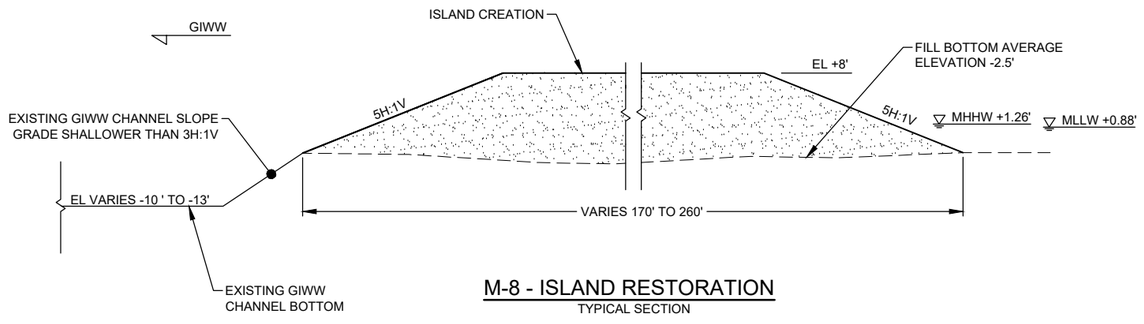
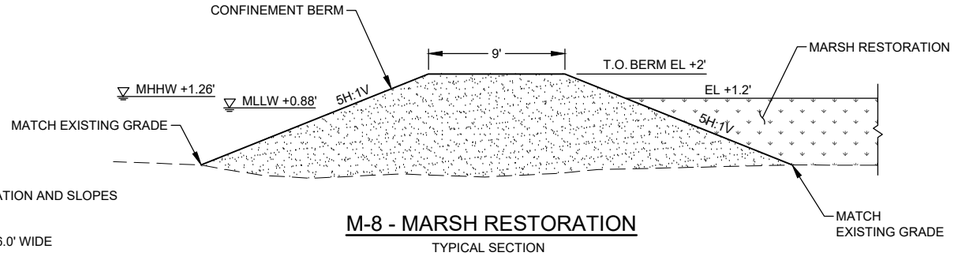




M-8 - BREAKWATER
TYPICAL SECTION



M-8 - ISLAND RESTORATION
TYPICAL SECTION



M-8 - MARSH RESTORATION
TYPICAL SECTION

NOTES:

1. OYSTER CULCH TO BE PLACED WITHIN OYSTER REEF TEMPLATE. FINAL ELEVATION AND SLOPES OF OYSTER CULCH PLACEMENT TO BE DETERMINED DURING FINAL DESIGN.
2. ALL ELEVATIONS IN FEET NAVD88.
3. VARY SLOPE OF BREAKWATER TOE SO THAT STONE IS PLACED WITHIN THE 46.0' WIDE BREAKWATER TEMPLATE.
4. DATUMS FROM NOAA GAGE 8773037 SEADRIFT, TX

M-8: EAST MATAGORDA BAY SHORELINE PROTECTION

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

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DATED:
JULY 28, 2020

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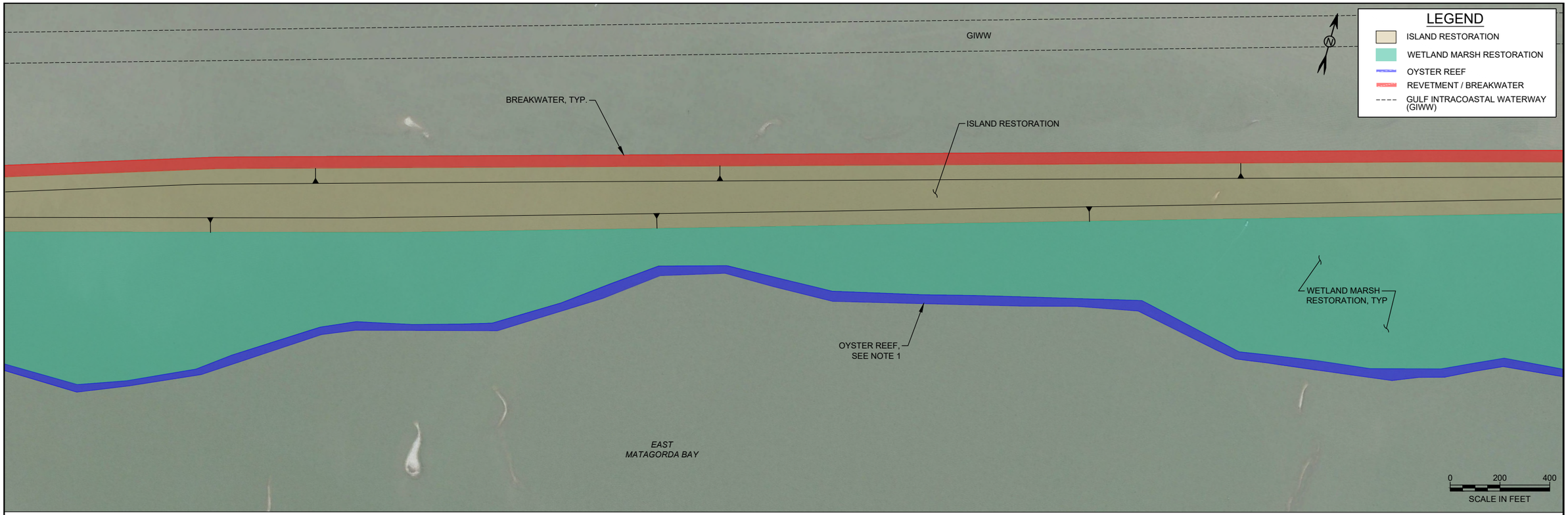

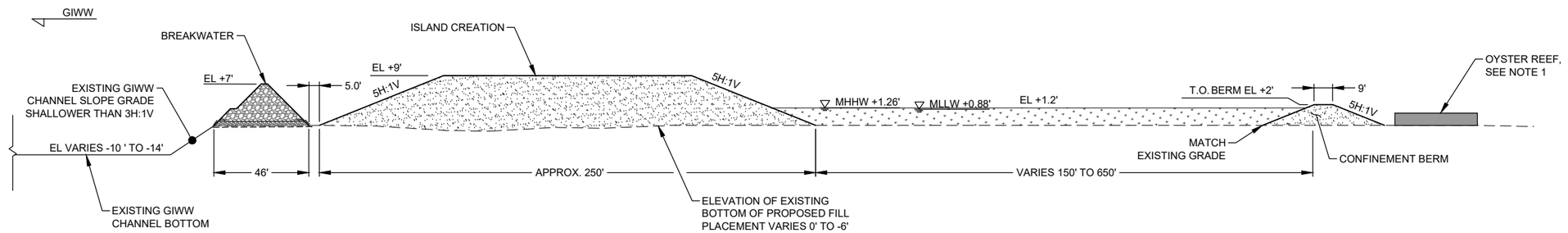

E
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M-8: COMBINED ISLAND RESTORATION, MARSH RESTORATION, AND OYSTER CULTCH SECTION

TYPICAL SECTION

NOTES:

1. OYSTER CULCH TO BE PLACED WITHIN OYSTER REEF TEMPLATE. FINAL ELEVATION AND SLOPES OF OYSTER CULCH PLACEMENT TO BE DETERMINED DURING FINAL DESIGN.
2. ALL ELEVATIONS IN FEET NAVD88.
3. VARY SLOPE OF BREAKWATER TOE SO THAT STONE IS PLACED WITHIN THE 46.0' WIDE BREAKWATER TEMPLATE.
4. DATUMS FROM NOAA GAGE 8773037 SEADRIFT, TX

M-8: EAST MATAGORDA BAY SHORELINE PROTECTION

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

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JULY 28, 2020

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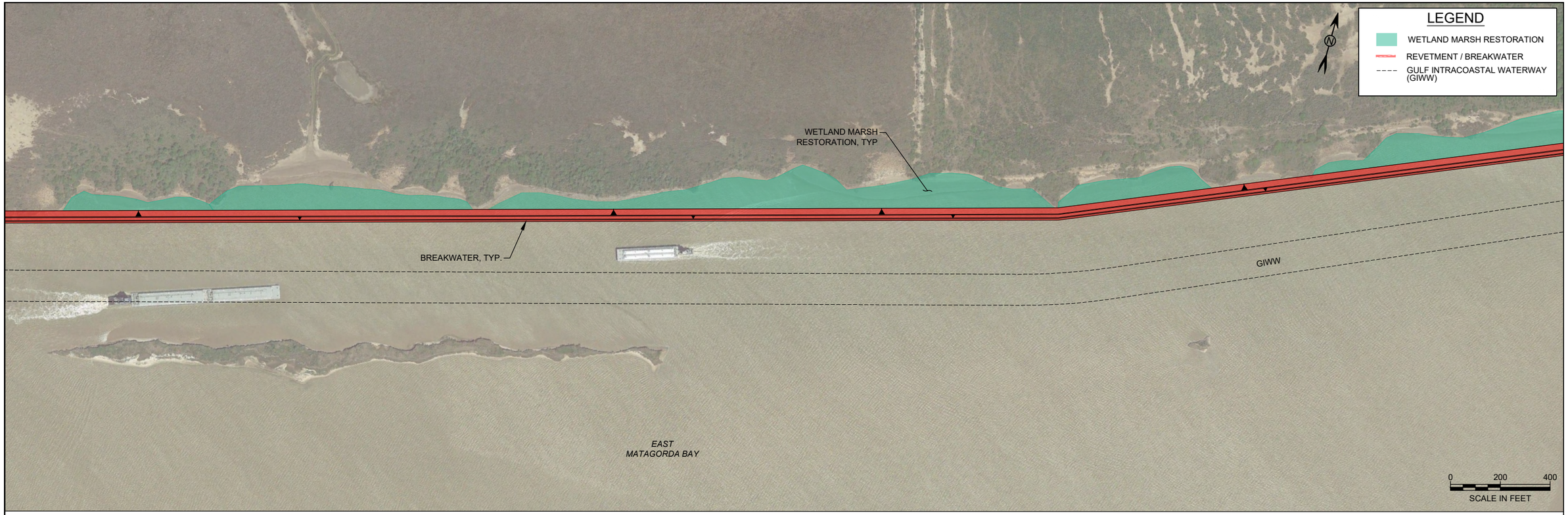

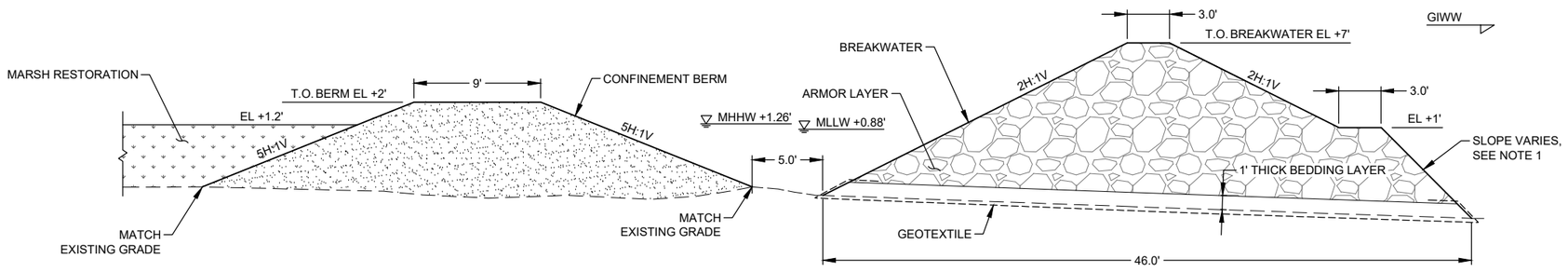

F
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M-8: COMBINED BREAKWATER & MARSH RESTORATION

TYPICAL SECTION

NOTES:

1. ALL ELEVATIONS IN FEET NAVD88.
2. VARY SLOPE OF BREAKWATER TOE SO THAT STONE IS PLACED WITHIN THE 46.0' WIDE BREAKWATER TEMPLATE.
3. DATUMS FROM NOAA GAGE 8773037 SEADRIFT, TX

M-8: EAST MATAGORDA BAY SHORELINE PROTECTION

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

ENGINEERING APPENDIX
DATED:
JULY 28, 2020

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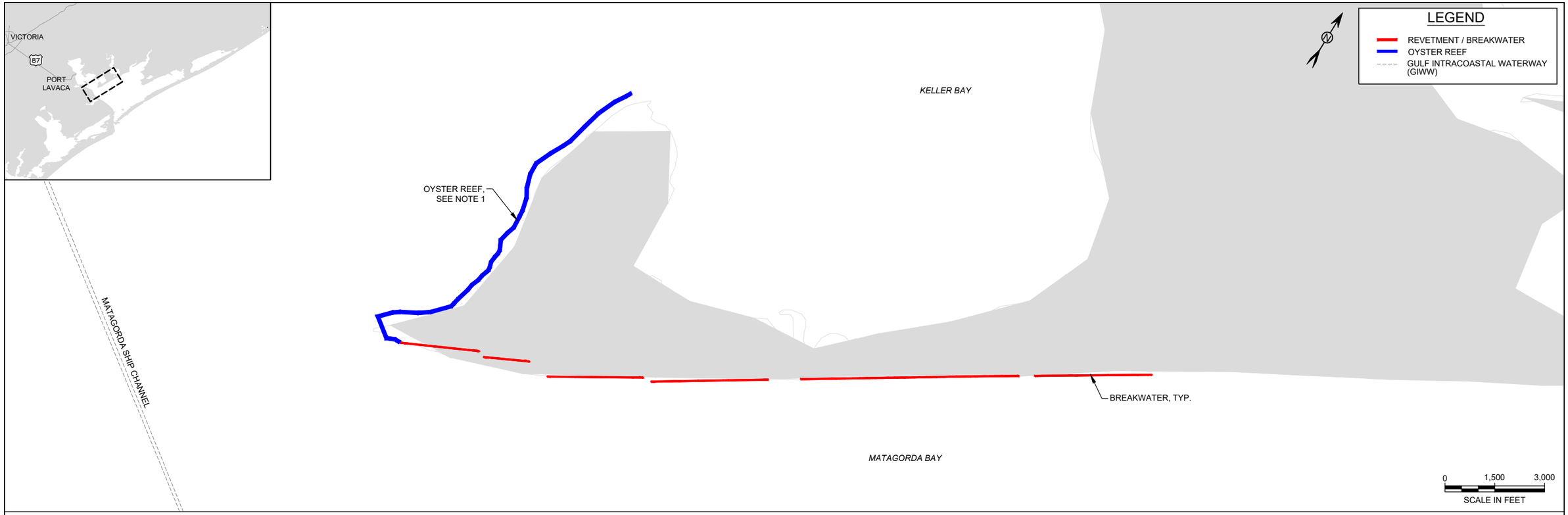

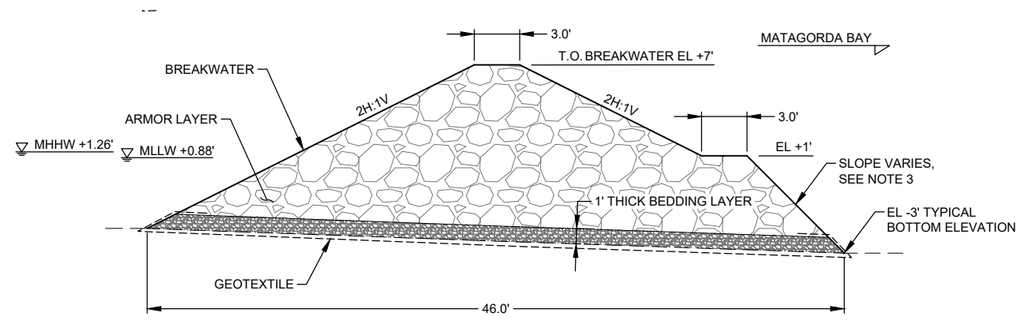

CA-5 - BREAKWATER
TYPICAL SECTION

NOTES:

1. OYSTER CULCH TO BE PLACED WITHIN OYSTER REEF TEMPLATE. FINAL ELEVATION AND SLOPES OF OYSTER CULCH PLACEMENT TO BE DETERMINED DURING FINAL DESIGN.
2. ALL ELEVATIONS IN FEET NAVD88.
3. VARY SLOPE OF BREAKWATER TOE SO THAT STONE IS PLACED WITHIN THE 46.0' WIDE BREAKWATER TEMPLATE.
4. DATUMS FROM NOAA GAGE 8773037 SEADRIFT, TX

CA-5: KELLER BAY RESTORATION

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

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DATED:
JULY 28, 2020

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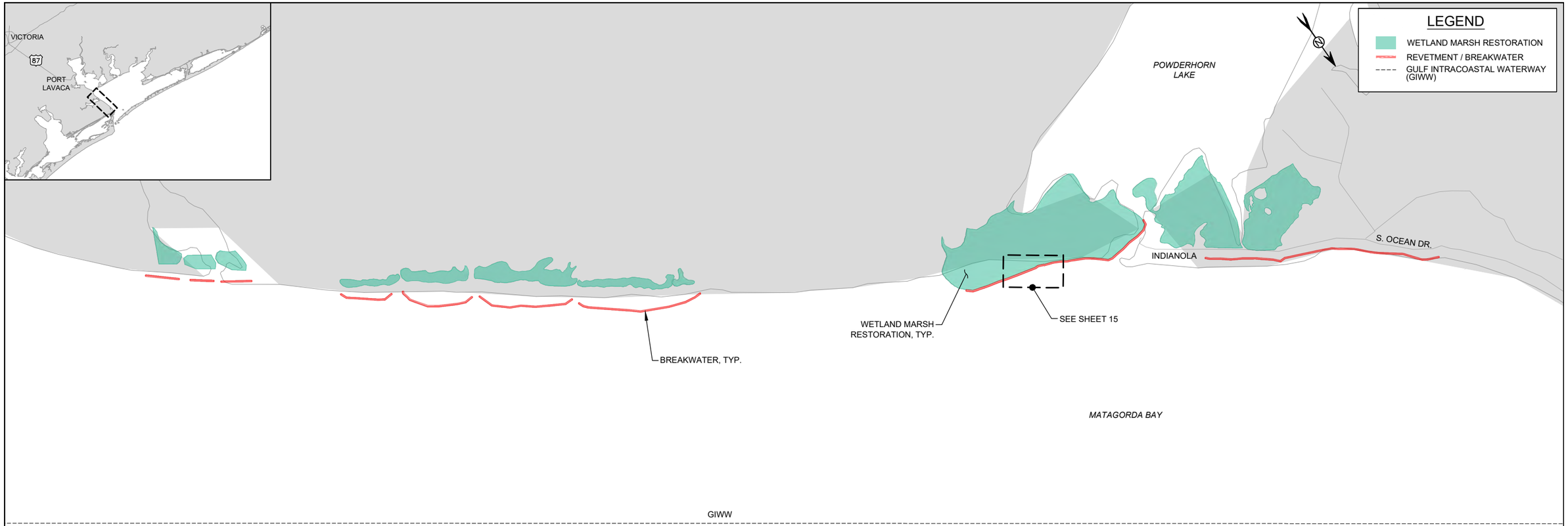
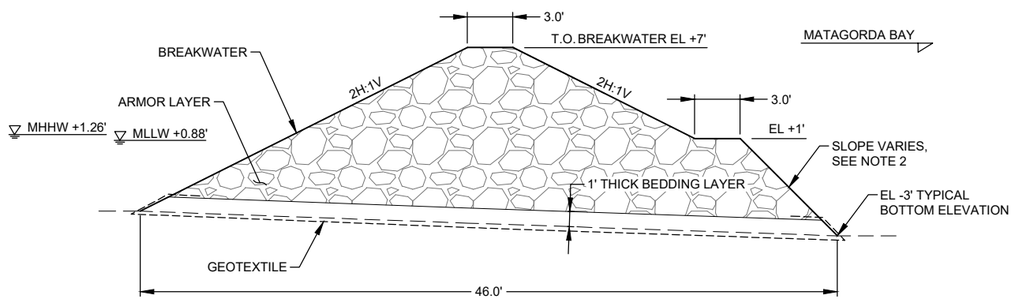
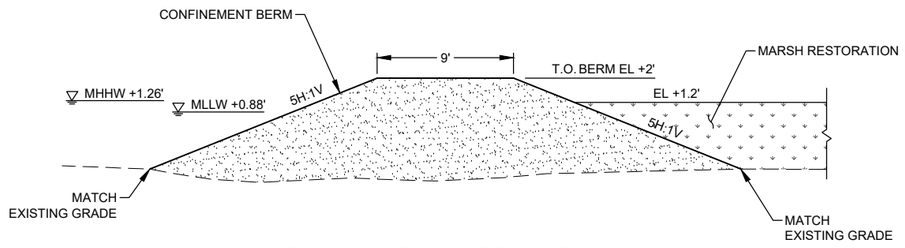




CA-6 - BREAKWATER
TYPICAL SECTION



CA-6 - MARSH RESTORATION
TYPICAL SECTION

NOTES:

1. ALL ELEVATIONS IN FEET NAVD88.
2. VARY SLOPE OF BREAKWATER TOE SO THAT STONE IS PLACED WITHIN THE 46.0' WIDE BREAKWATER TEMPLATE.
3. DATUMS FROM NOAA GAGE 8773037 SEADRIFT, TX

CA-6: POWDERHORN SHORELINE PROTECTION & WETLAND RESTORATION

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

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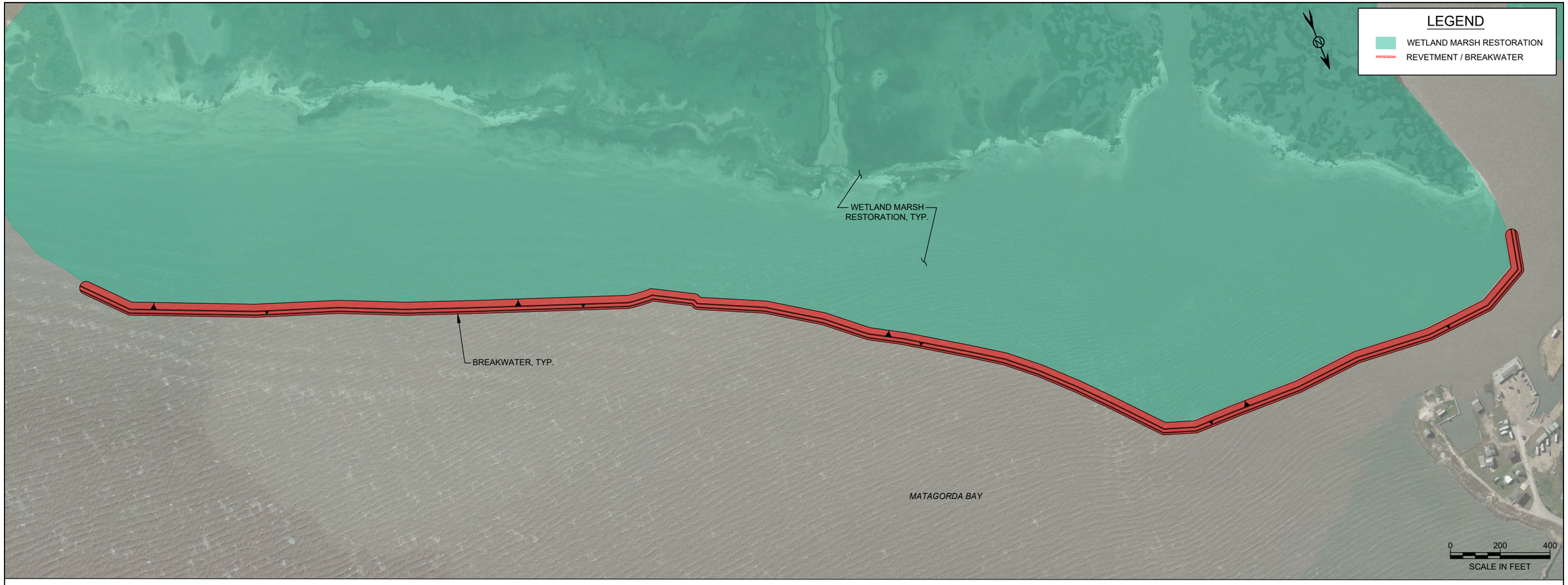

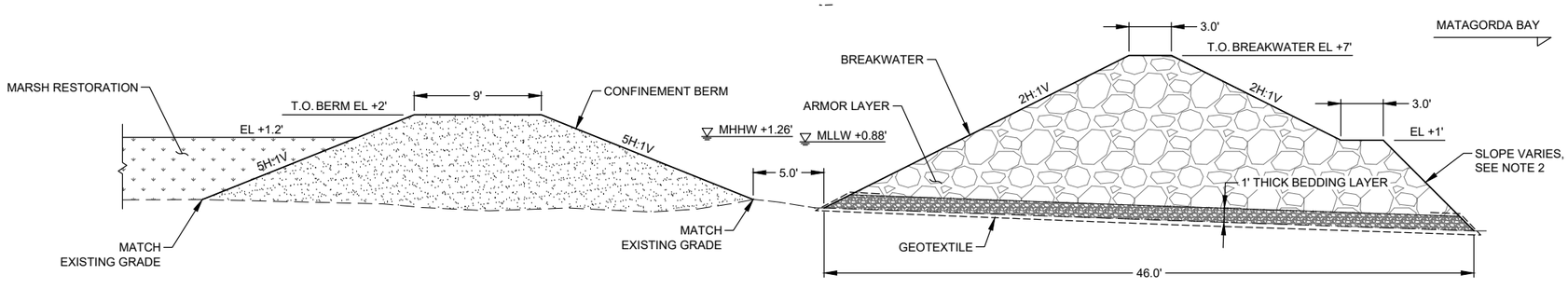

G-

CA-6: COMBINED BREAKWATER & MARSH RESTORATION

TYPICAL SECTION

NOTES:

1. ALL ELEVATIONS IN FEET NAVD88.
2. VARY SLOPE OF BREAKWATER TOE SO THAT STONE IS PLACED WITHIN THE 46.0' WIDE BREAKWATER TEMPLATE.
3. DATUMS FROM NOAA GAGE 8773037 SEADRIFT, TX

CA-6: POWDERHORN SHORELINE PROTECTION & WETLAND RESTORATION

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

ENGINEERING APPENDIX
DATED:
JULY 28, 2020

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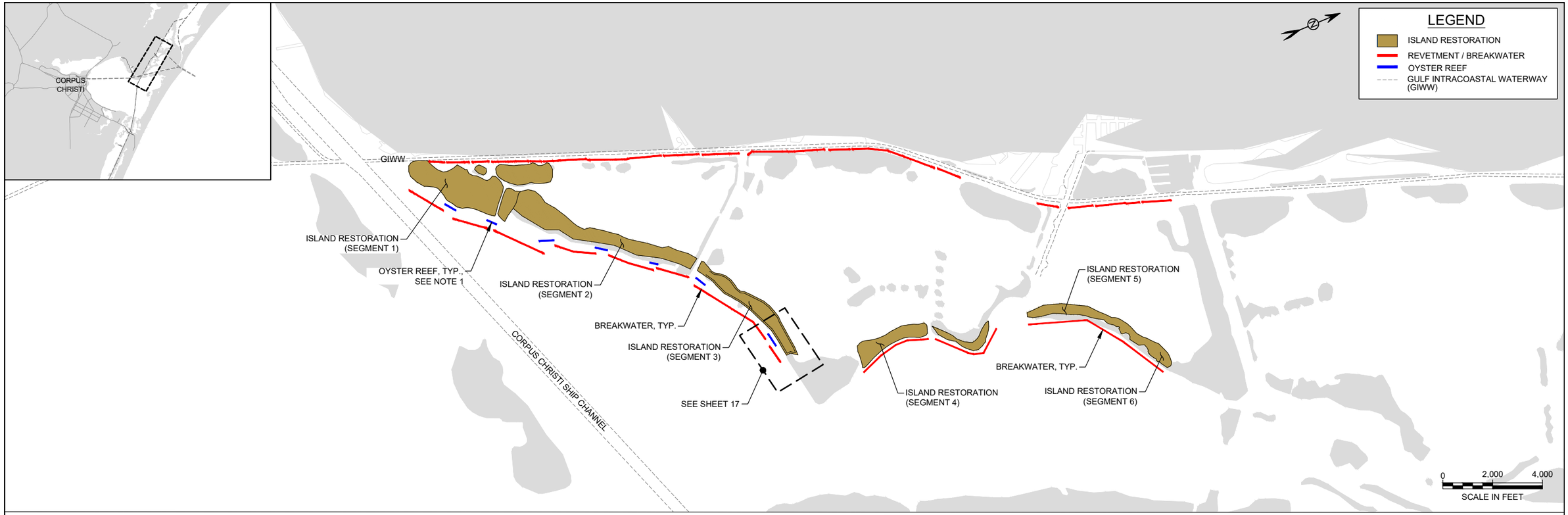
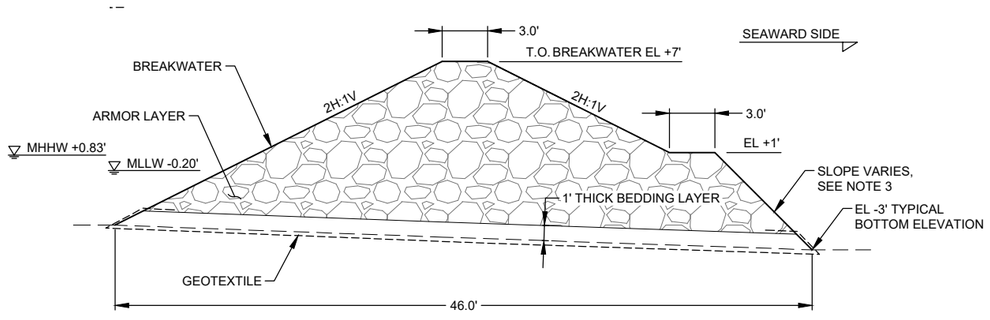
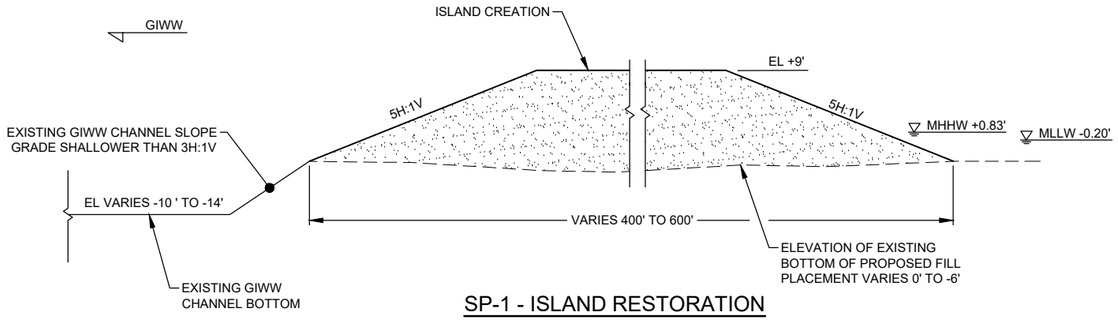




SP-1 - BREAKWATER
TYPICAL SECTION



SP-1 - ISLAND RESTORATION
TYPICAL SECTION

NOTES:

1. OYSTER CULCH TO BE PLACED WITHIN OYSTER REEF TEMPLATE. FINAL ELEVATION AND SLOPES OF OYSTER CULCH PLACEMENT TO BE DETERMINED DURING FINAL DESIGN.
2. ALL ELEVATIONS IN FEET NAVD88.
3. VARY SLOPE OF BREAKWATER TOE SO THAT STONE IS PLACED WITHIN THE 46.0' WIDE BREAKWATER TEMPLATE.
4. DATUMS FROM NOAA GAGE 8775237, PORT ARANSAS TX

SP-1: REDFISH BAY PROTECTION & ENHANCEMENT

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

ENGINEERING APPENDIX
DATED:
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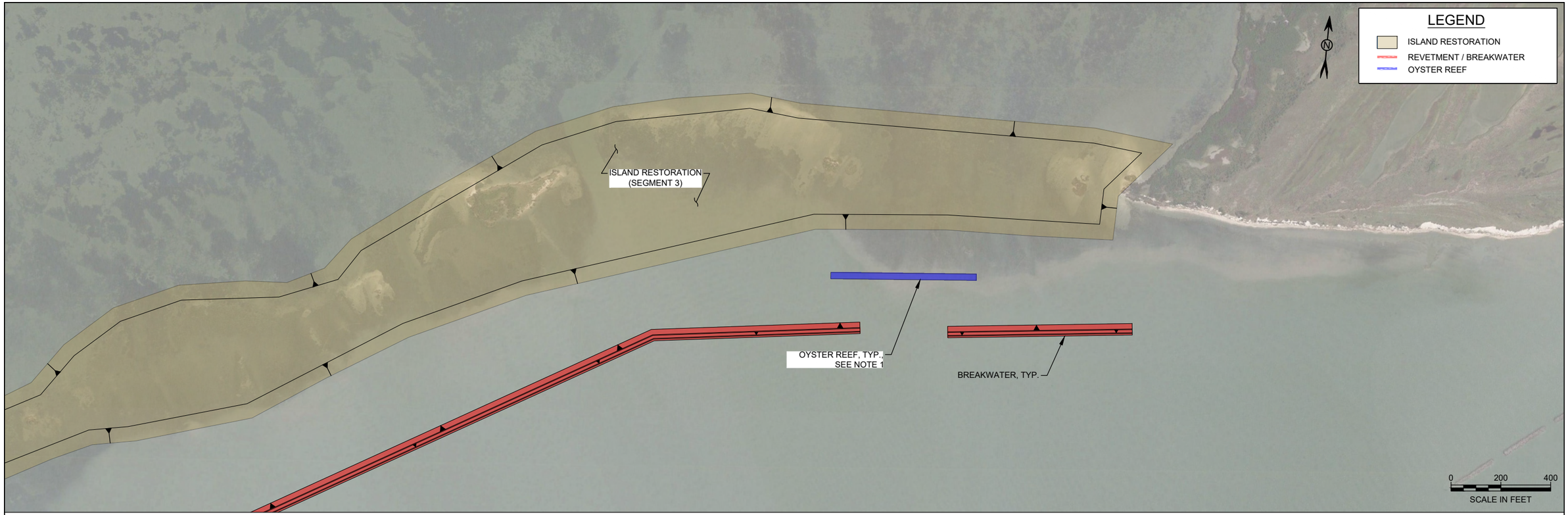

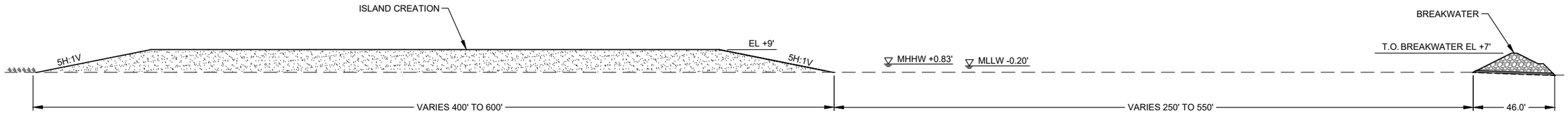

H
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SP-1: COMBINED ISLAND RESTORATION AND BREAKWATER

TYPICAL SECTION

NOTES:

1. OYSTER CULCH TO BE PLACED WITHIN OYSTER REEF TEMPLATE. FINAL ELEVATION AND SLOPES OF OYSTER CULCH PLACEMENT TO BE DETERMINED DURING FINAL DESIGN.
2. ALL ELEVATIONS IN FEET NAVD88.
3. VARY SLOPE OF BREAKWATER TOE SO THAT STONE IS PLACED WITHIN THE 46.0' WIDE BREAKWATER TEMPLATE.
4. DATUMS FROM NOAA GAGE 8775237, PORT ARANSAS TX

SP-1: REDFISH BAY PROTECTION & ENHANCEMENT

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

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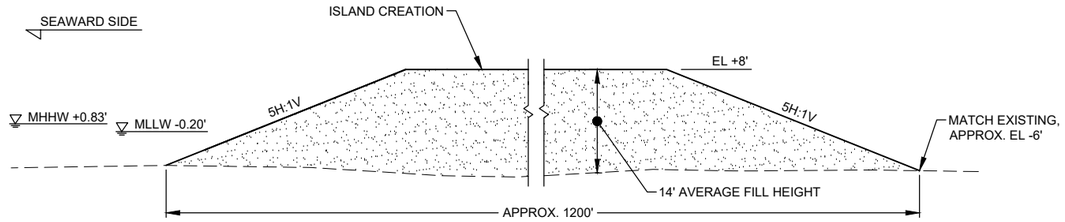
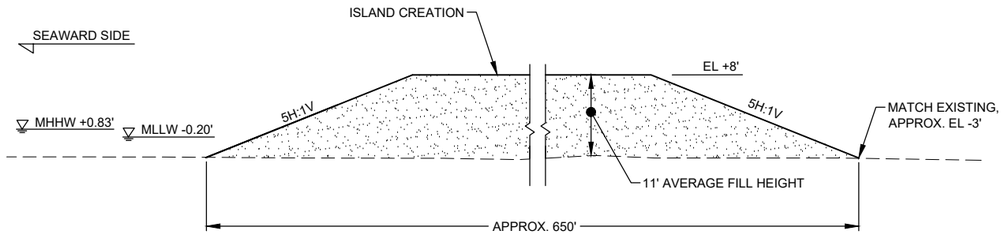


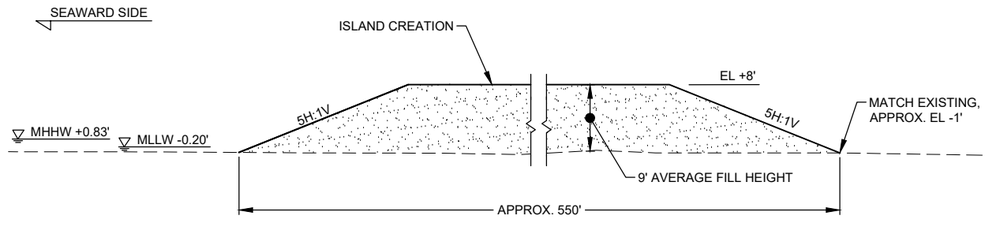
SP-1 - ISLAND RESTORATION (SEGMENT 1)

TYPICAL SECTION



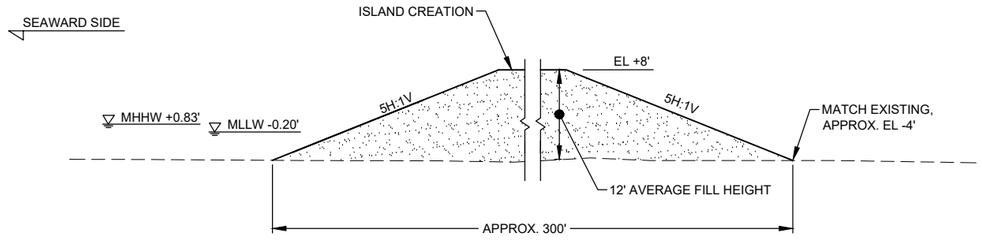
SP-1 - ISLAND RESTORATION (SEGMENT 4)

TYPICAL SECTION



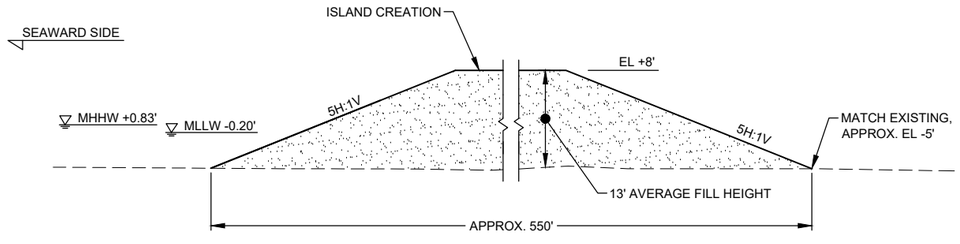
SP-1 - ISLAND RESTORATION (SEGMENT 2)

TYPICAL SECTION



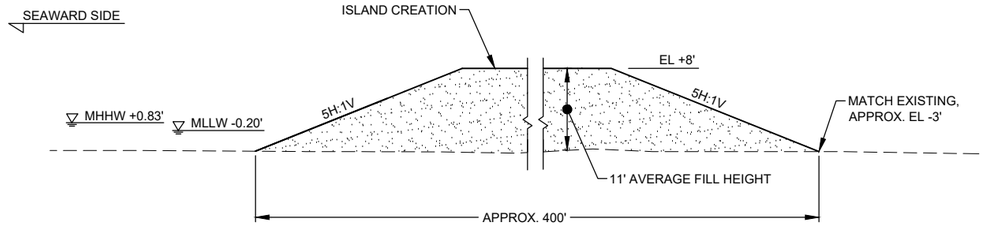
SP-1 - ISLAND RESTORATION (SEGMENT 5)

TYPICAL SECTION



SP-1 - ISLAND RESTORATION (SEGMENT 3)

TYPICAL SECTION



SP-1 - ISLAND RESTORATION (SEGMENT 6)

TYPICAL SECTION

NOTES:

1. ALL ELEVATIONS IN FEET NAVD88.
2. DATUMS FROM NOAA GAGE 8775237, PORT ARANSAS TX

SP-1: REDFISH BAY PROTECTION & ENHANCEMENT

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

ENGINEERING APPENDIX
DATED:
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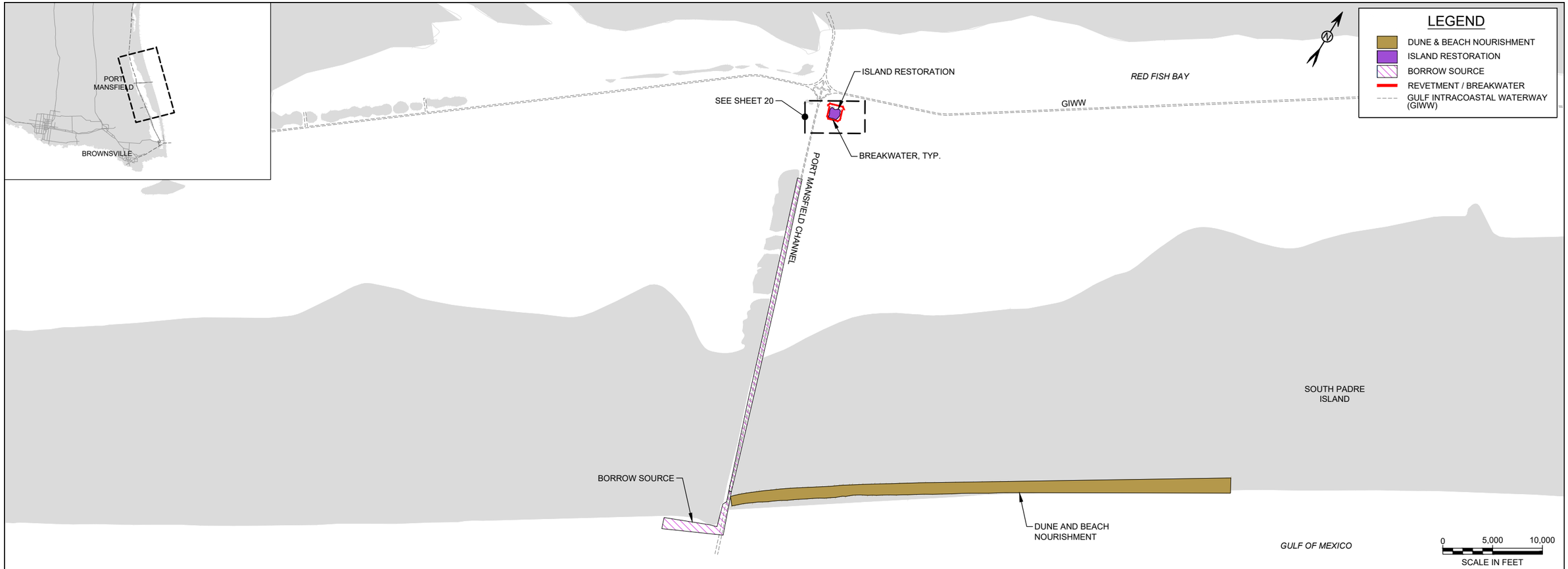
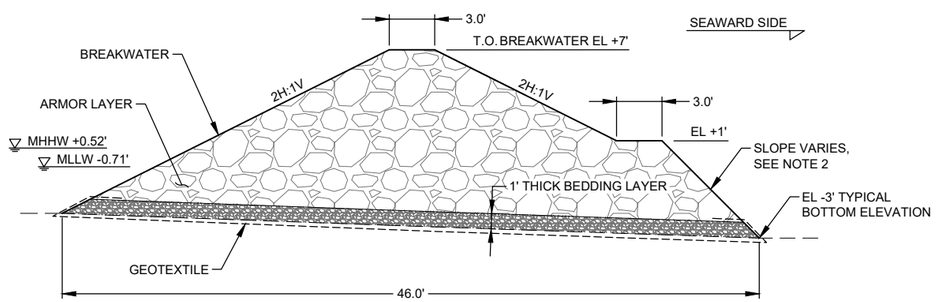
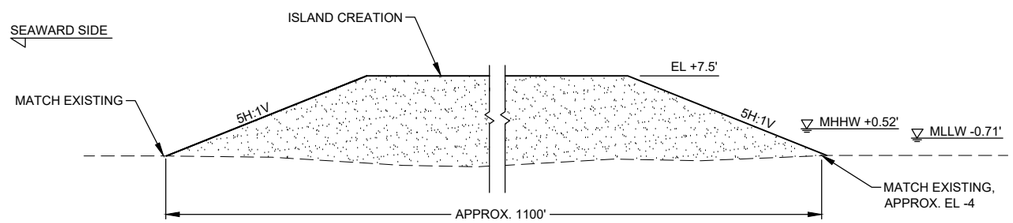
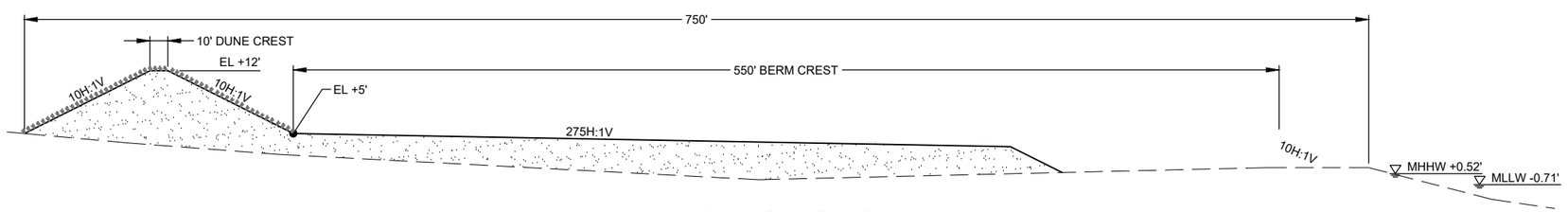




W-3 - BREAKWATER
TYPICAL SECTION



W-3 - ISLAND RESTORATION
TYPICAL SECTION



W-3 - DUNE & BEACH NOURISHMENT
TYPICAL SECTION

NOTES:

1. ALL ELEVATIONS IN FEET NAVD88.
2. VARY SLOPE OF BREAKWATER TOE SO THAT STONE IS PLACED WITHIN THE 46.0' WIDE BREAKWATER TEMPLATE.
3. DATUMS FROM NOAA GAGE 8779770, PORT ISABEL TX

W-3: PORT MANSFIELD CHANNEL, ISLAND ROOKERY & HYDROLOGIC RESTORATION

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

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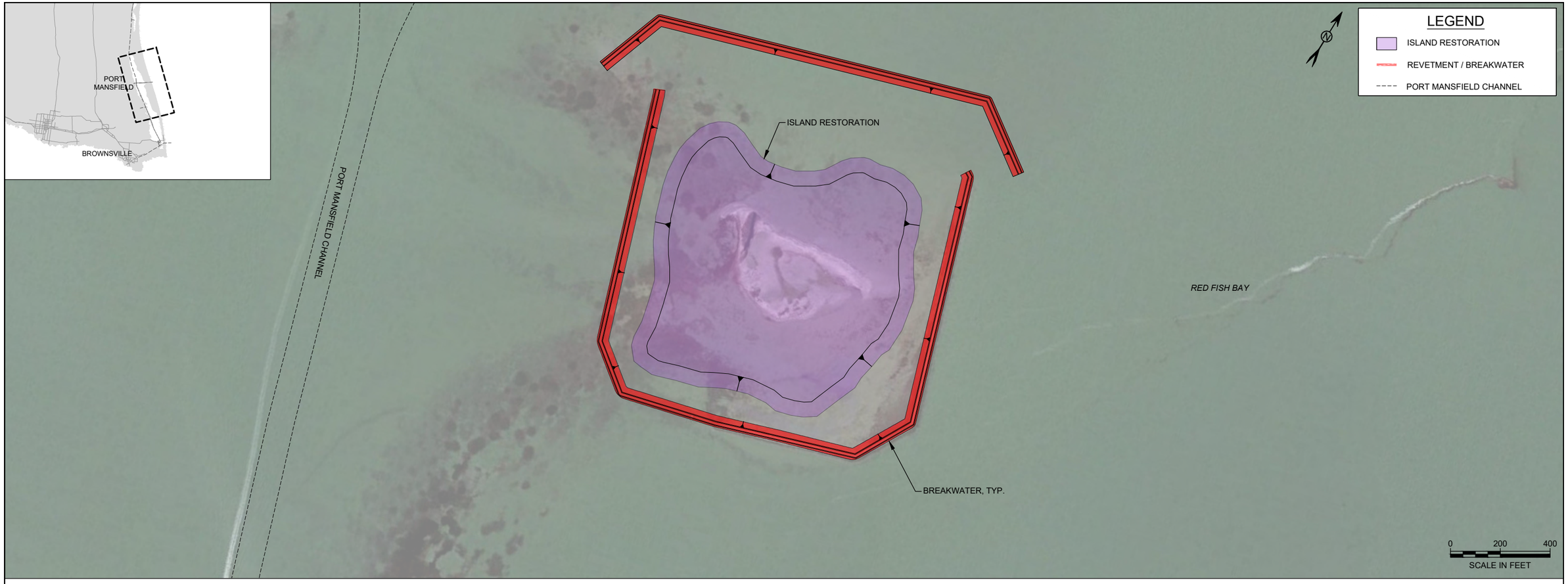

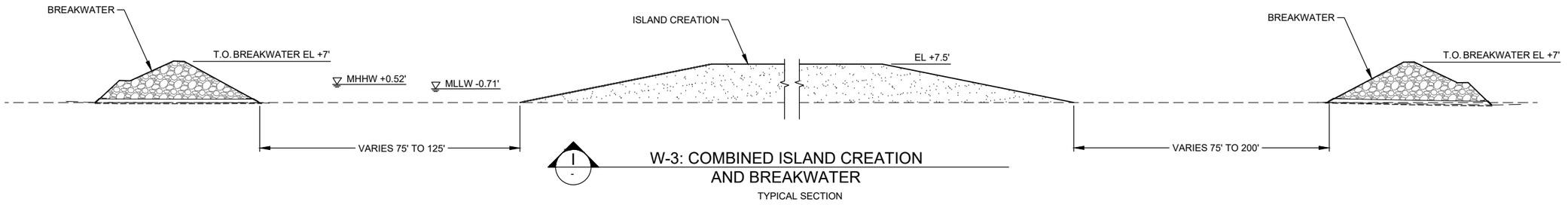

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W-3: COMBINED ISLAND CREATION AND BREAKWATER

TYPICAL SECTION

NOTES:

1. ALL ELEVATIONS IN FEET NAVD88.
2. VARY SLOPE OF BREAKWATER TOE SO THAT STONE IS PLACED WITHIN THE 46.0' WIDE BREAKWATER TEMPLATE.
3. DATUMS FROM NOAA GAGE 8779770, PORT ISABEL TX

W-3: PORT MANSFIELD CHANNEL, ISLAND ROOKERY & HYDROLOGIC RESTORATION

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

ENGINEERING APPENDIX
DATED:
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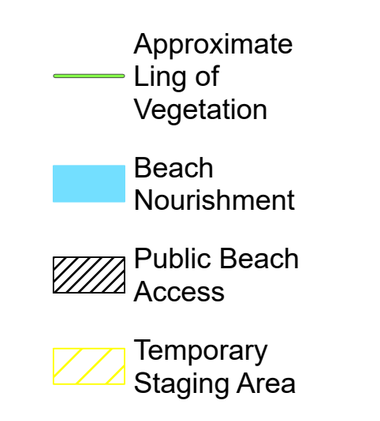
MOTT MACDONALD

SPI Beach Nourishment and Sediment Management

- Private Beach Access
- Approximate Mean Low Tide Line
- Approximate Ling of Vegetation
- Beach Nourishment
- Public Beach Access
- Temporary Staging Area
- Permanent Easement
- Temporary Work Area Easement
- Reach 3
- Reach 4
- Reach 5



US Army Corps of Engineers ®
Galveston District

Coastal Texas Protection and Restoration Feasibility Study

DATUM: NAD 1983
PROJECTION: STATE PLANE
ZONE: TX-S 4205

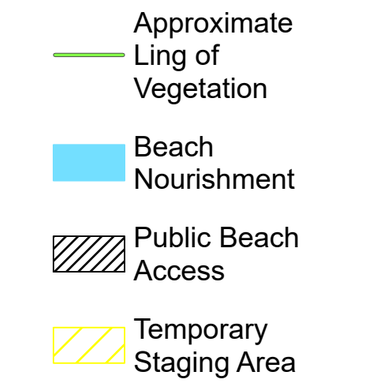
Basemap: 2018 NAIP

0 ¼ ½ Miles

2 September 2020

SPI Beach Nourishment and Sediment Management

- Private Beach Access
- Approximate Mean Low Tide Line
- Approximate Ling of Vegetation
- Beach Nourishment
- Public Beach Access
- Temporary Staging Area
- Permanent Easement
- Temporary Work Area Easement
- Reach 3
- Reach 4
- Reach 5



US Army Corps of Engineers ®
Galveston District

Coastal Texas Protection and Restoration Feasibility Study

DATUM: NAD 1983
PROJECTION: STATE PLANE
ZONE: TX-S 4205

Basemap: 2018 NAIP

0 ¼ ½ Miles

2 September 2020

SPI Beach Nourishment and Sediment Management

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- Permanent Easement
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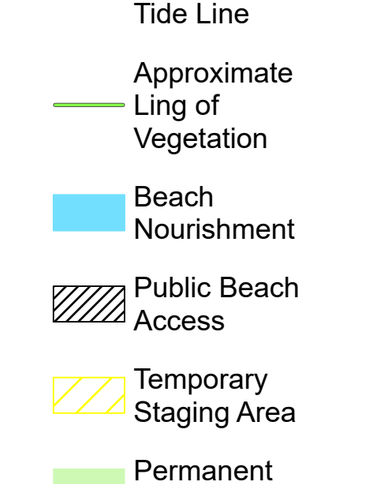

US Army Corps of Engineers ®
Galveston District

Coastal Texas Protection and Restoration Feasibility Study

DATUM: NAD 1983
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ZONE: TX-S 4205

Basemap: 2018 NAIP

0 200 400 Feet

2 September 2020

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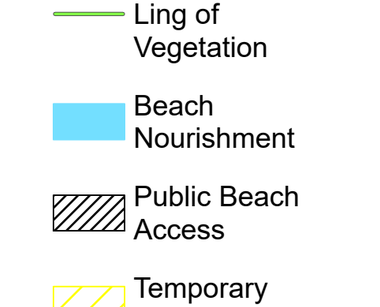

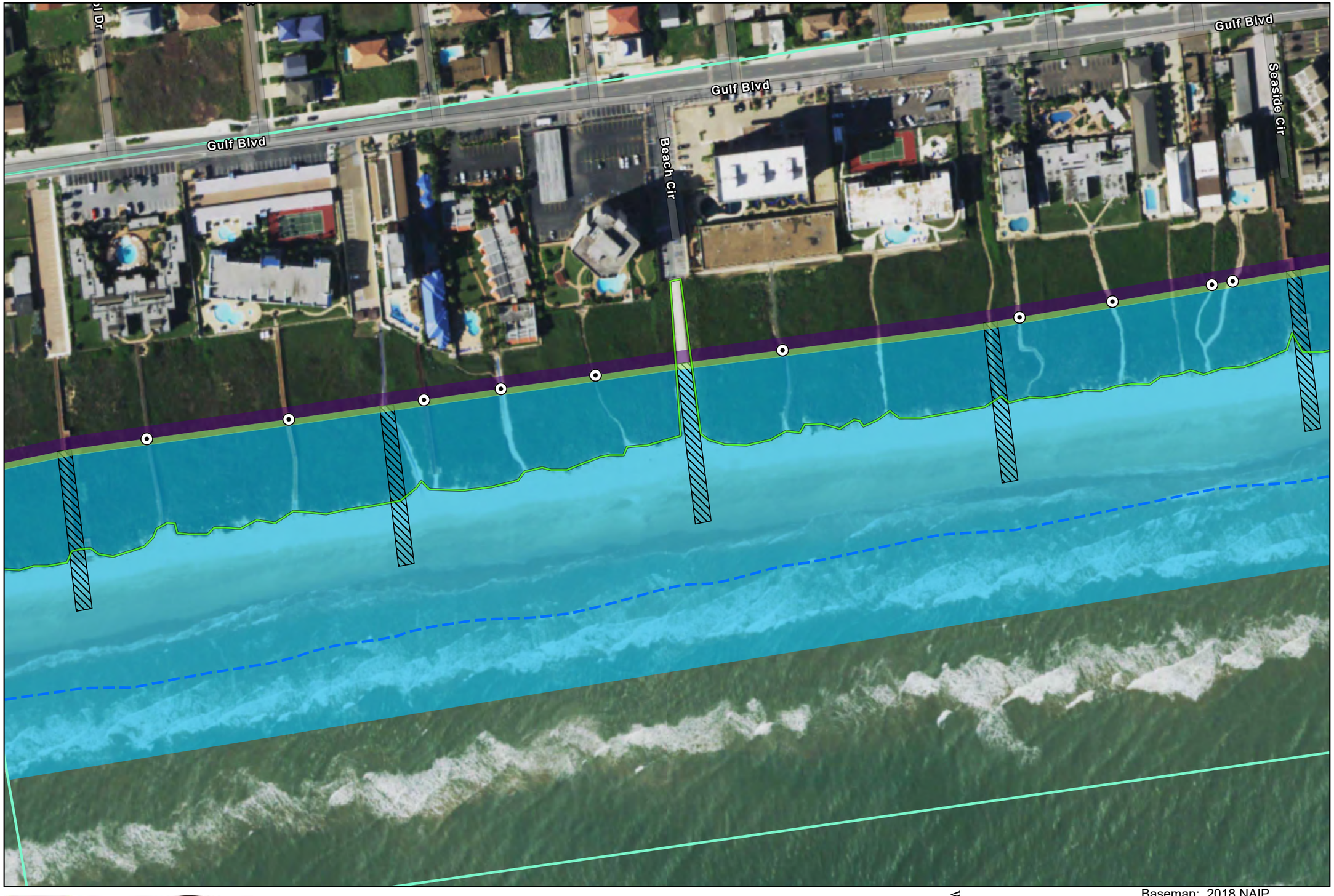

US Army Corps of Engineers ®
Galveston District

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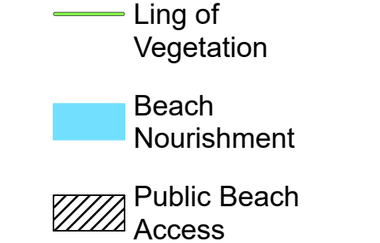

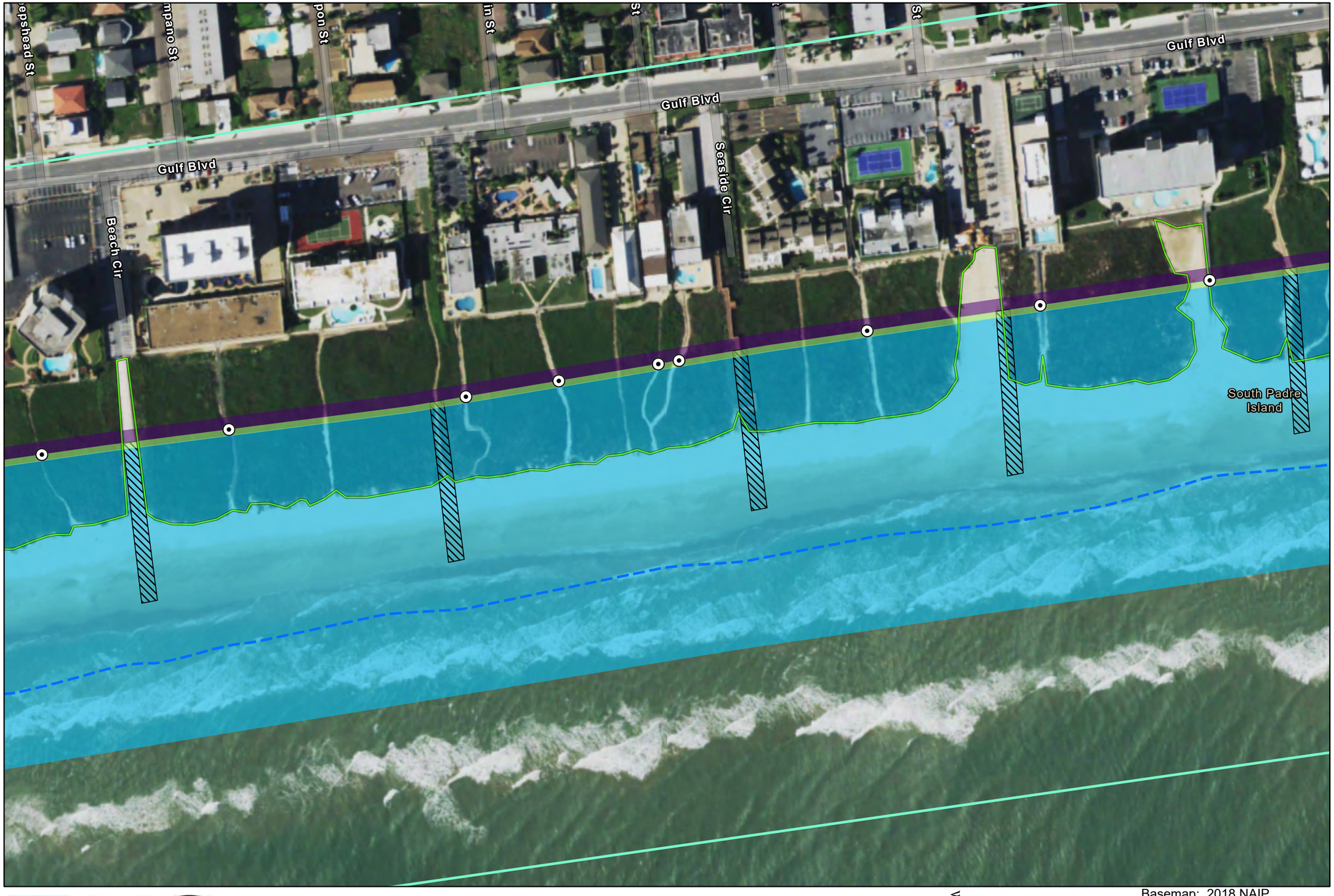

US Army Corps of Engineers ®
Galveston District

TEXAS GENERAL LAND OFFICE
ESTABLISHED 1836

Coastal Texas Protection and Restoration Feasibility Study

DATUM: NAD 1983
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US Army Corps of Engineers ®
Galveston District

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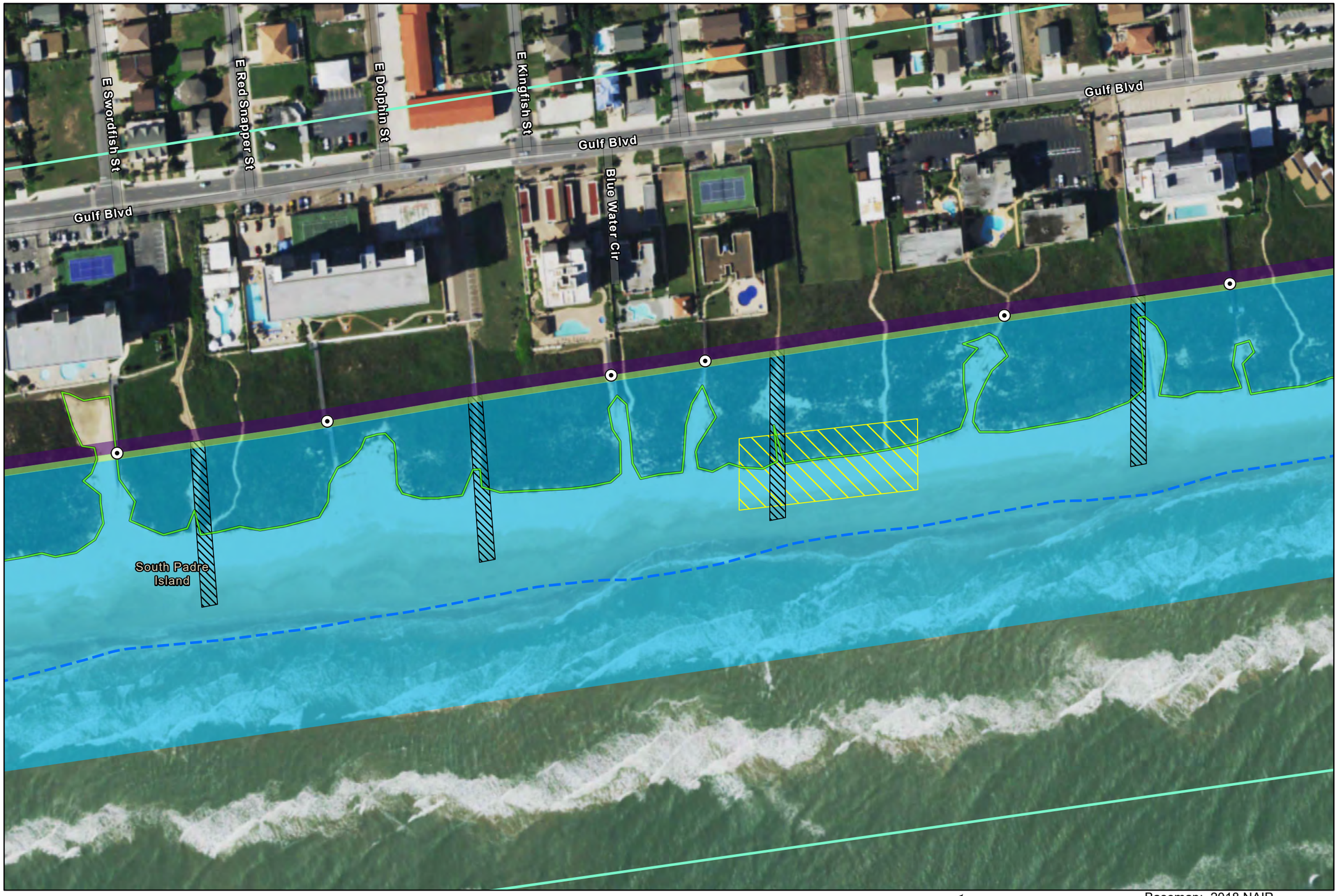

US Army Corps of Engineers ®
Galveston District

Coastal Texas Protection and Restoration Feasibility Study

Basemap: 2018 NAIP

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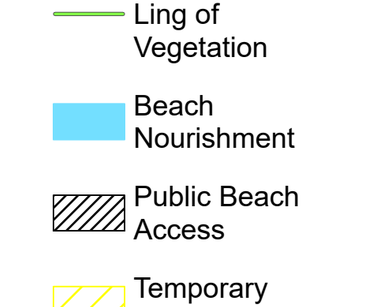

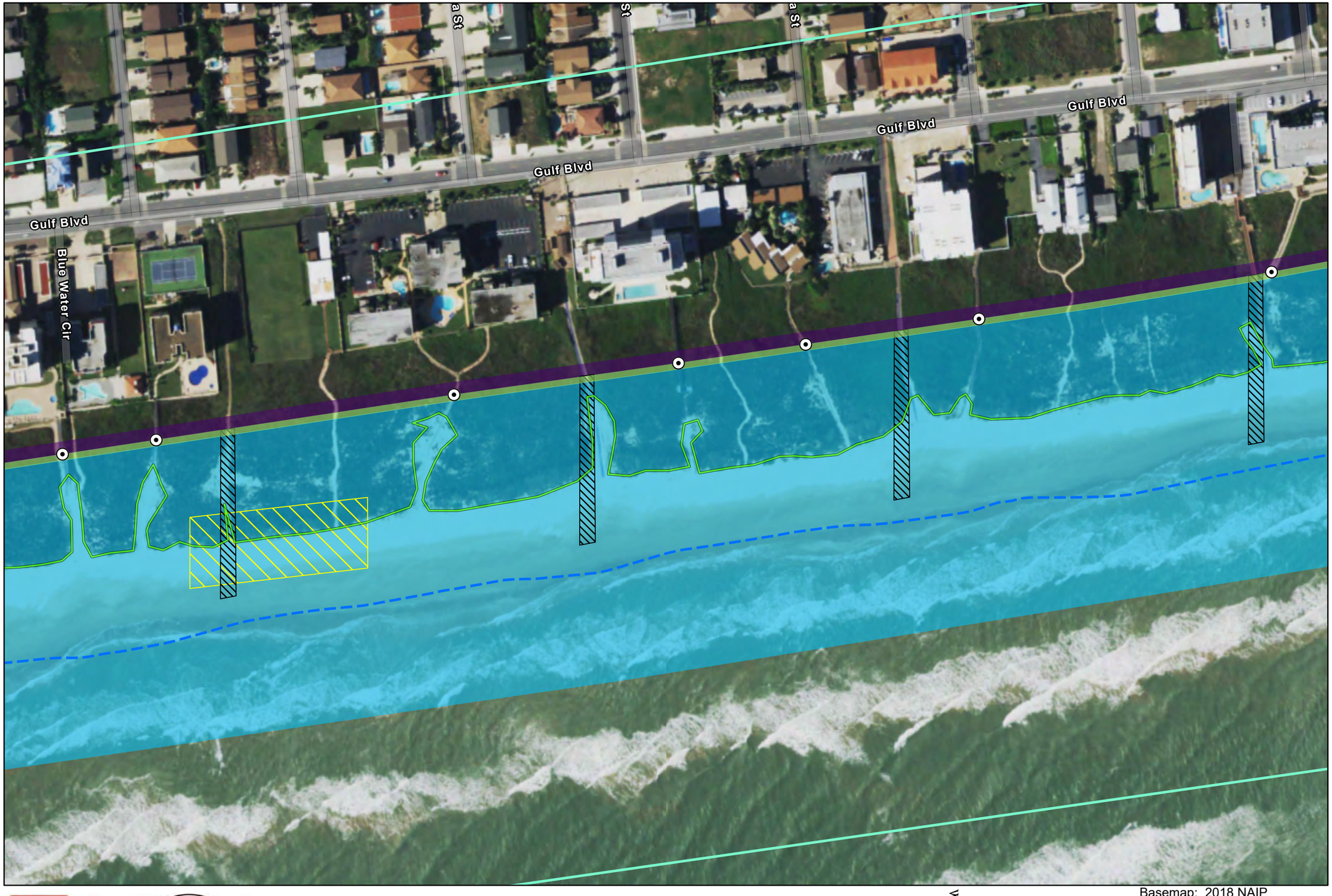

US Army Corps of Engineers ®
Galveston District

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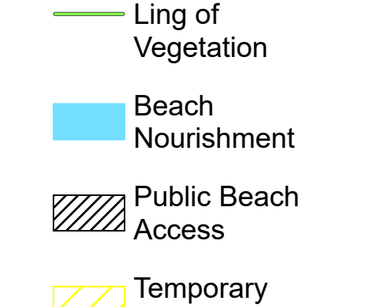

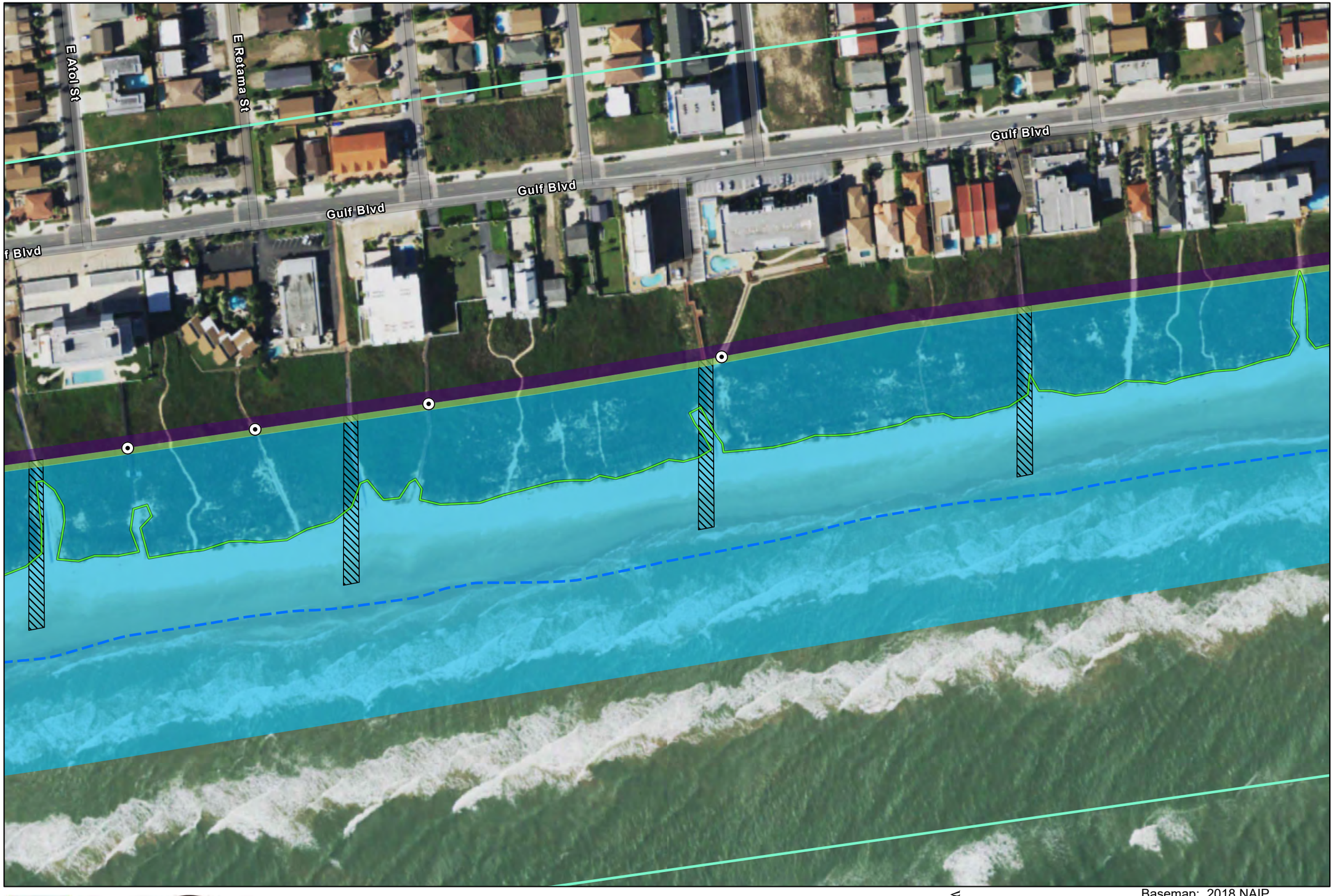

US Army Corps of Engineers ®
Galveston District

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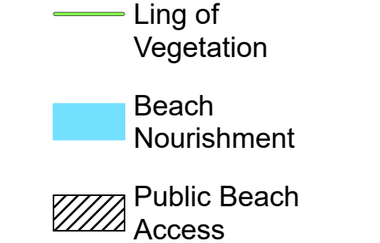

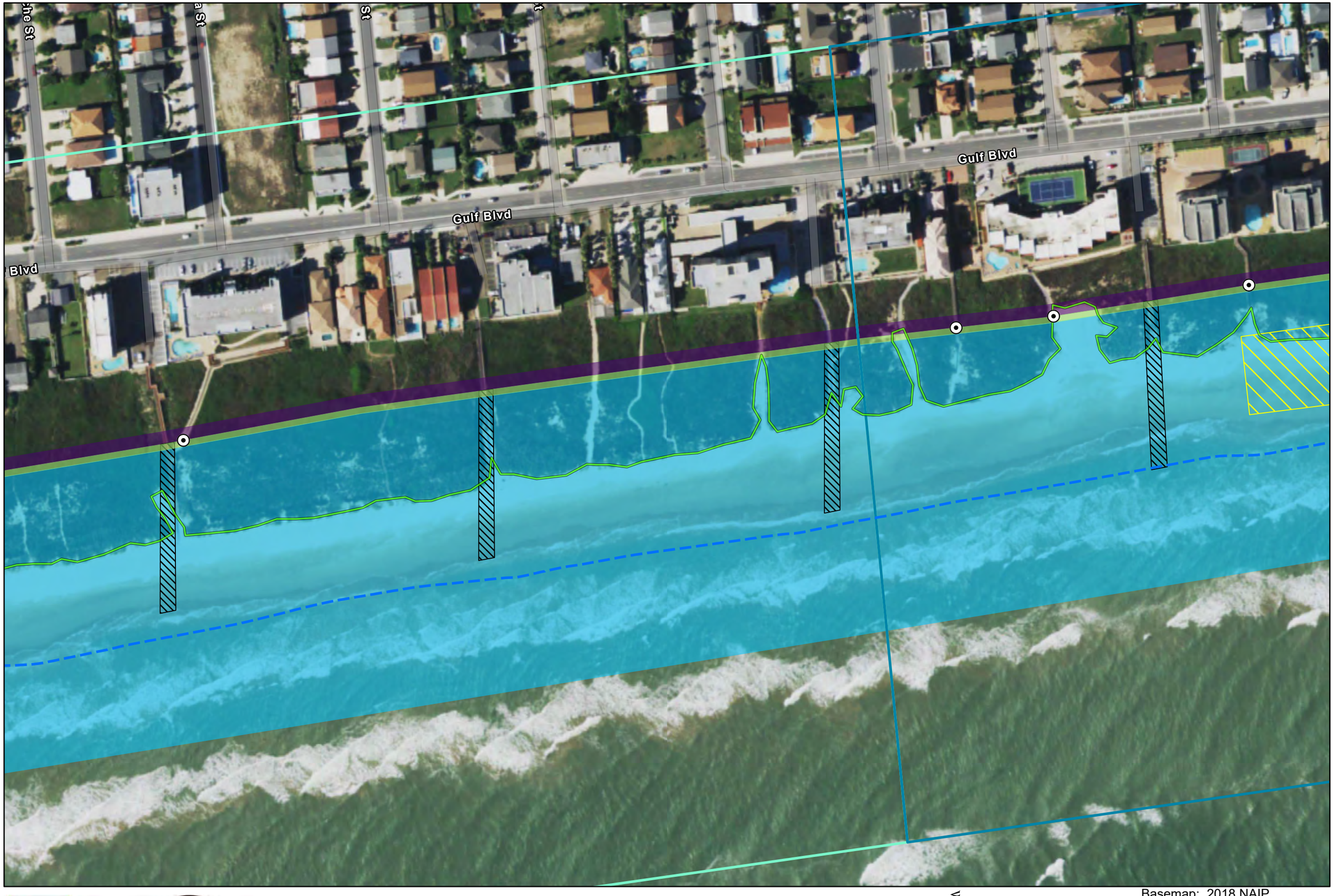

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Galveston District

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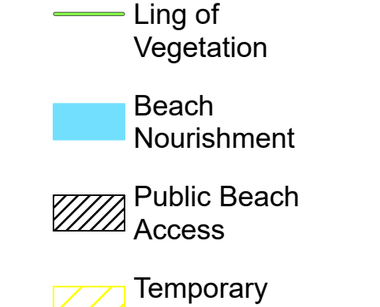

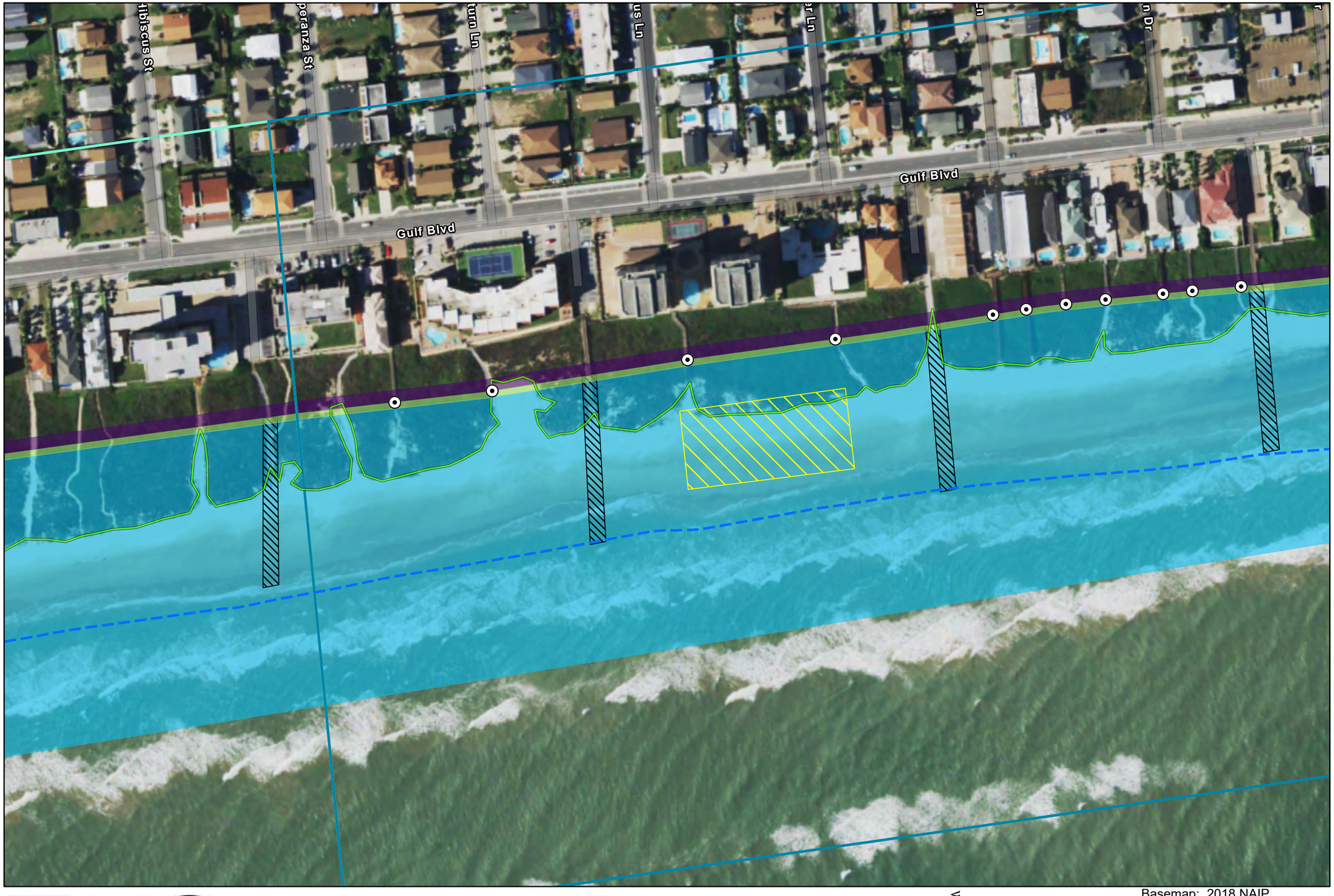

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Galveston District

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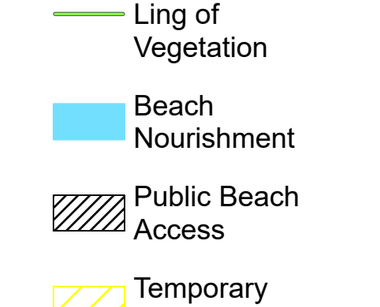

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Galveston District

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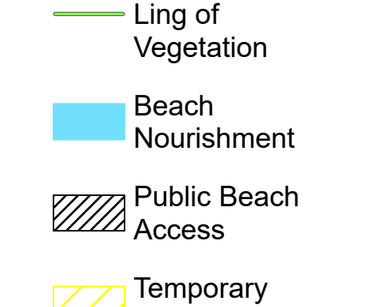

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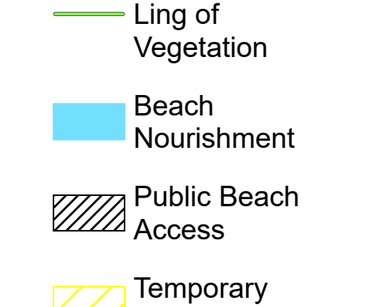

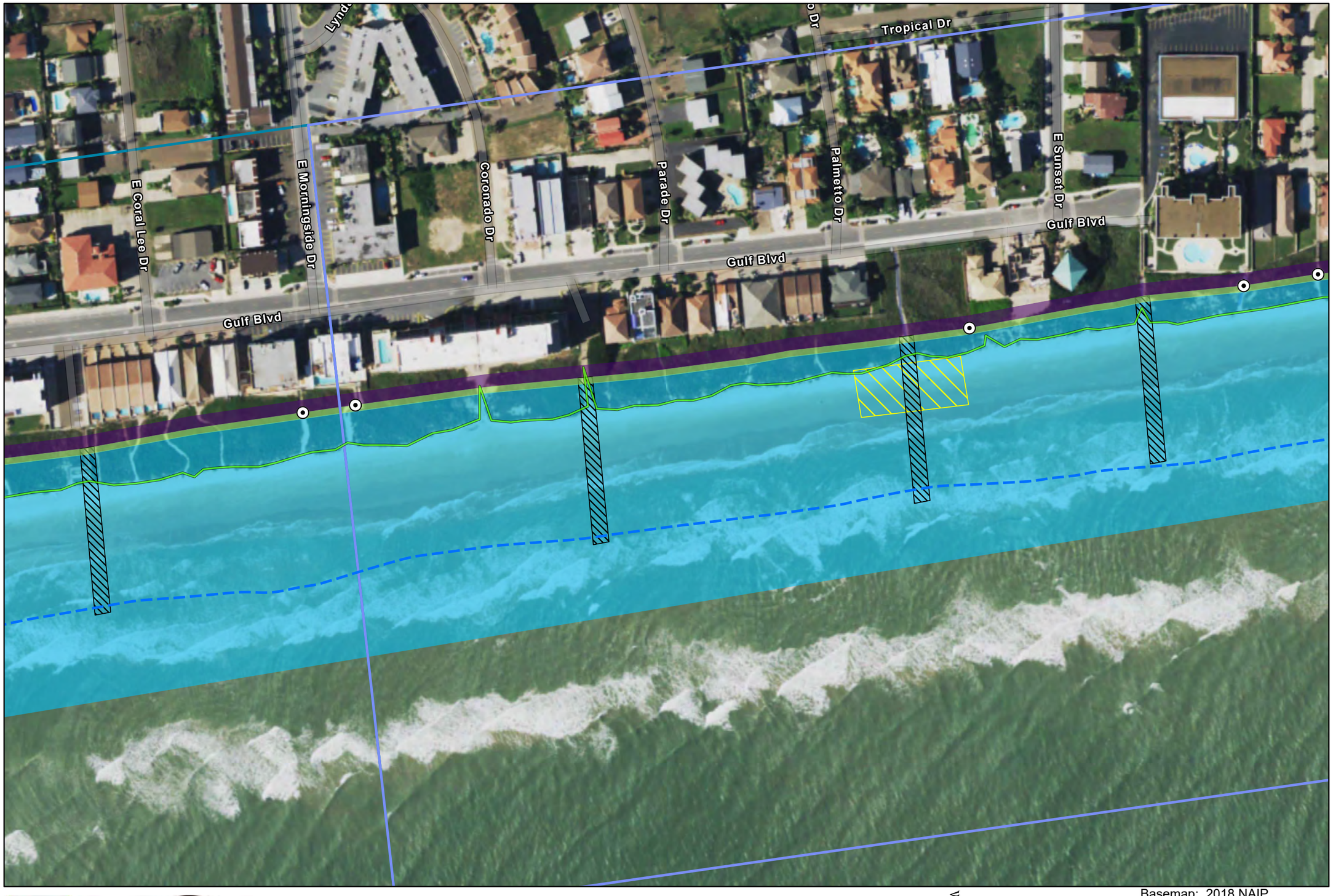

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Galveston District

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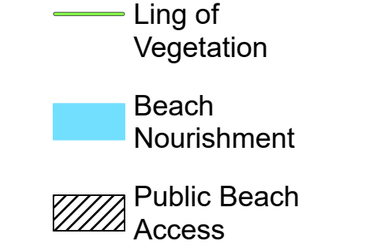

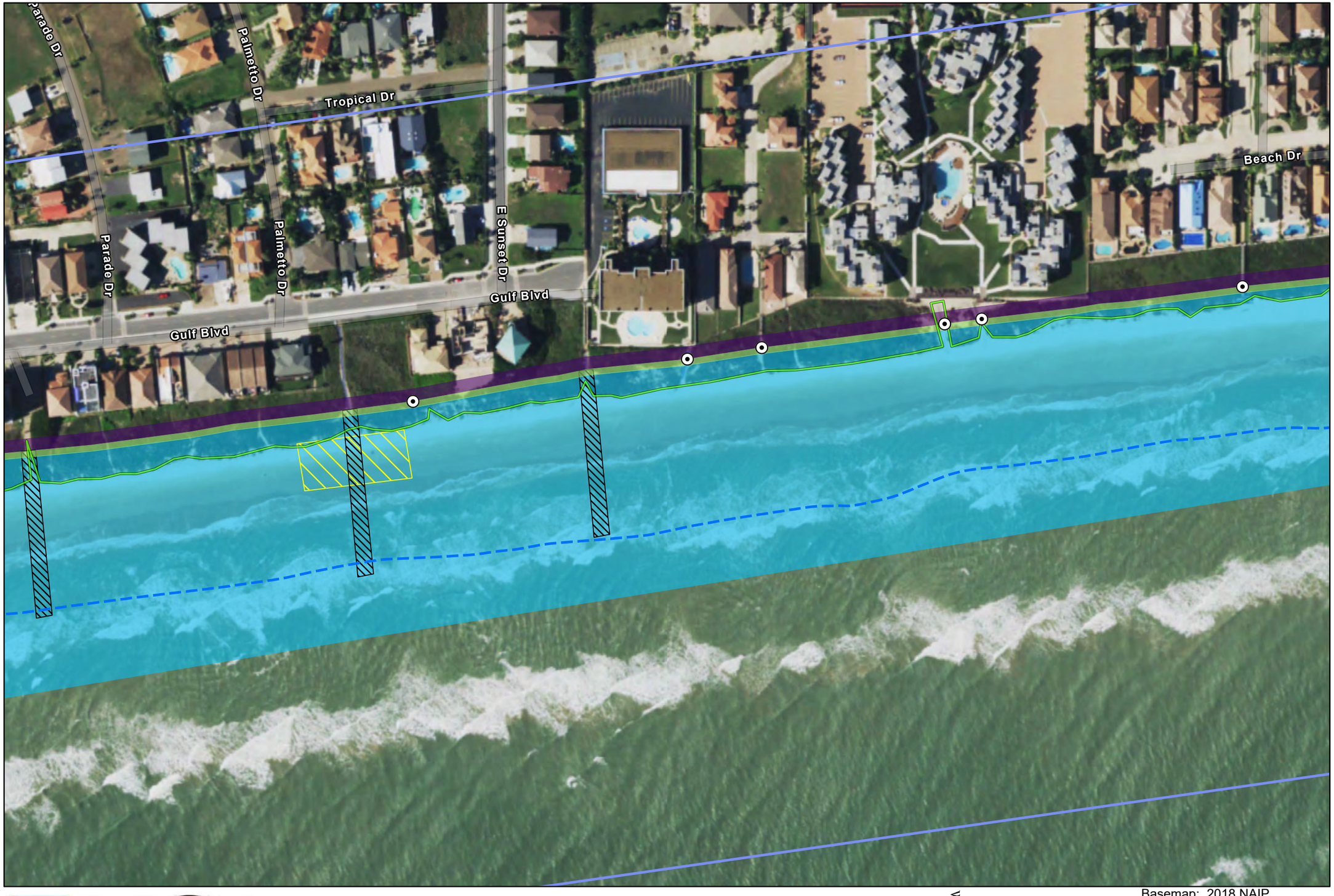

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Galveston District

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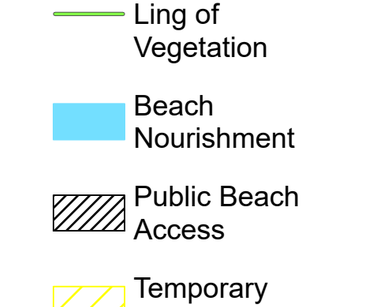

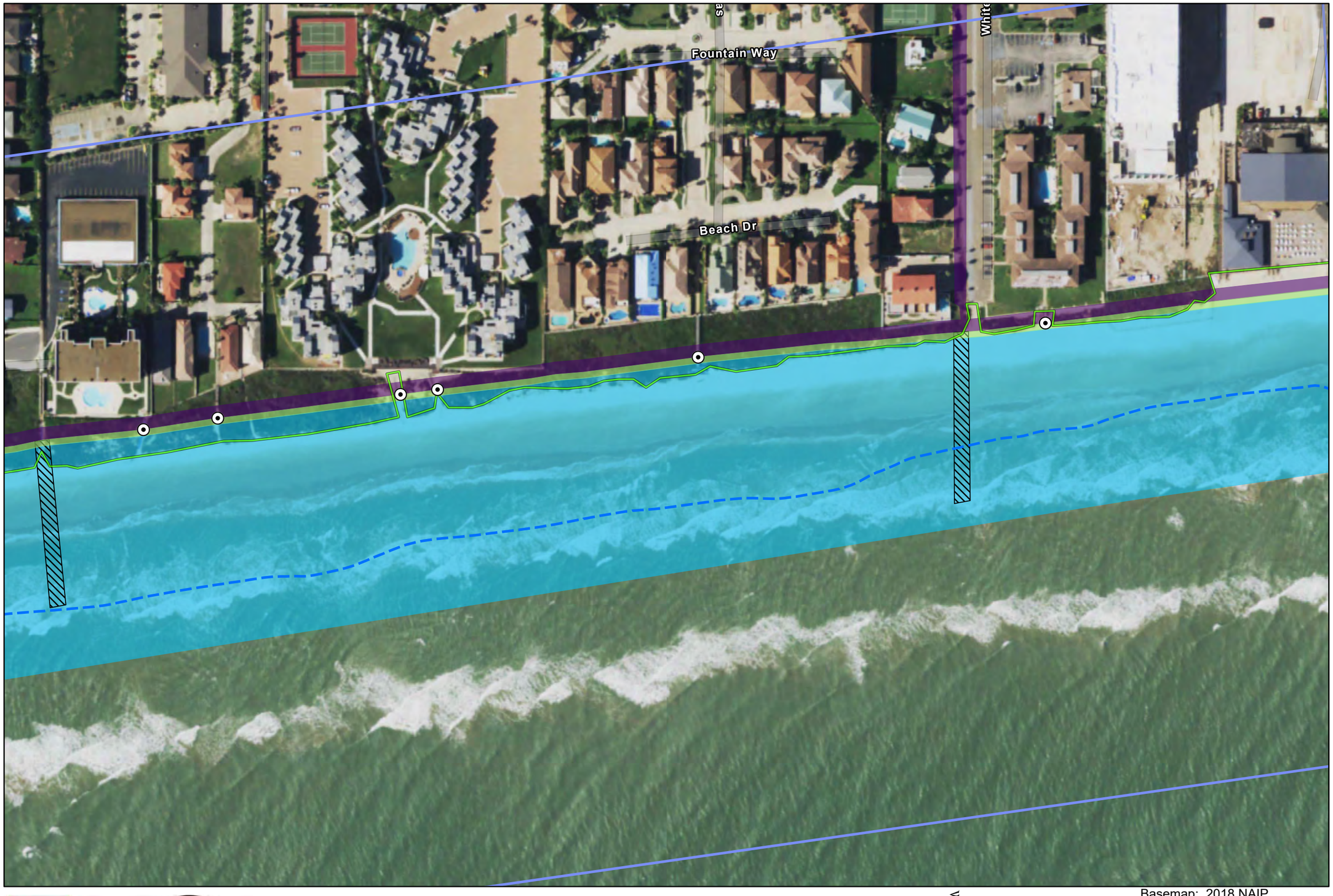

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Galveston District

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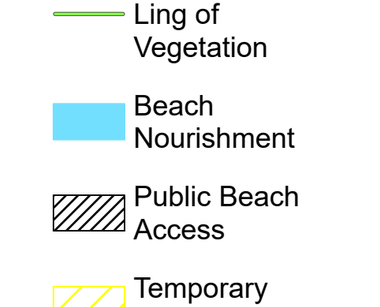

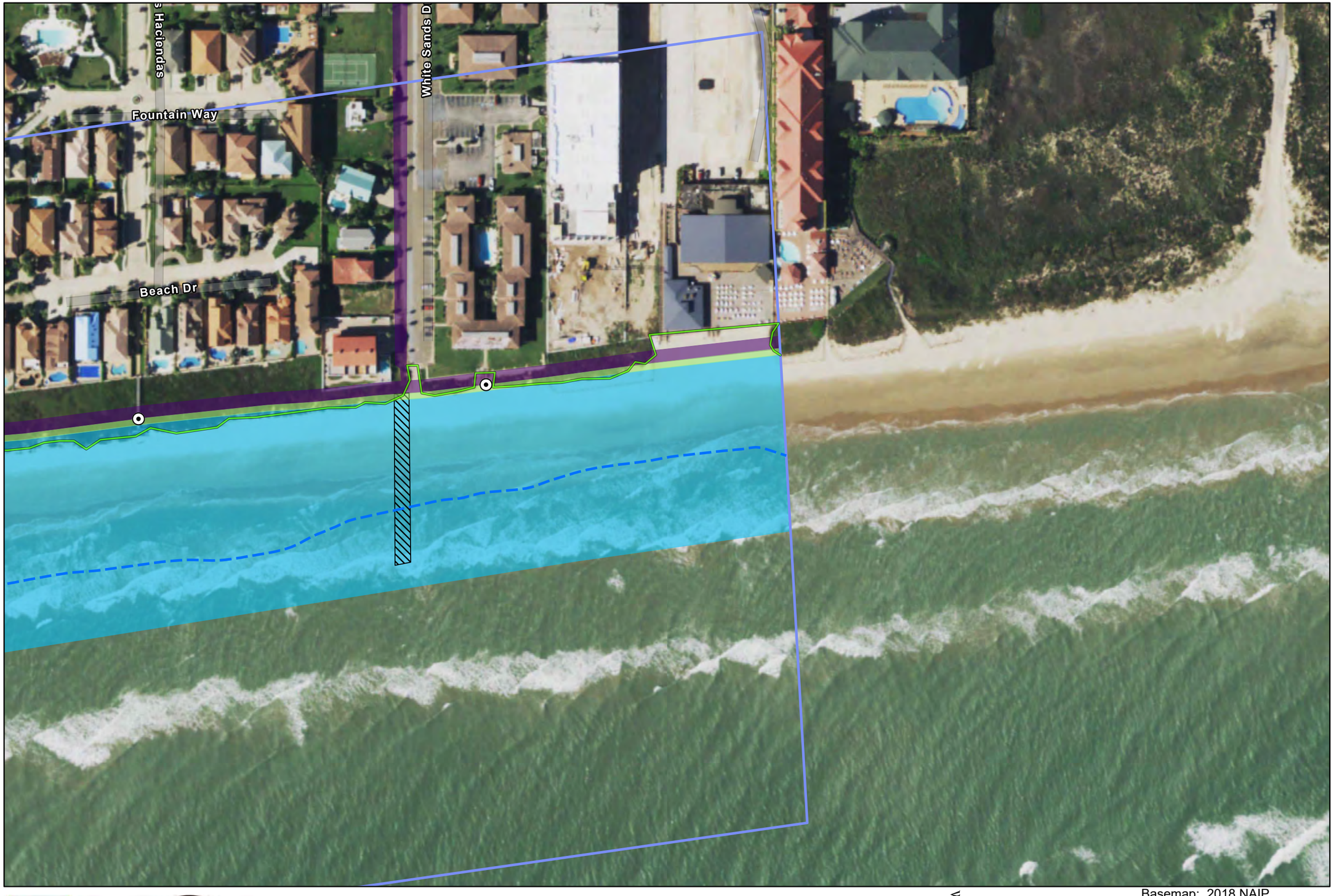

US Army Corps of Engineers ®
Galveston District

TEXAS GENERAL LAND OFFICE
ESTABLISHED 1836

Coastal Texas Protection and Restoration Feasibility Study

DATUM: NAD 1983
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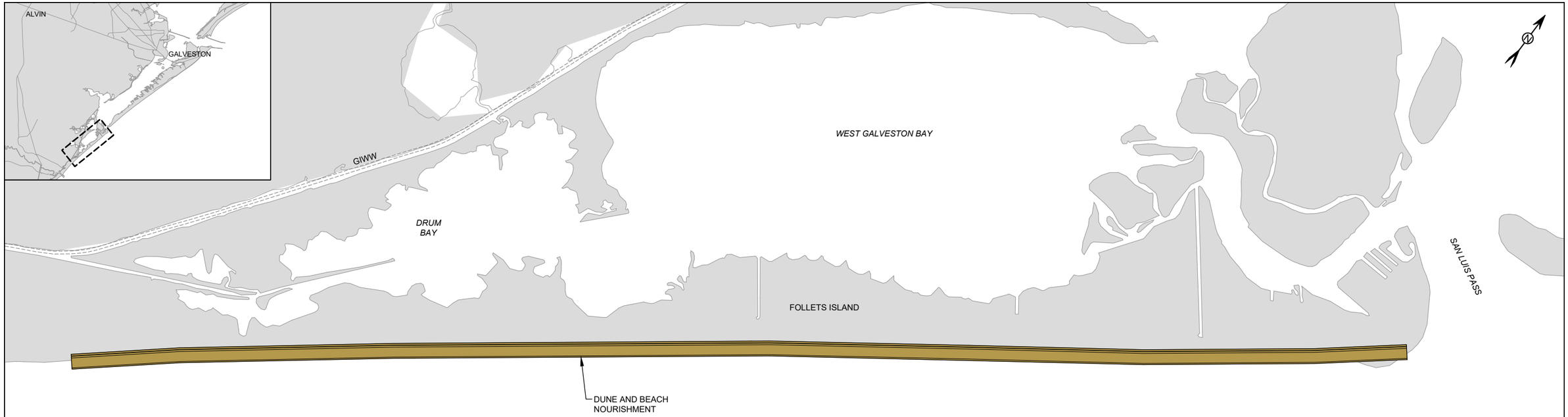
ZONE: TX-S 4205

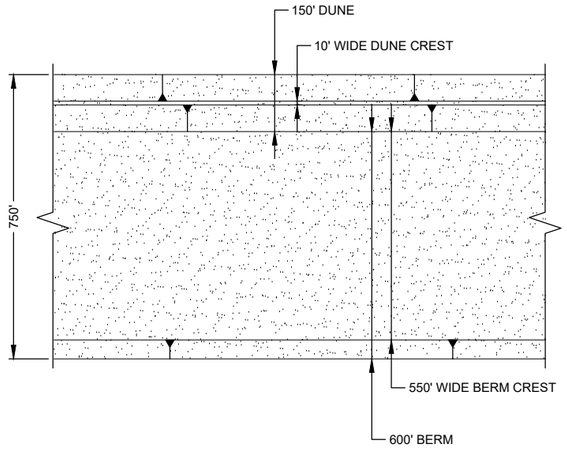
Basemap: 2018 NAIP

0 200 400 Feet

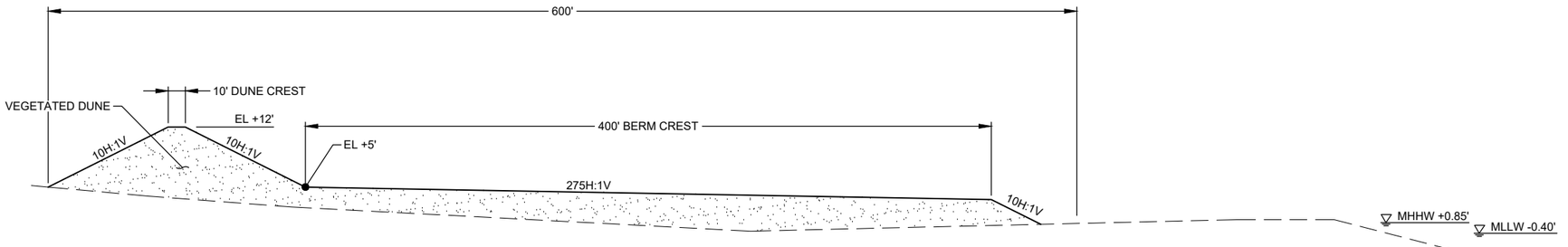
2 September 2020

Tier 1 Measures Map Book and Conceptual Designs

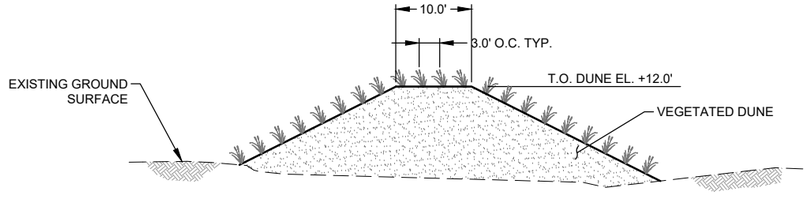




B-2 - DUNE & BEACH NOURISHMENT
SITE PLAN DETAIL



B-2 - DUNE & BEACH NOURISHMENT
TYPICAL SECTION



TYPICAL VEGETATION SECTION
NOT TO SCALE

NOTES:

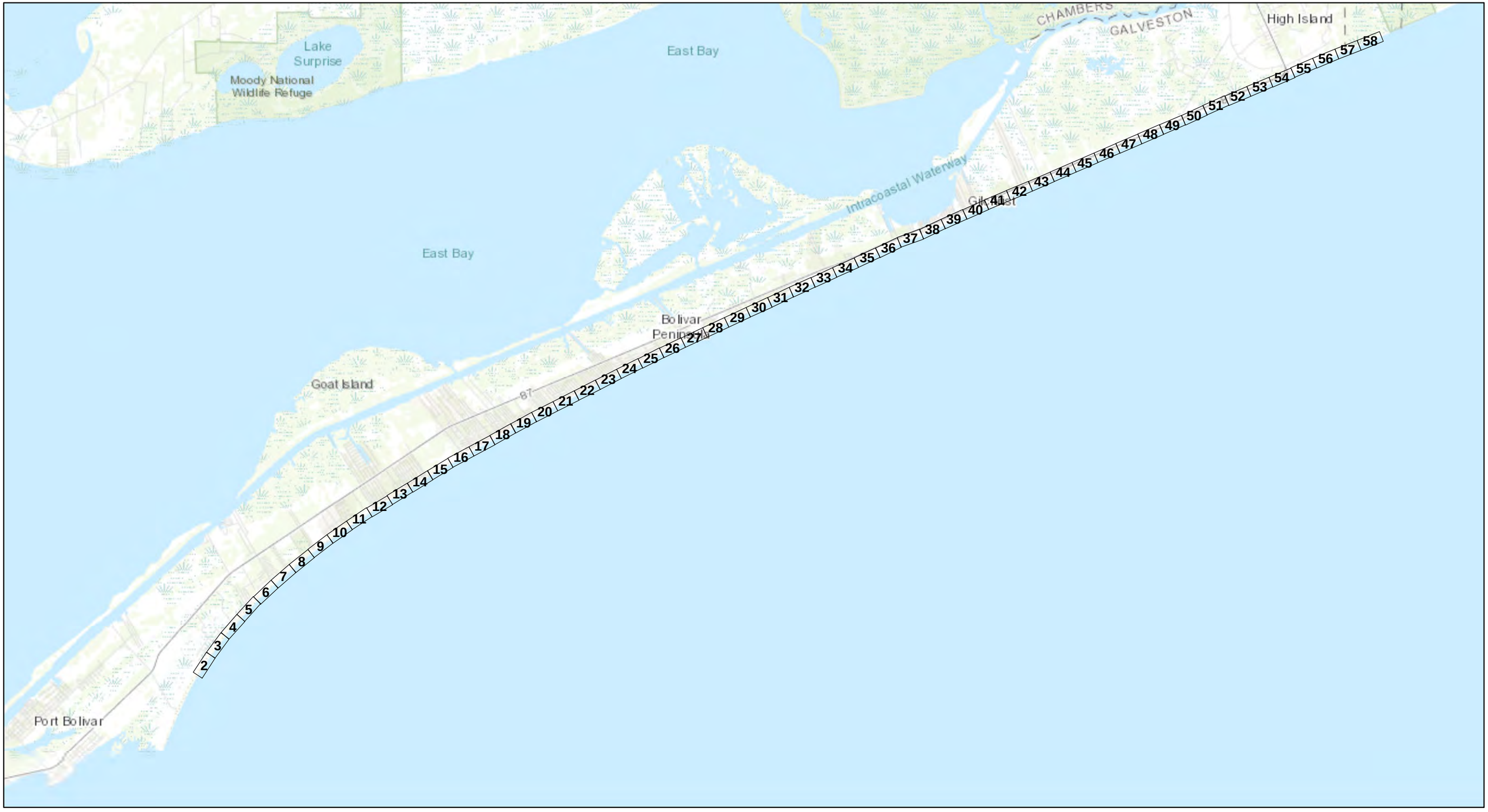
1. ALL ELEVATIONS IN FEET NAVD88.
2. DATUMS FROM NOAA GAGE 8771972, SAN LUIS PASS, TX.

B2: FOLLET'S ISLAND GULF BEACH & DUNE RESTORATION

COASTAL TEXAS PROTECTION AND RESTORATION FEASIBILITY STUDY

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

ENGINEERING APPENDIX
DATED:
JULY 28, 2020
MOTT MACDONALD



US Army Corps of Engineers ®
Galveston District

Coastal Texas Protection and Restoration Feasibility Study
Beach and Dune System
Bolivar Peninsula

DATUM: NAD 1983
PROJECTION: STATE PLANE
ZONE: TX-SC 4204

Base Imagery: ESRI Basemaps

0 2 4 Miles

Draft Date: 10Jan2020

NOTE: Vehicle and Pedestrian access locations are reflective of current beach access plans and may be subject to change.

- Private Access
- Proposed Outfalls
- Navigation Gate Tie-In
- CBRS Unit Area
- Vehicle Access
- Temporary Staging Area
- New Beach - 250ft
- Dune Field - 185ft
- Temporary Work Easement - 20ft
- Permanent Easement - 10ft

US Army Corps of Engineers ®
Galveston District

Coastal Texas Protection and Restoration Feasibility Study

Beach and Dune System
Bolivar Peninsula

DATUM: NAD 1983
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ZONE: TX-SC 4204

Base Imagery: ESRI World Imagery Basemap

0 250 500 1,000 Feet

Draft Date: 10Jan2020

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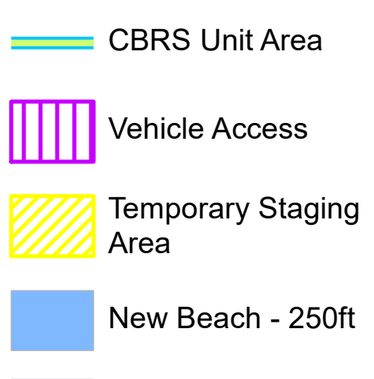

US Army Corps of Engineers ®
Galveston District

Coastal Texas Protection and Restoration Feasibility Study

Beach and Dune System
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DATUM: NAD 1983
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Base Imagery: ESRI World Imagery Basemap

0 125 250 500 Feet

Draft Date: 10Jan2020

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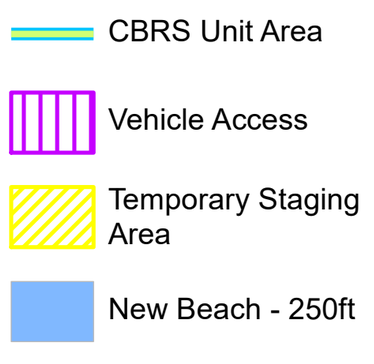

US Army Corps of Engineers ®
Galveston District

Coastal Texas Protection and Restoration Feasibility Study

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Galveston District

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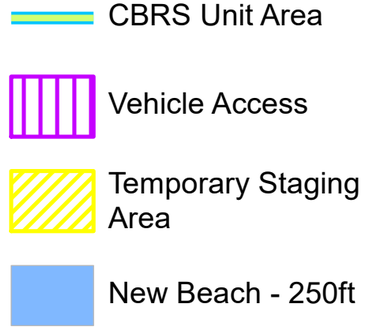

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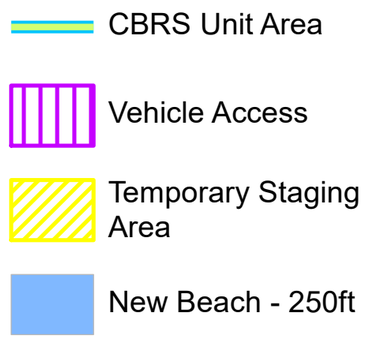

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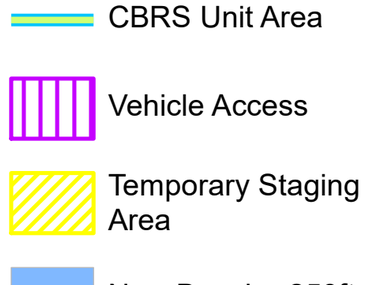

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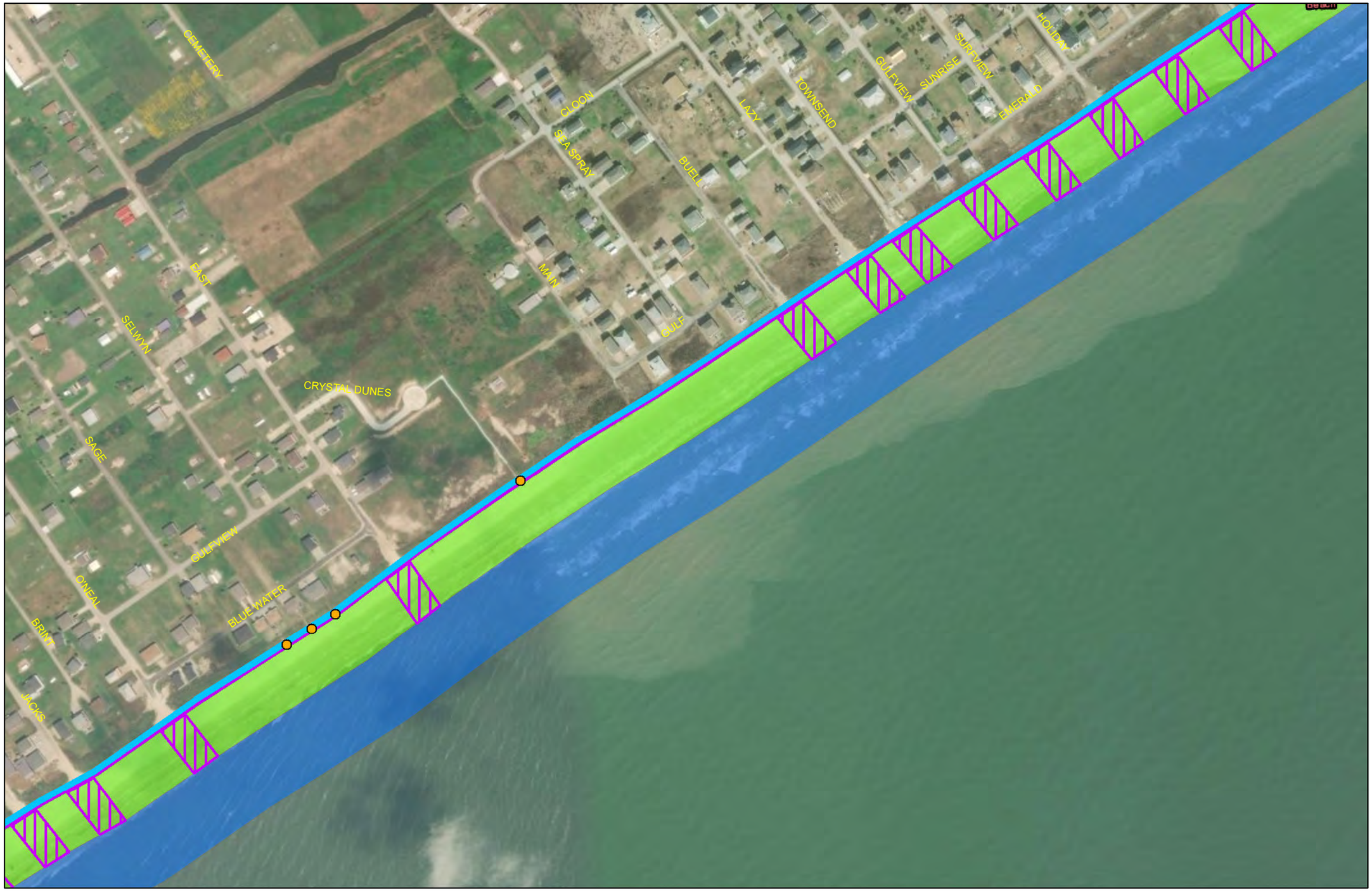

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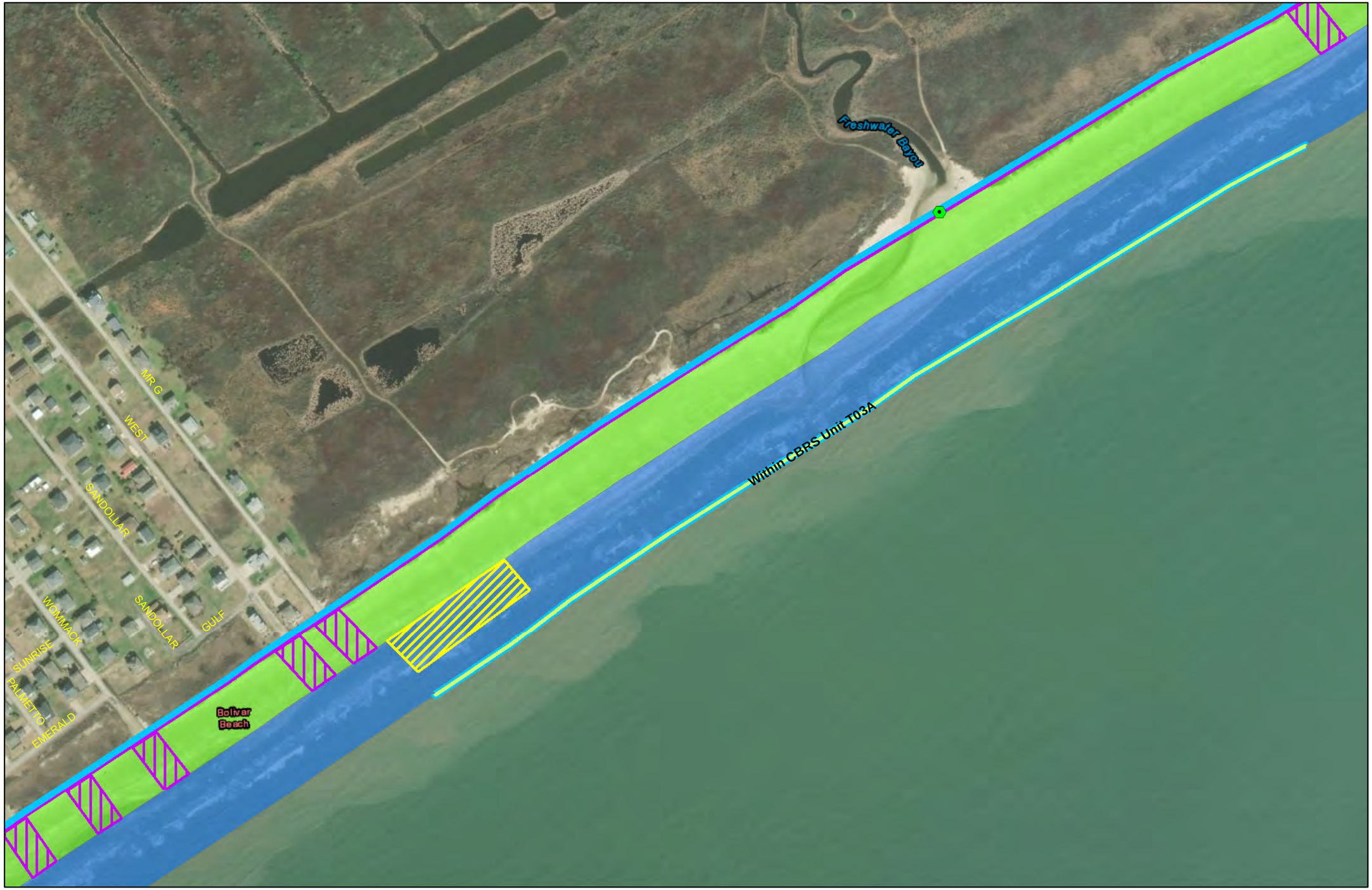

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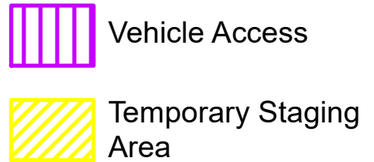

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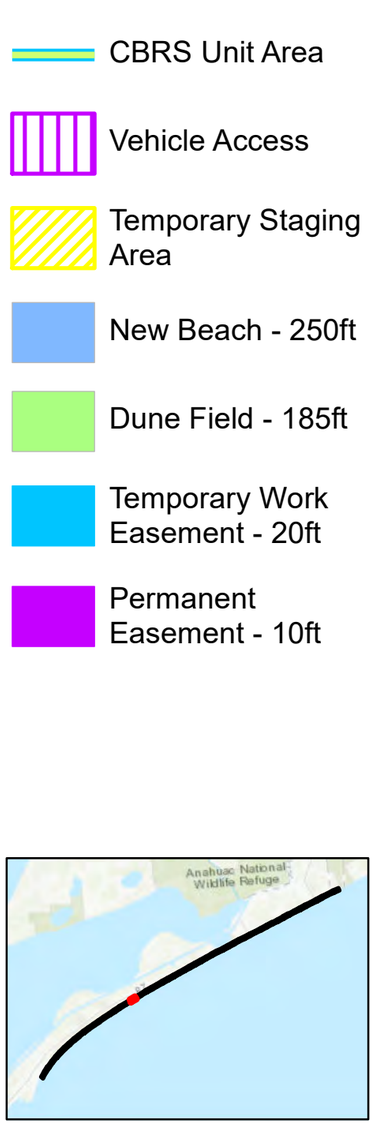

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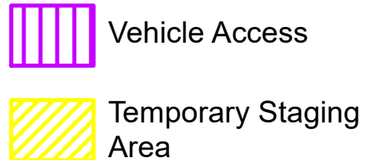

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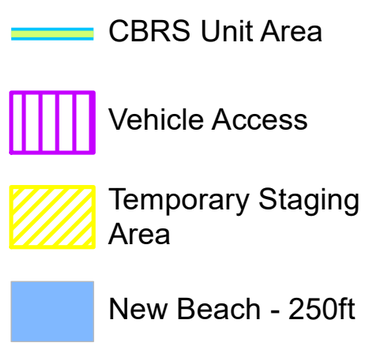

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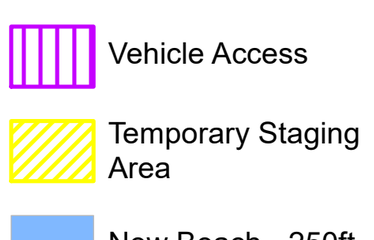

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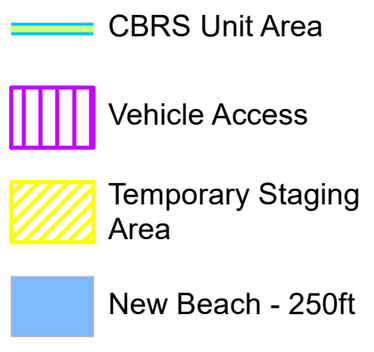

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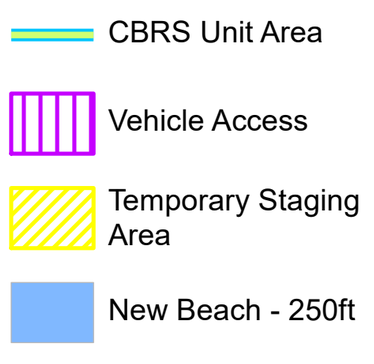

US Army Corps of Engineers ®
Galveston District

Coastal Texas Protection and Restoration Feasibility Study

Beach and Dune System
Bolivar Peninsula

DATUM: NAD 1983
PROJECTION: STATE PLANE
ZONE: TX-SC 4204

Base Imagery: ESRI World Imagery Basemap

0 125 250 500 Feet

Draft Date: 10Jan2020

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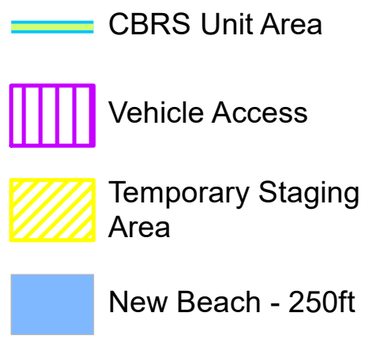

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Galveston District

Coastal Texas Protection and Restoration Feasibility Study

Beach and Dune System
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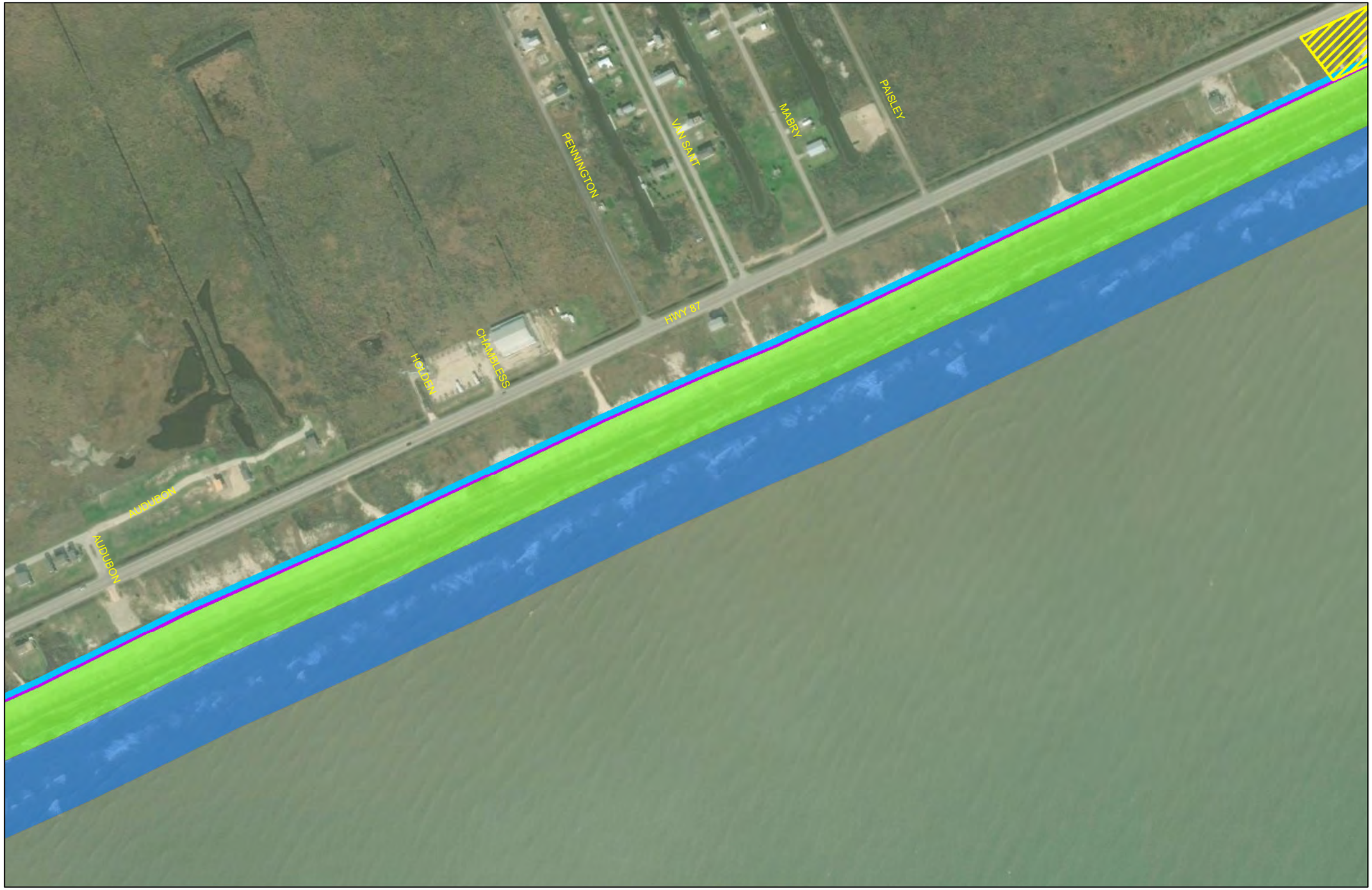

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Coastal Texas Protection and Restoration Feasibility Study
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US Army Corps of Engineers ®
Galveston District

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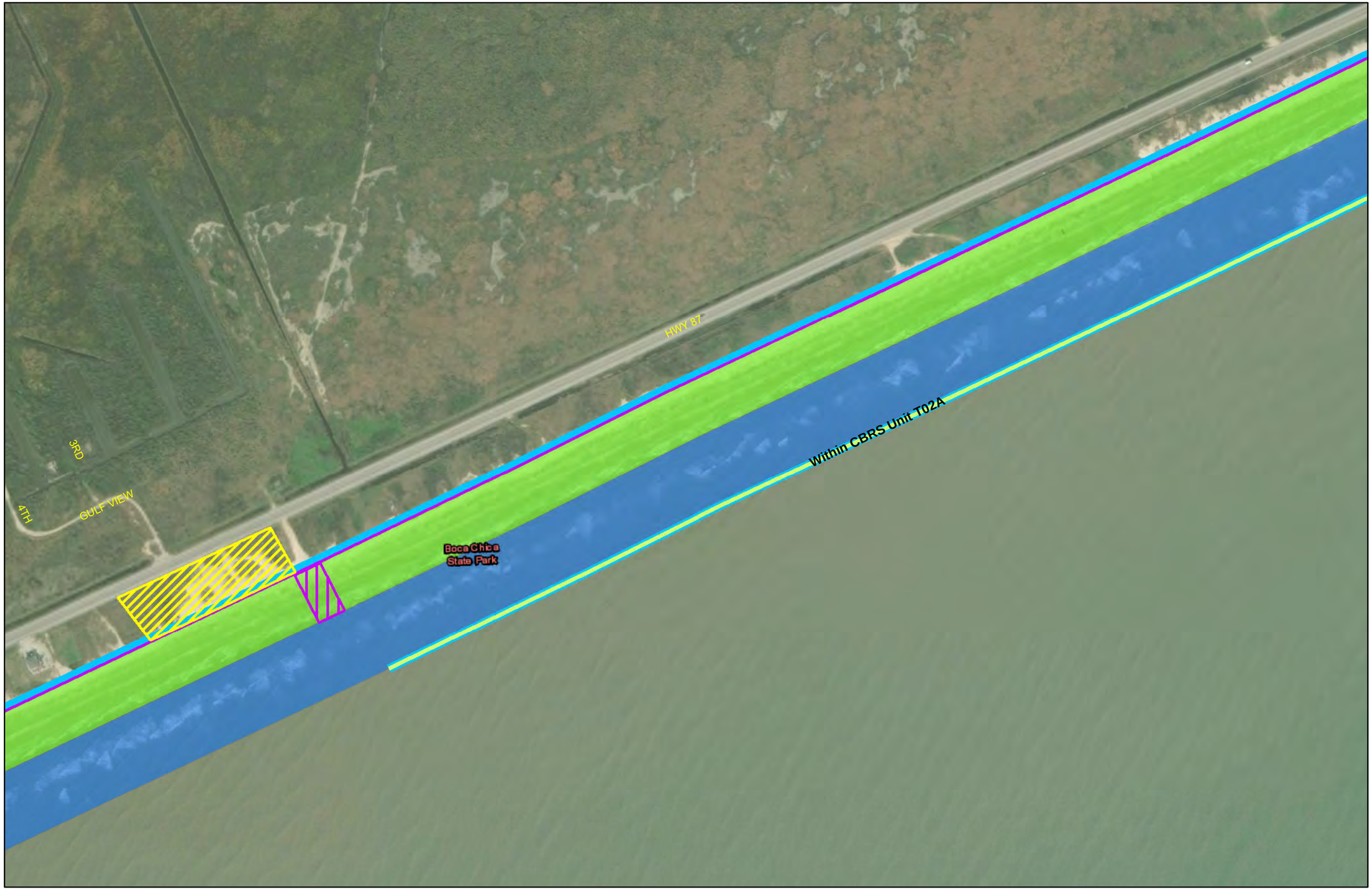

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Coastal Texas Protection and Restoration Feasibility Study
Beach and Dune System
Bolivar Peninsula

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Galveston District

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US Army Corps of Engineers ®
Galveston District

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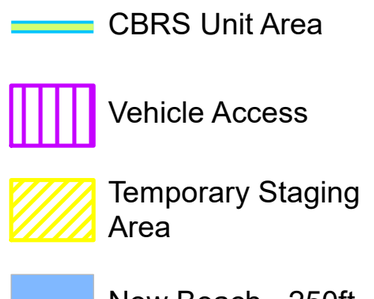

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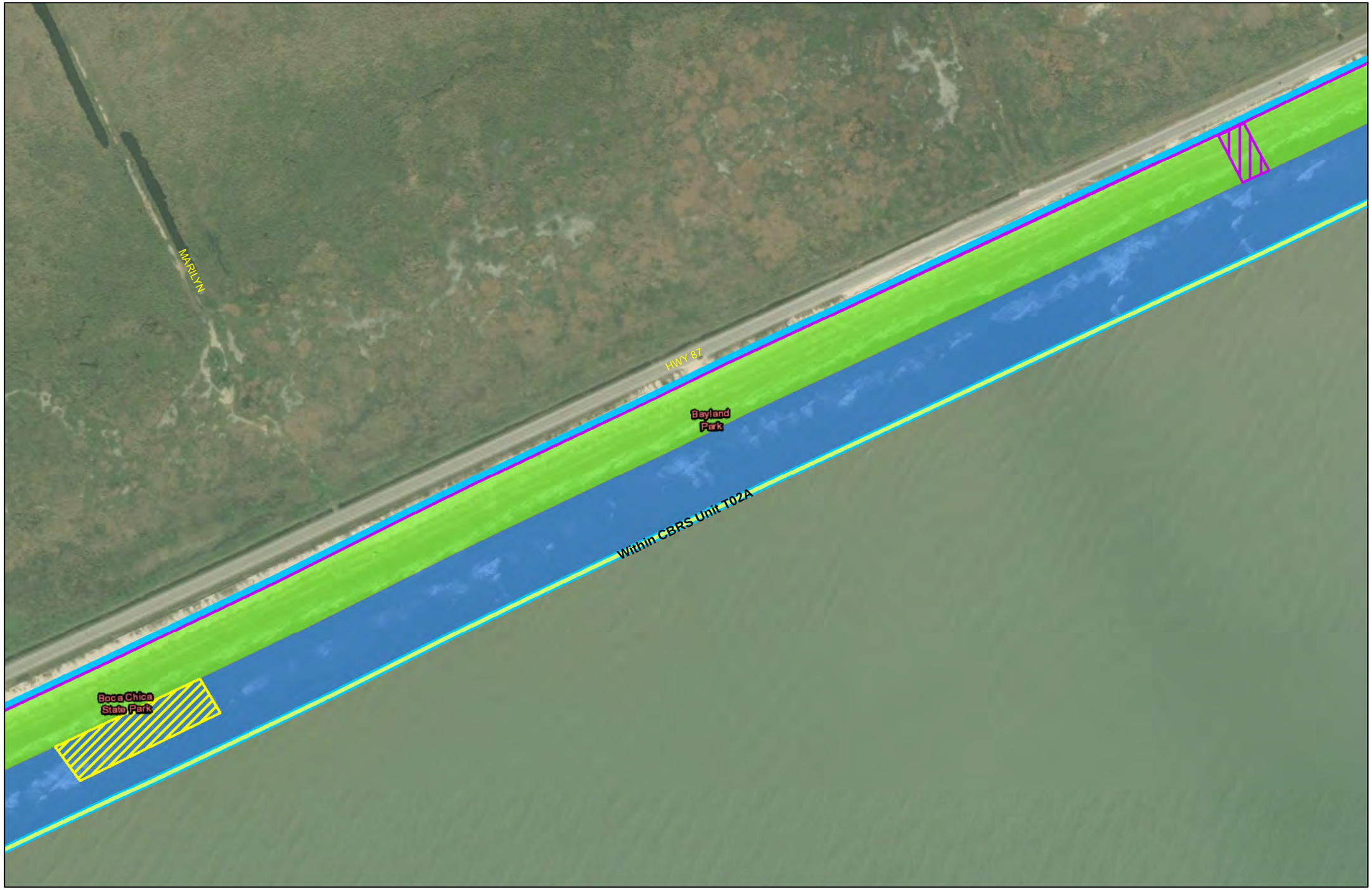

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Coastal Texas Protection and Restoration Feasibility Study
Beach and Dune System
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Galveston District

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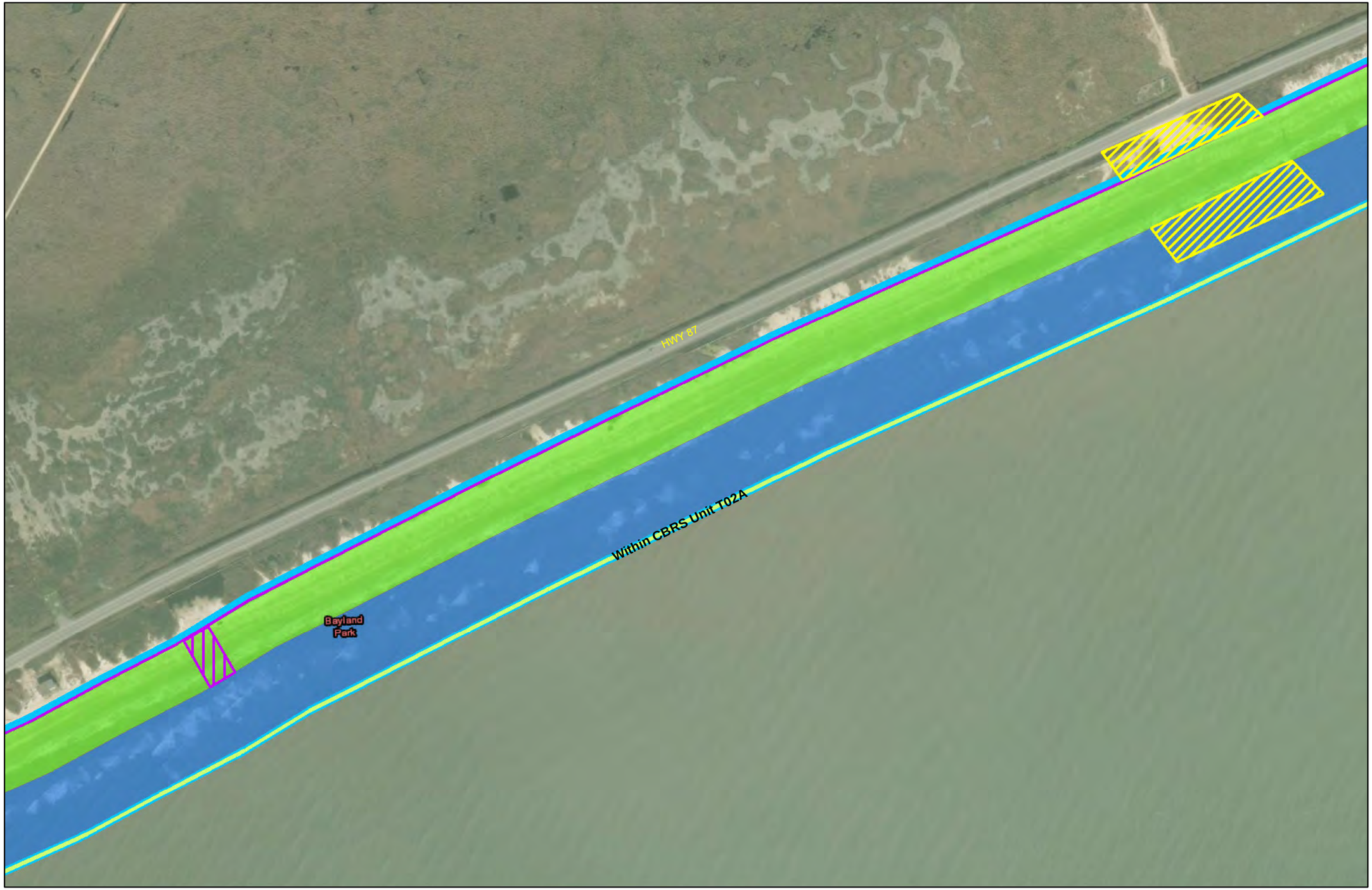

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Galveston District

Coastal Texas Protection and Restoration Feasibility Study

Beach and Dune System
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Galveston District

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Galveston District

TEXAS GENERAL LAND OFFICE
ESTABLISHED 1836

Coastal Texas Protection and Restoration Feasibility Study

Beach and Dune System
Bolivar Peninsula

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S

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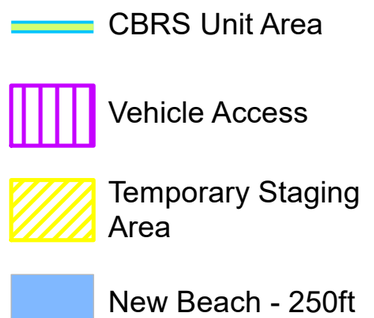

US Army Corps of Engineers ®
Galveston District

Coastal Texas Protection and Restoration Feasibility Study

Beach and Dune System
Bolivar Peninsula

N W E S

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US Army Corps of Engineers ®
Galveston District

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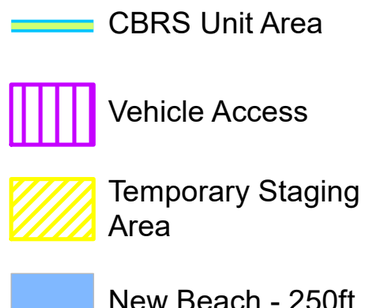

US Army Corps of Engineers ®
Galveston District

Coastal Texas Protection and Restoration Feasibility Study

Beach and Dune System
Bolivar Peninsula

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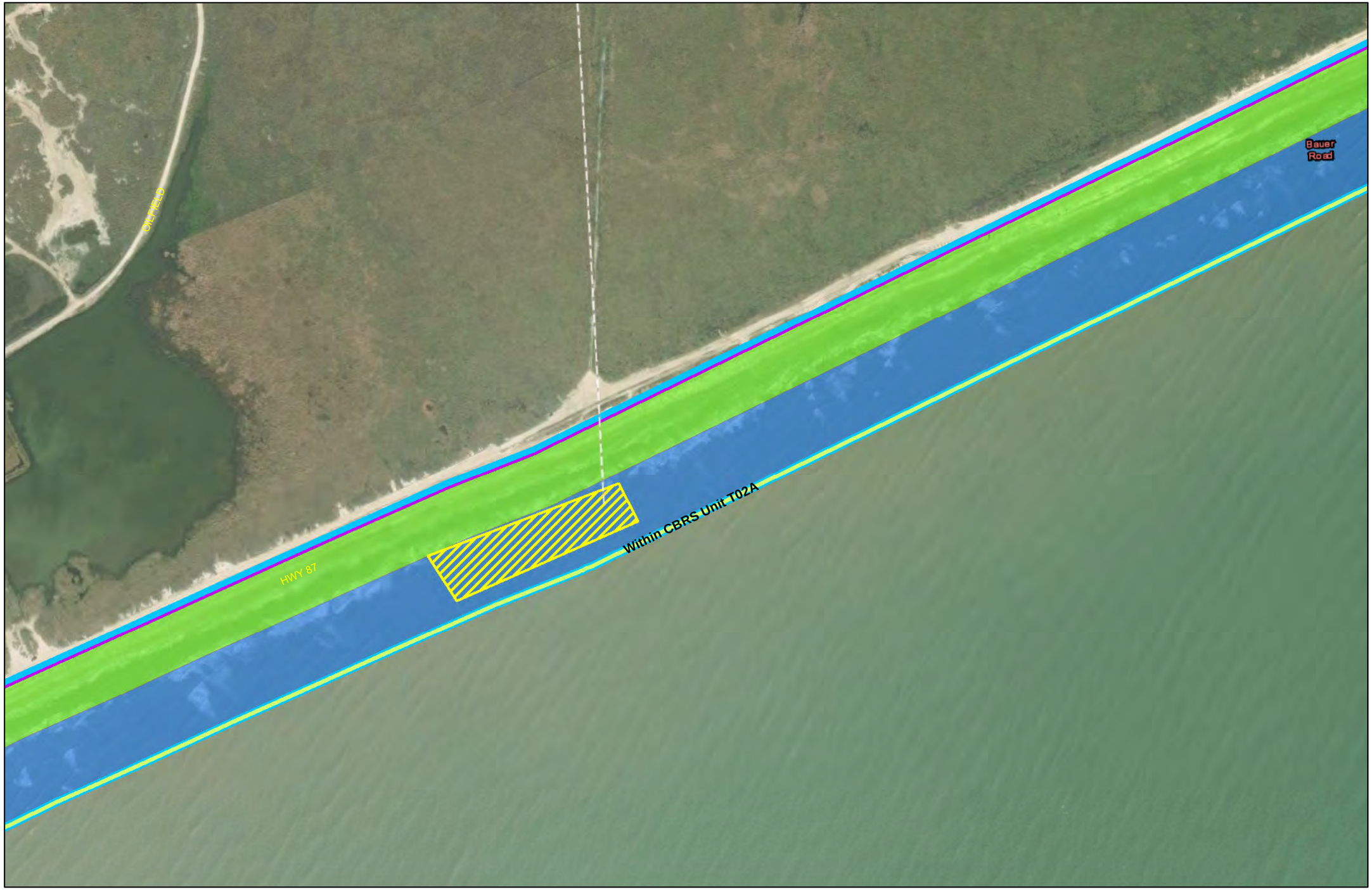

US Army Corps of Engineers ®
Galveston District

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Beach and Dune System
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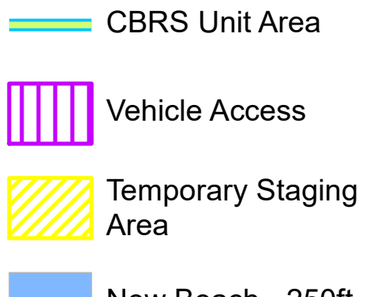

US Army Corps of Engineers ®
Galveston District

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Beach and Dune System
Bolivar Peninsula

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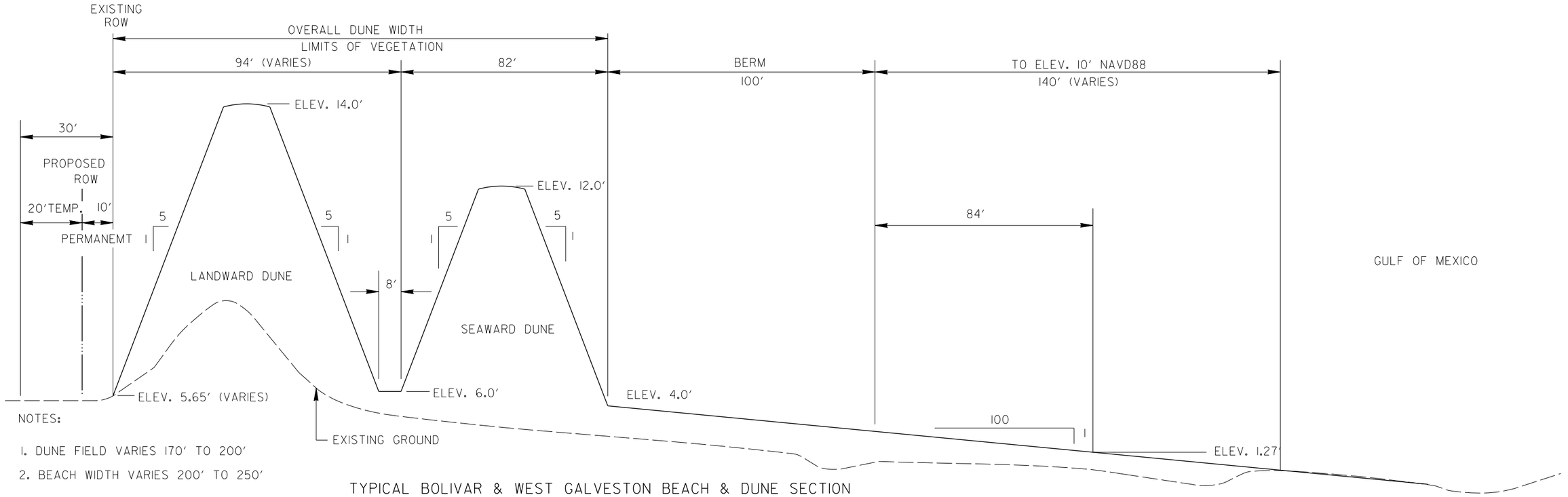


NOTES:

1. DUNE FIELD VARIES 170′ TO 200′
2. BEACH WIDTH VARIES 200′ TO 250′

TYPICAL BOLIVAR & WEST GALVESTON BEACH & DUNE SECTION

SCALE: NTS

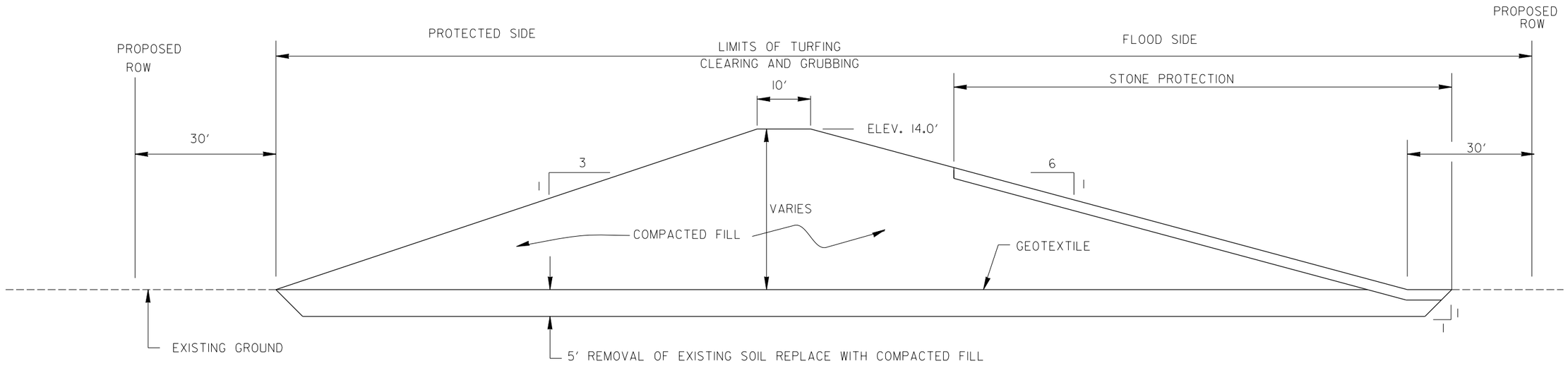
COASTAL TEXAS PROTECTION AND RESTORATION STUDY

TYPICAL BEACH & DUNE, SECTION

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

ENGINEERING APPENDIX
DATED: FEBURARY 2020

GENERAL 3000



TYPICAL BOLIVAR LEVEE SECTION

SCALE: NTS

COASTAL TEXAS PROTECTION AND RESTORATION STUDY

TYPICAL BOLIVAR LEVEE SECTION

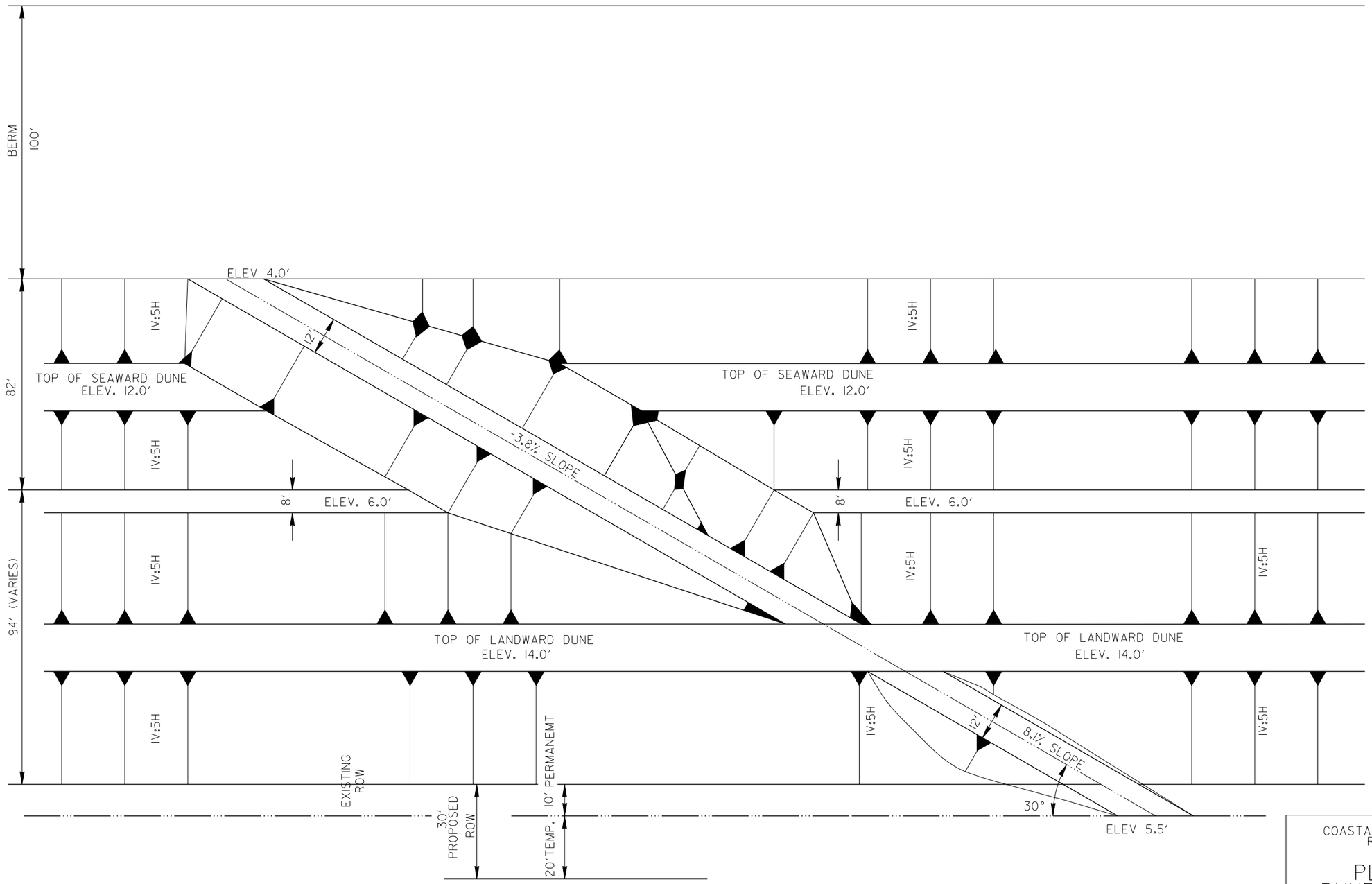
U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

ENGINEERING APPENDIX
DATED: FEBURARY 2020

GENERAL 3000

PLATE 2

GULF OF MEXICO



COASTAL TEXAS PROTECTION AND RESTORATION STUDY

PLAN TYPICAL DUNE ACCESS RAMP

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

ENGINEERING APPENDIX
DATED: FEBURARY 2020

GENERAL 3000

PLATE 3

CADD

N

N

PROPOSED NEW ANCHORAGE AREA A
(1.2 SQ. MILES)

AREA C

SHALLOW ANCHORAGE
AREA B

AREA A

CENTERLINE INBOUND CHANNEL

650'

1100'

NEW CHANNEL TOE

A

800'

NEW CHANNEL TOE

BOLIVAR ROADS CHANNEL

B

GALVESTON ENTRANCE CHANNEL

INNER BAR CHANNEL

1000'

800'

800'

800'

CENTERLINE OUTBOUND CHANNEL
(SAME AS CURRENT CHANNEL)

A

PROPOSED NEW ANCHORAGE AREA D

(1.2 SQ. MILES)

GALVESTON HARBOR CHANNEL

PLAN

0 1000 2000 3000

SCALE IN FEET

COASTAL TEXAS

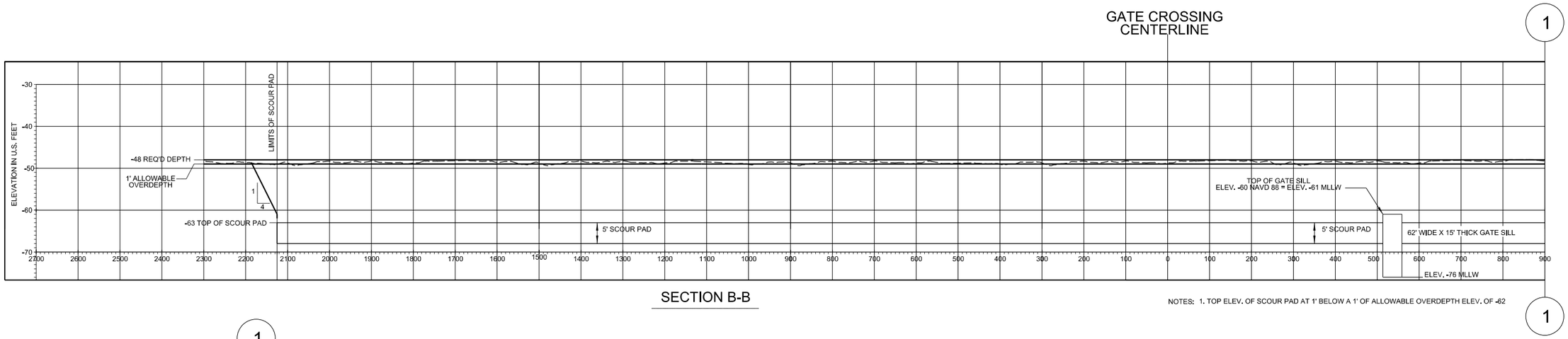
PLAN ENTRANCE CHANNEL

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

ENGINEERING APPENDIX
DATED: FEBRUARY 2020

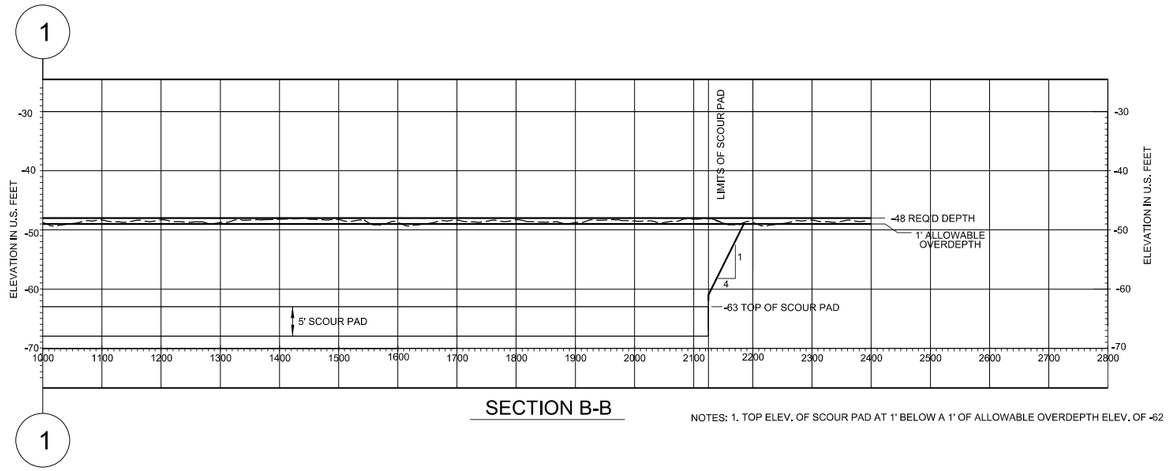
FILE NO. X

PLATE 4



SECTION B-B

NOTES: 1. TOP ELEV. OF SCOUR PAD AT 1' BELOW A 1' OF ALLOWABLE OVERDEPTH ELEV. OF -62



SECTION B-B

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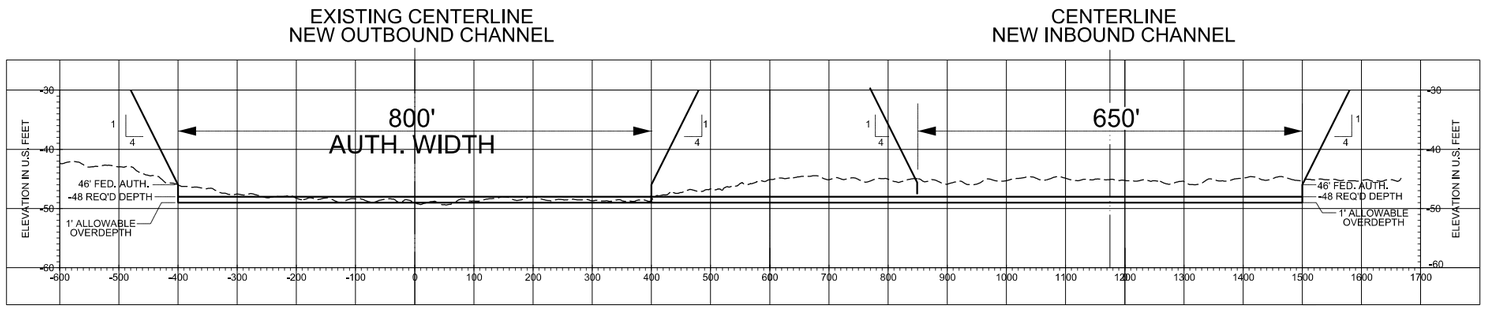


SECTION A-A = AUTH. CHANNEL STA. 15+000

NOTES:

1. EXISTING ENTRANCE CHANNEL WILL BECOME A ONE-WAY OUTBOUND CHANNEL WITH A SECTOR GATE OPENING OF 650'.
2. DREDGING DEPTHS ARE MLLW.

COASTAL TEXAS PROTECTION AND RESTORATION STUDY

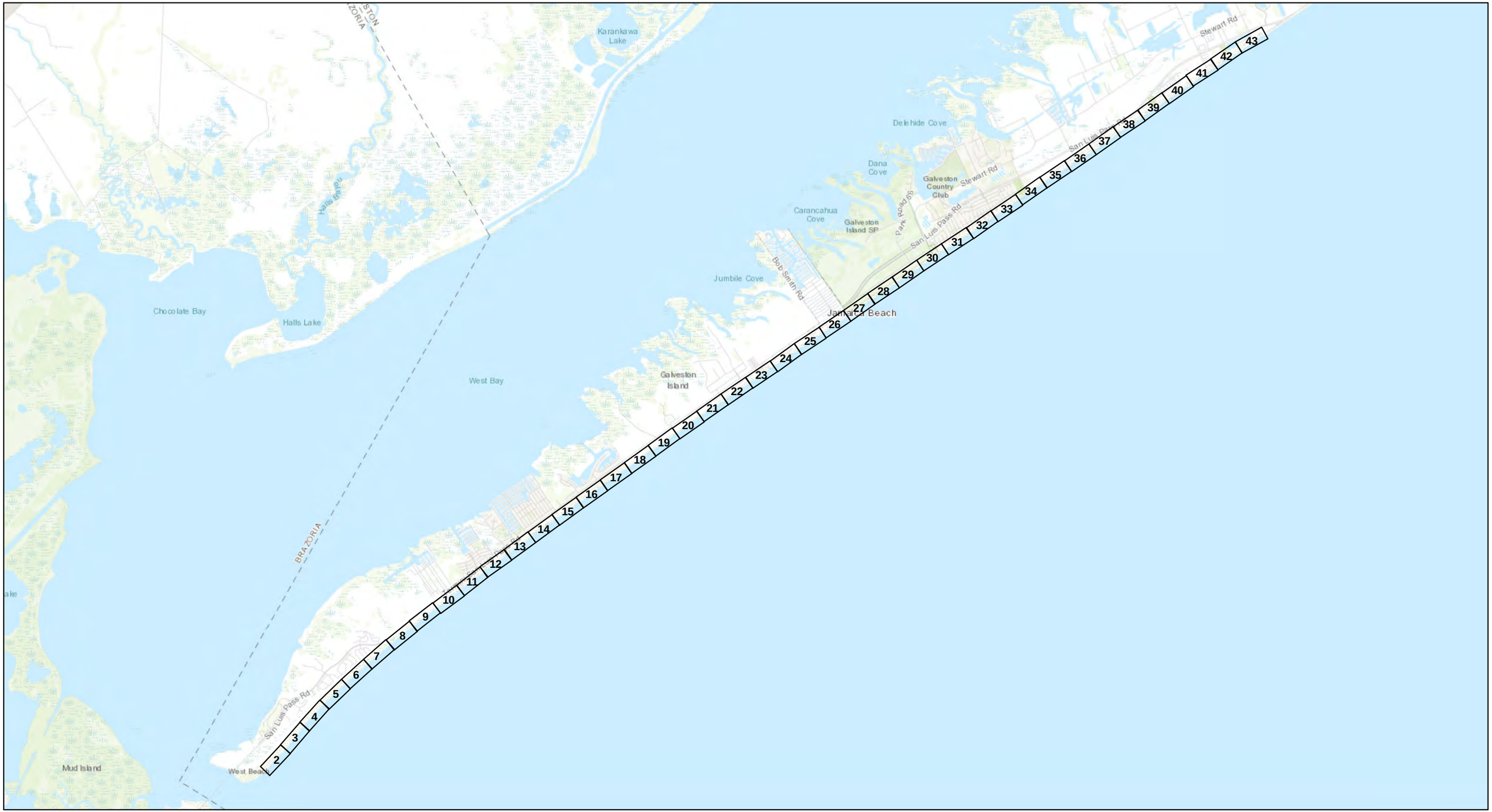
ENTRANCE CHANNEL SECTIONS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

ENGINEERING APPENDIX
DATED: FEBURARY 2020

GENERAL 3000

PLATE 5



US Army Corps of Engineers ®
Galveston District

Coastal Texas Protection and Restoration Feasibility Study

G5 Beach and Dune Restoration

N
W E
S

DATUM: NAD 1983
PROJECTION: STATE PLANE
ZONE: TX-SC 4204

Base Imagery: ESRI Basemaps

0 1 2 Miles

Draft Date: 23Jan2020

NOTE: Vehicle and Pedestrian access locations are reflective of current beach access plans and may be subject to change.

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- Existing Outfalls
- CBRS Unit Area
- Proposed Ditch
- Breakwater/Reef Ball
- Pedestrian Public Access
- Vehicle Public Access
- Temporary Staging Area
- New Beach - 250ft
- DuneField_185ft...
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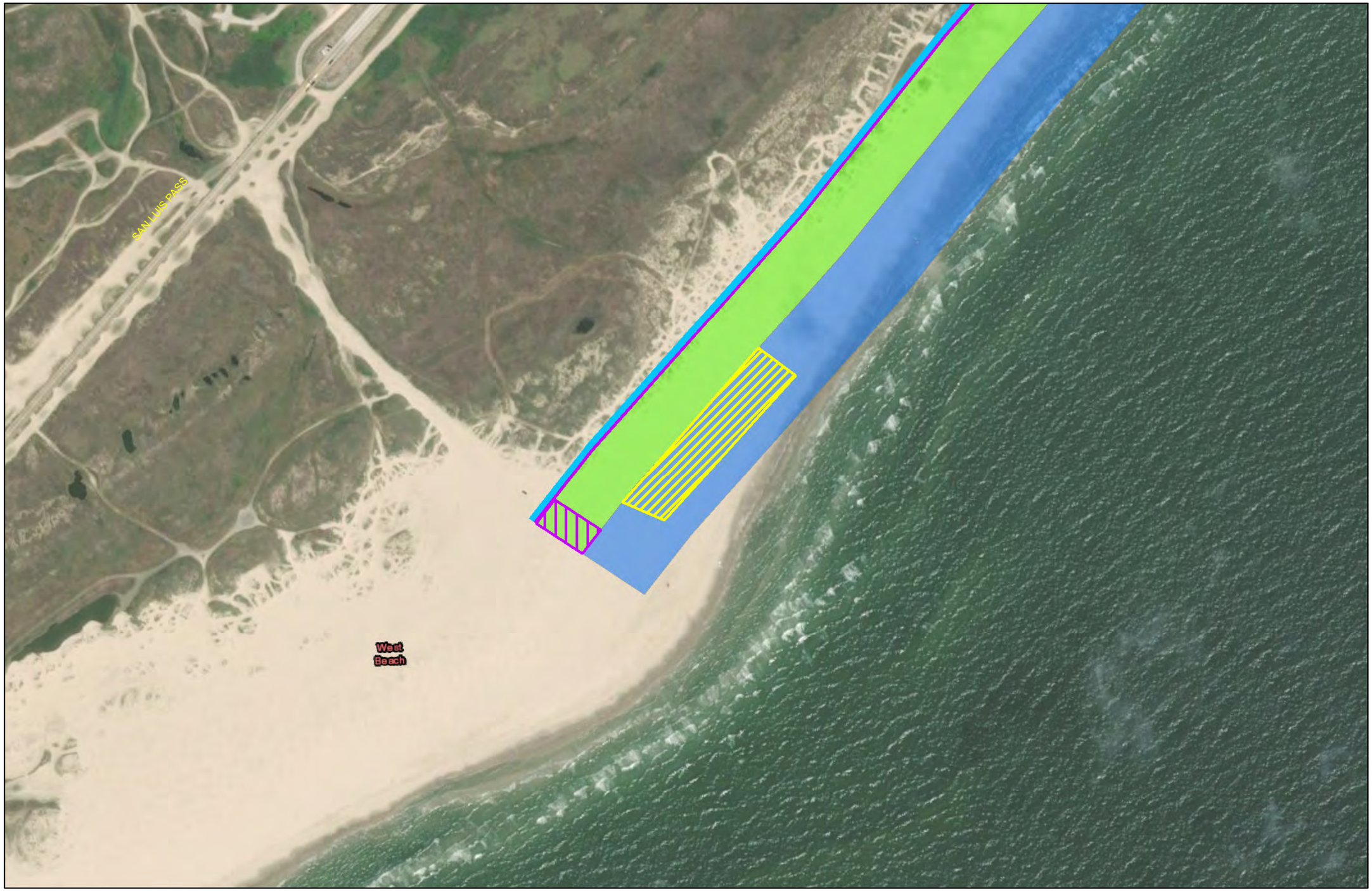

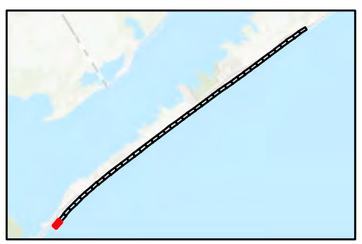

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Coastal Texas Protection and Restoration Feasibility Study

Beach and Dune System
Galveston Island

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PROJECTION: STATE PLANE
ZONE: TX-SC 4204

ESRI World Imagery Basemap

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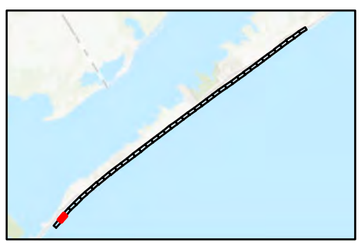

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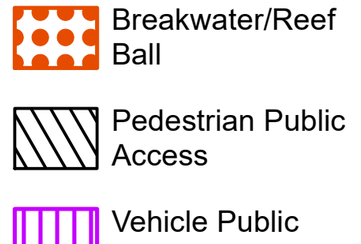

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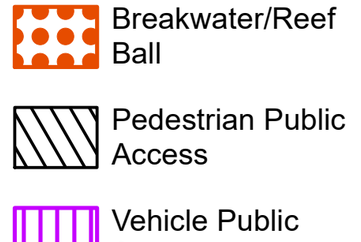

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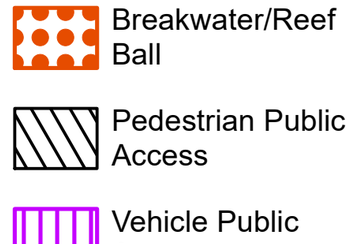

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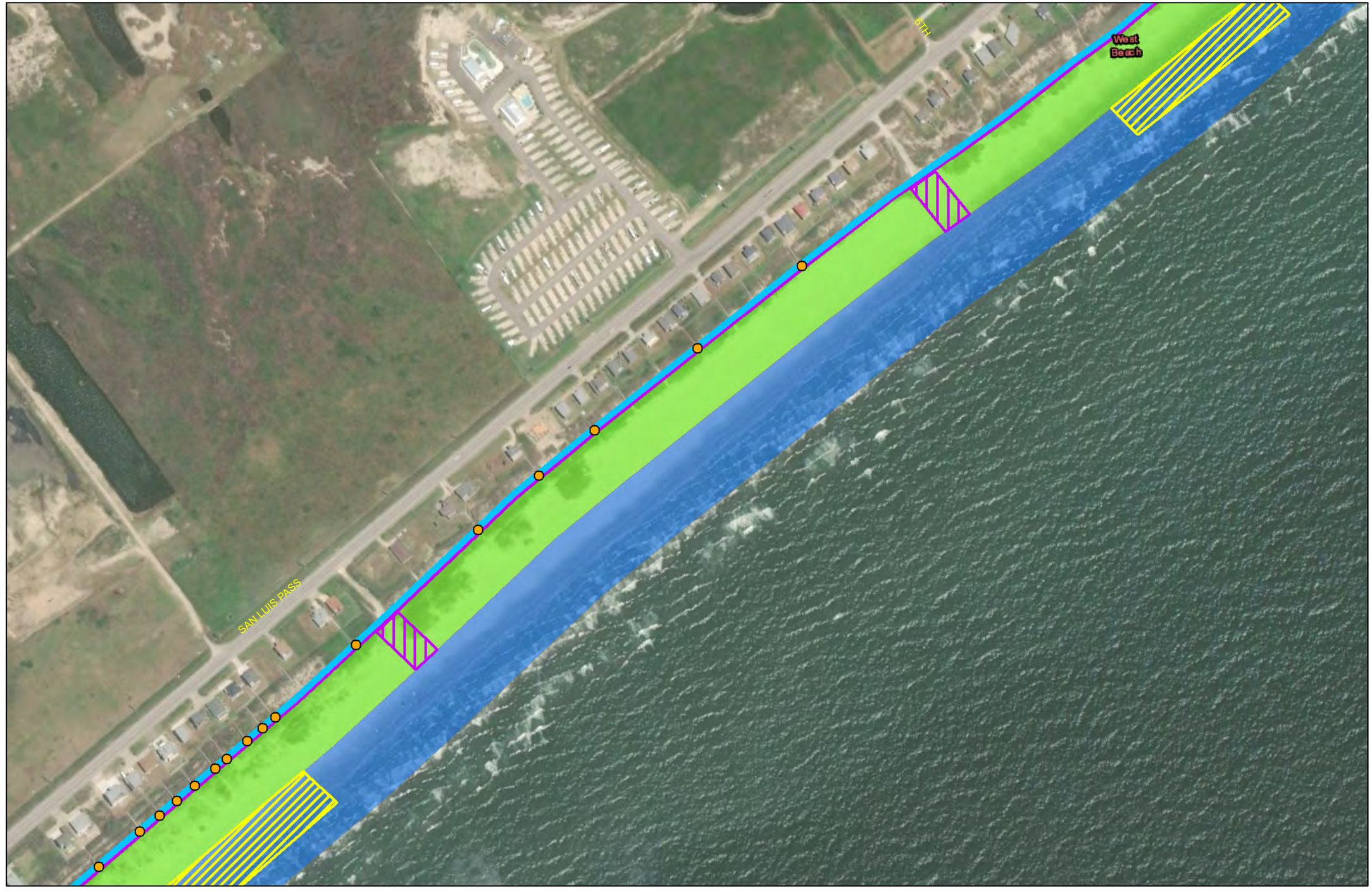

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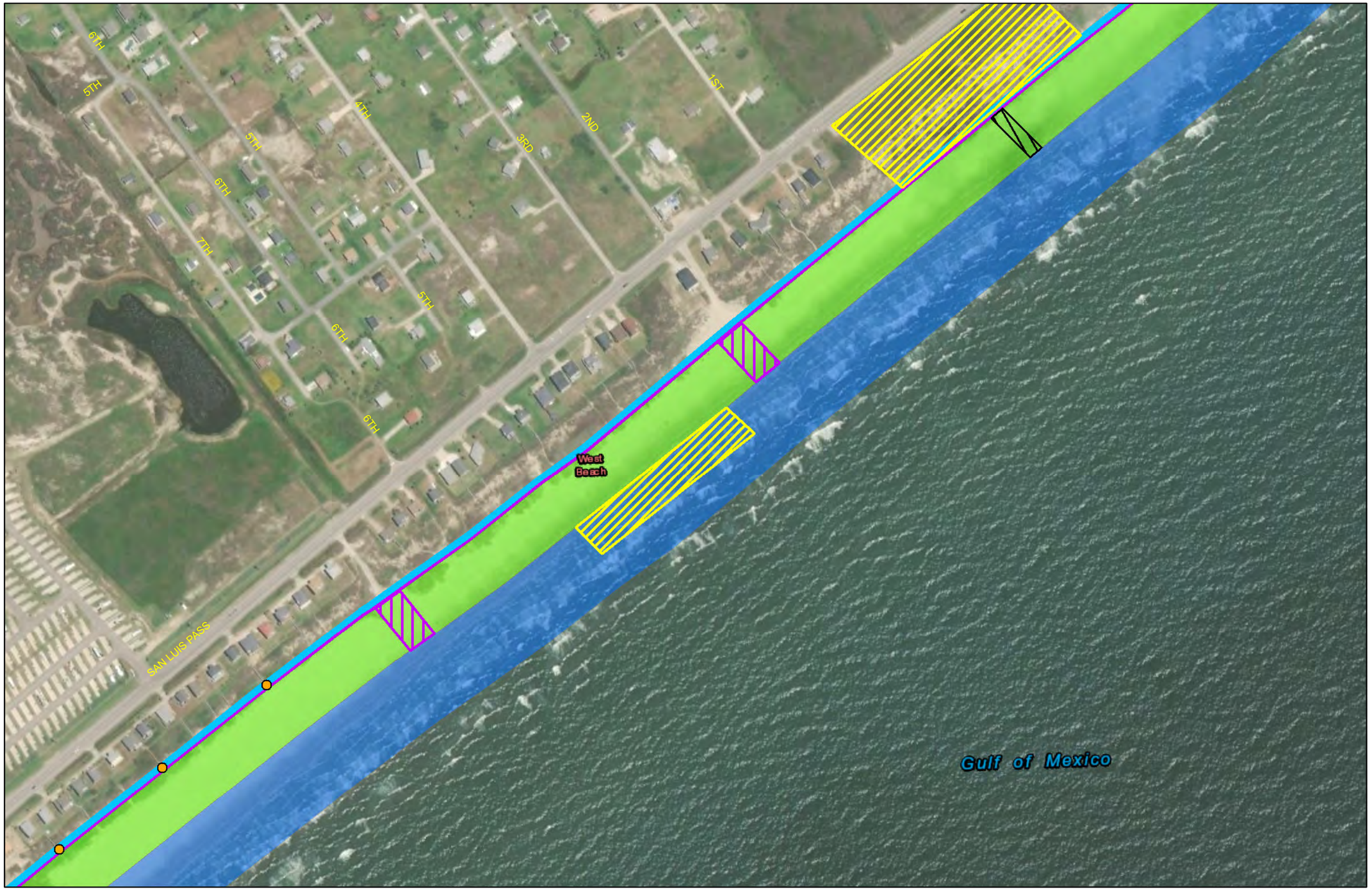

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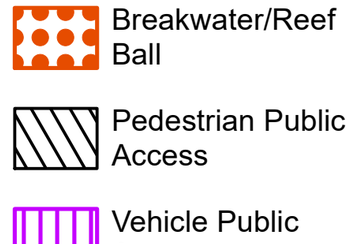

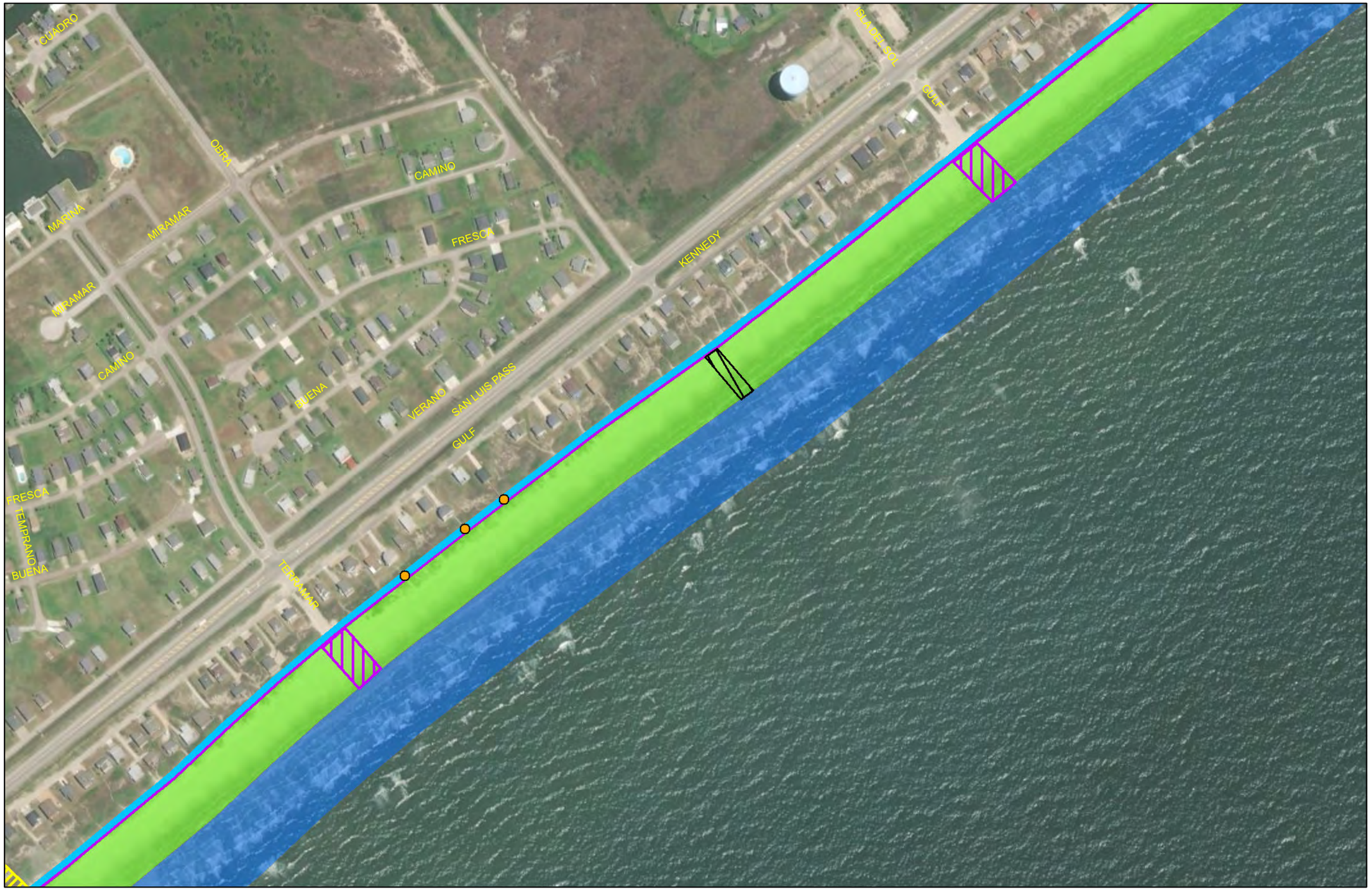

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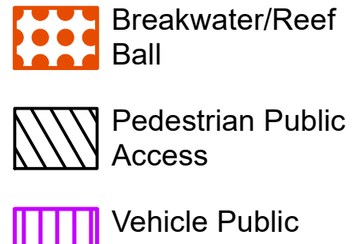

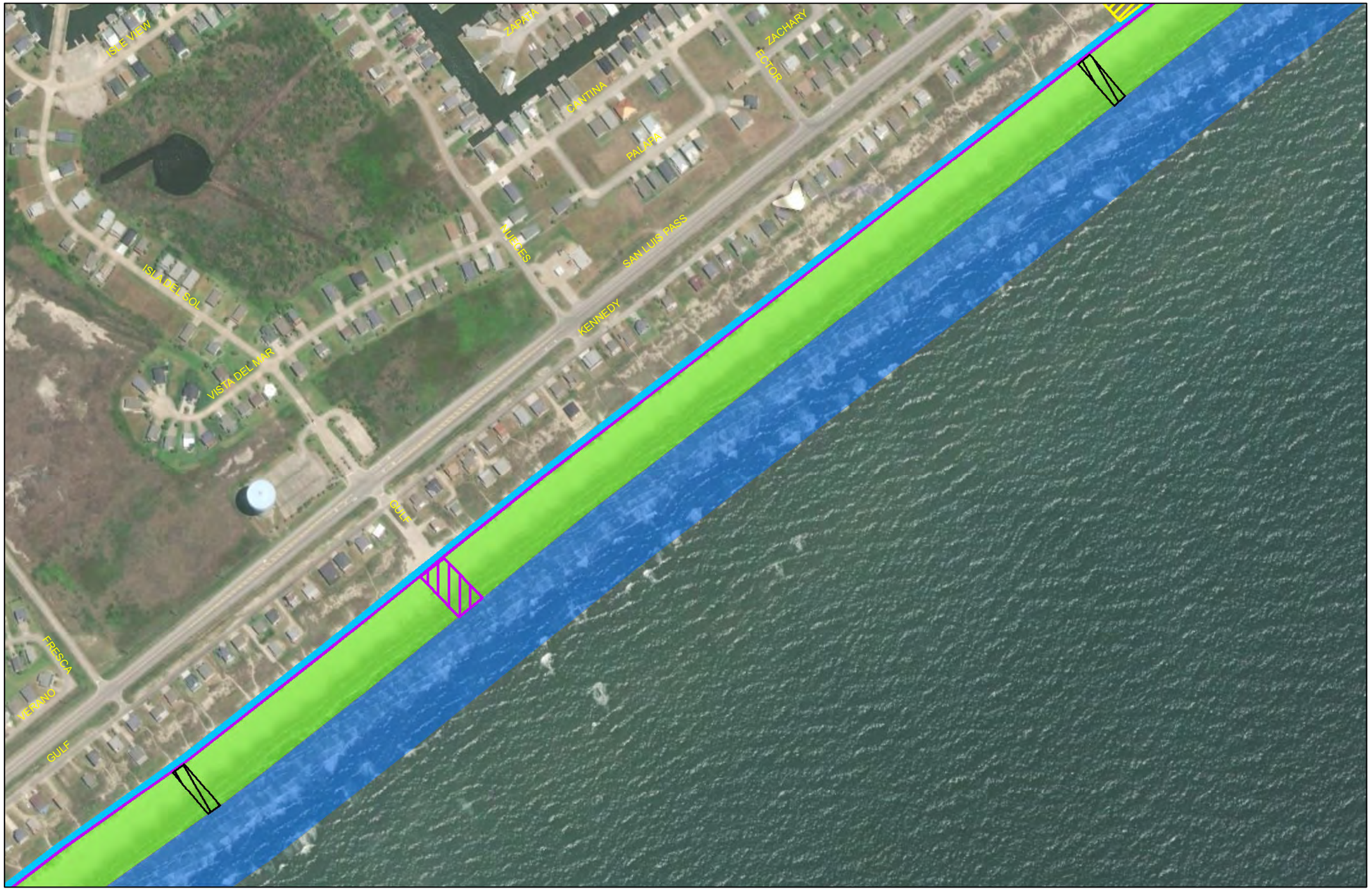

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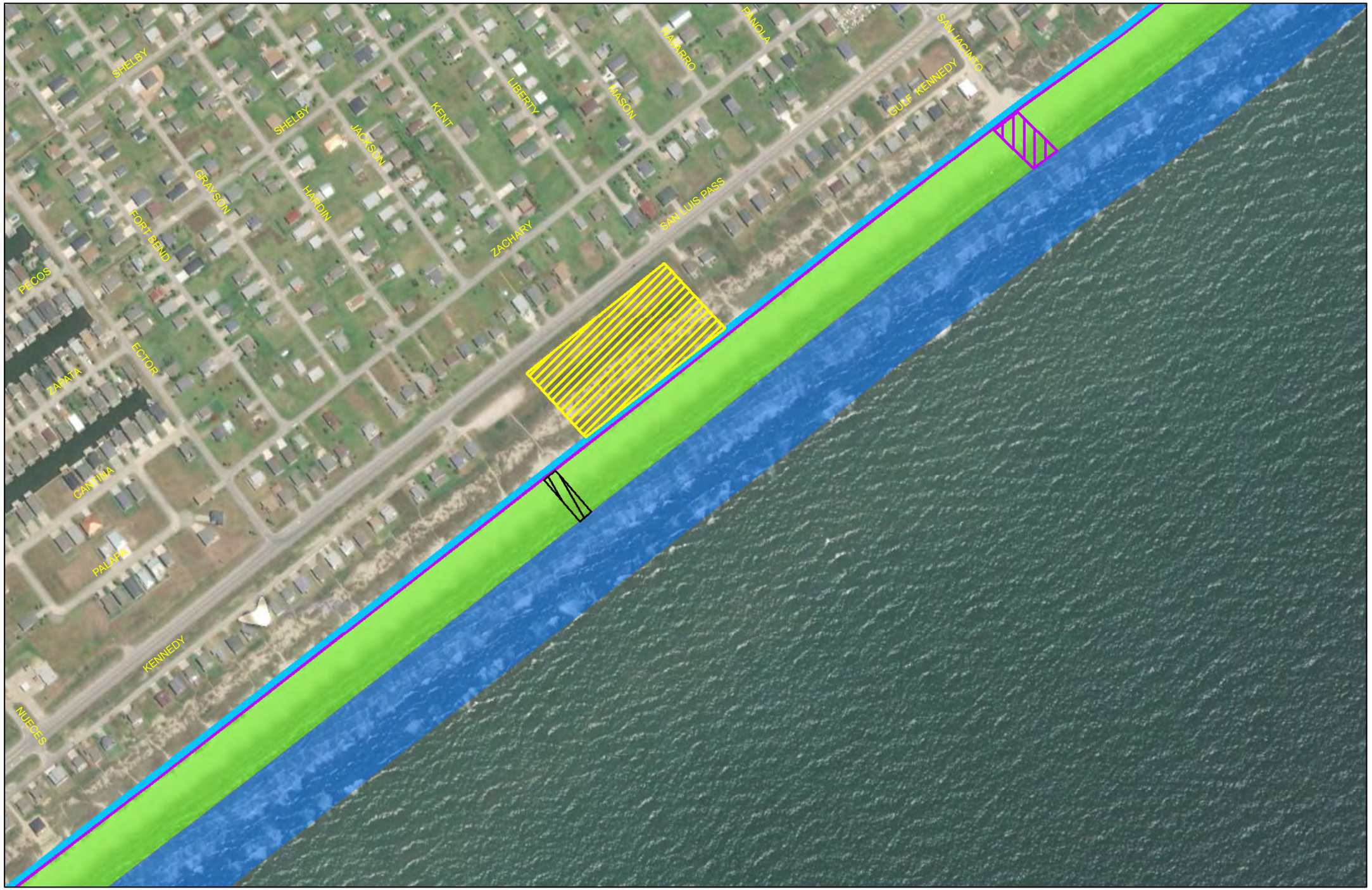

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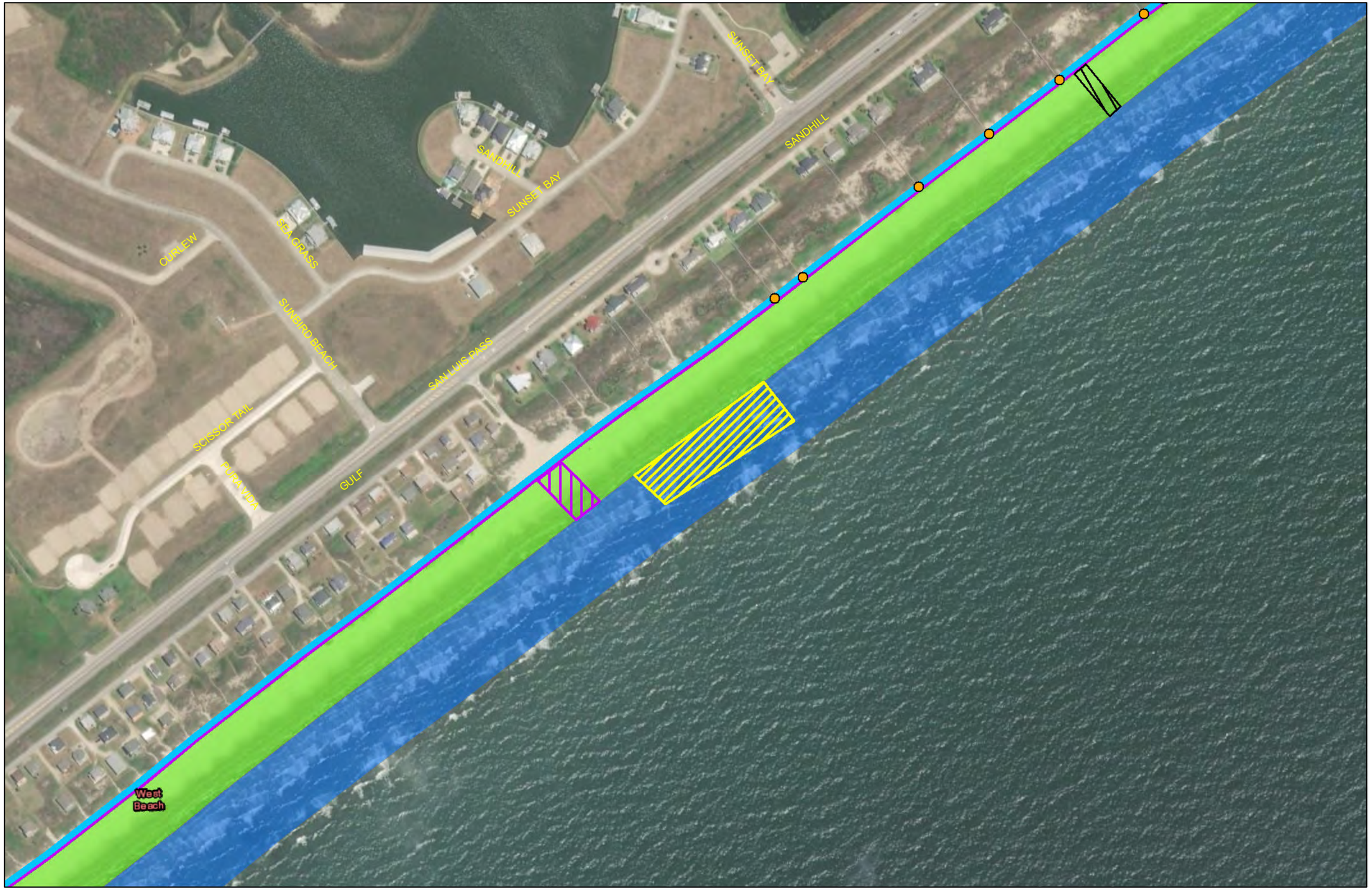

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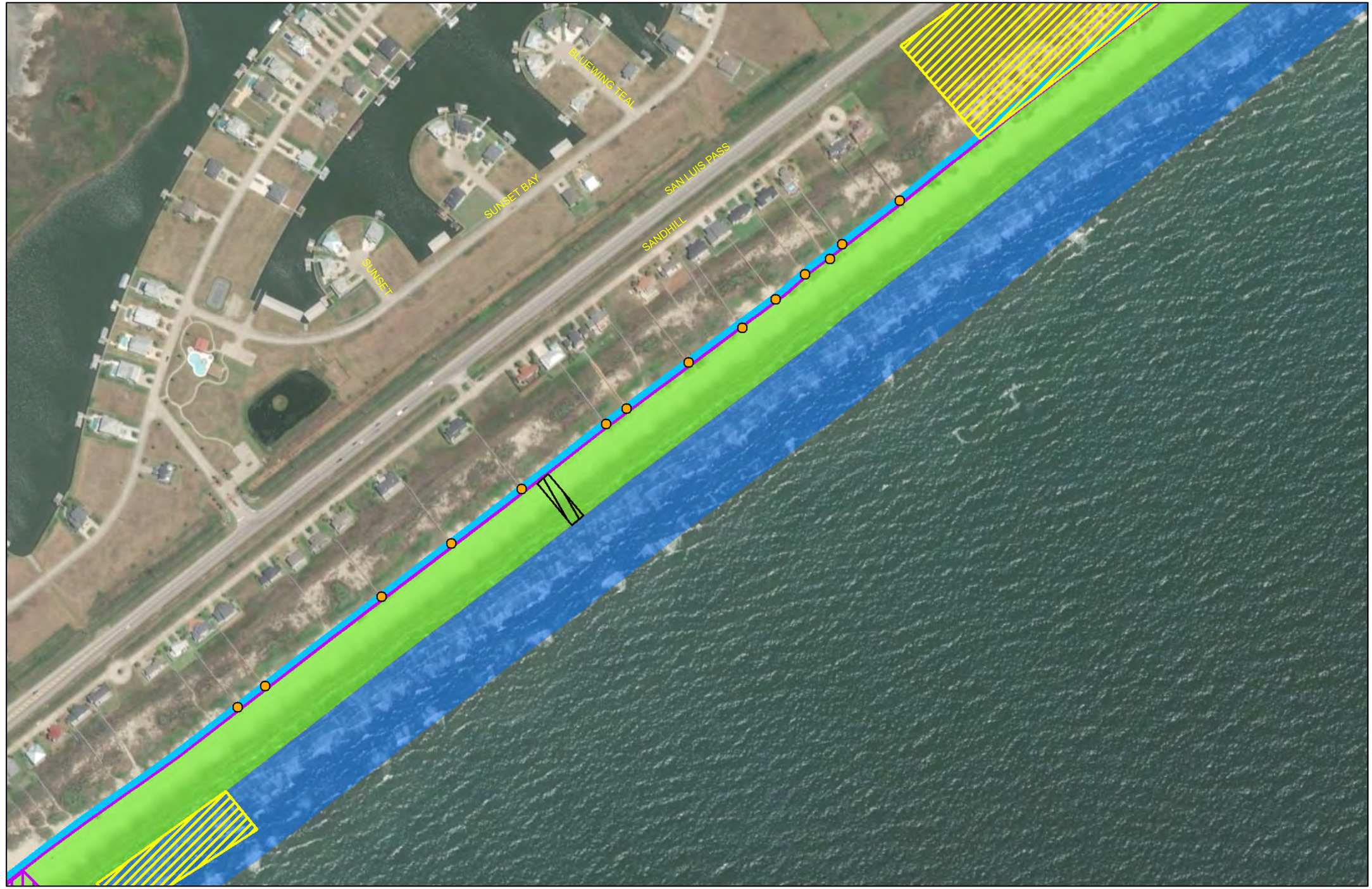

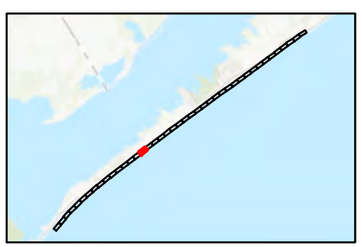

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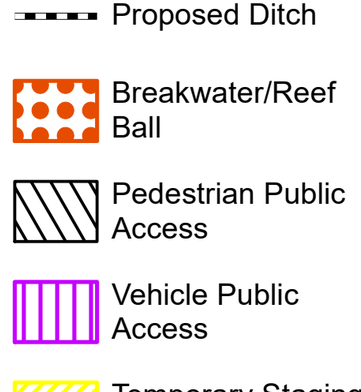

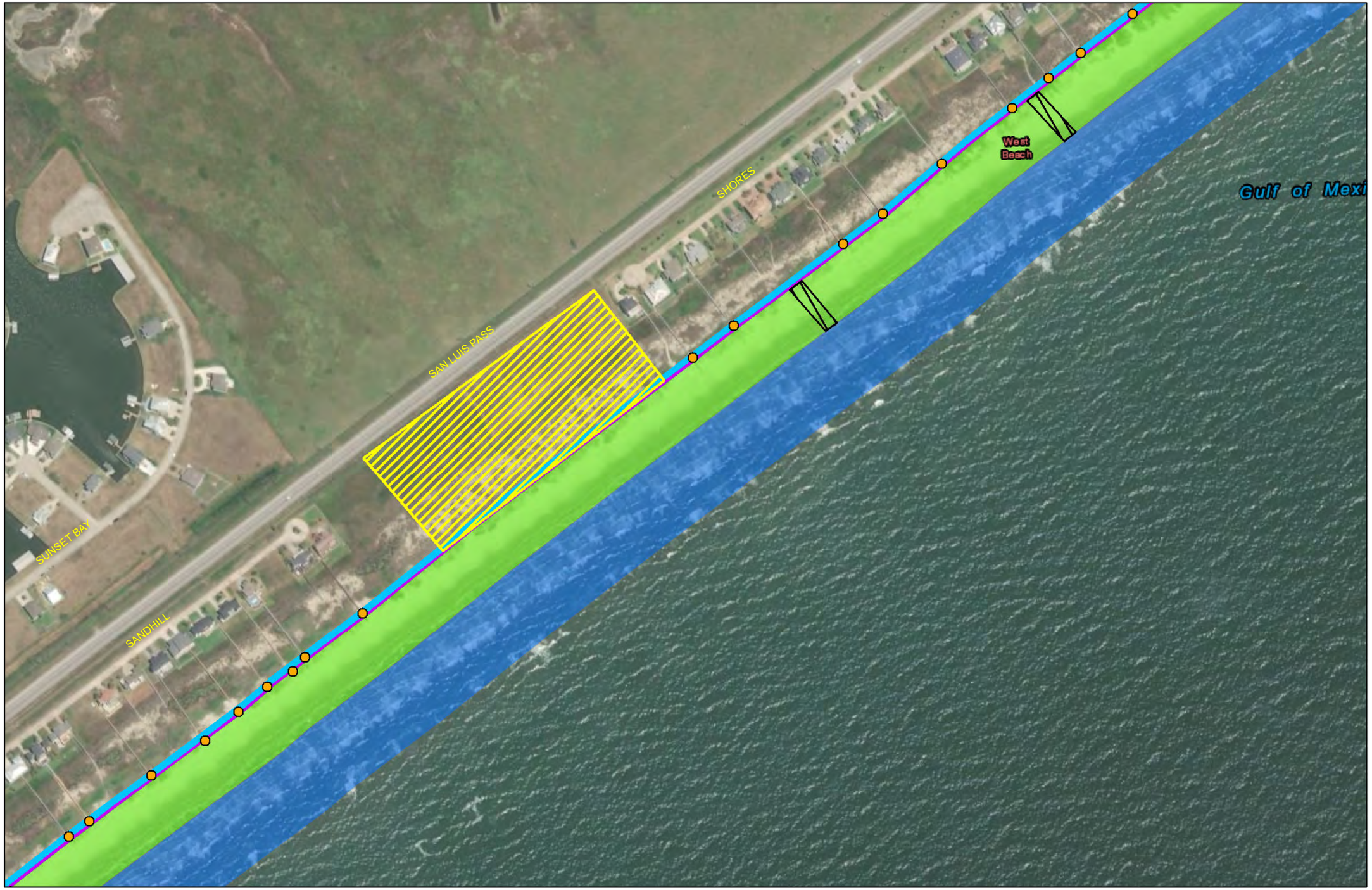

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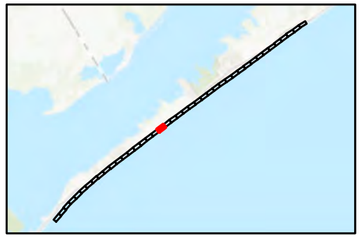

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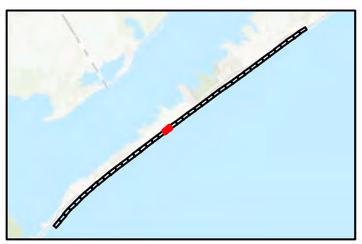

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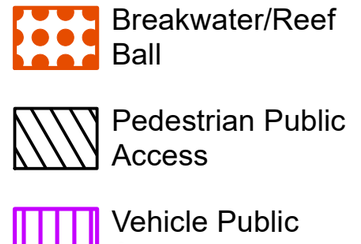

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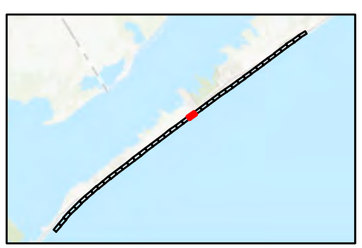

US Army Corps of Engineers ®
Galveston District

Coastal Texas Protection and Restoration Feasibility Study

Beach and Dune System
Galveston Island

DATUM: NAD 1983
PROJECTION: STATE PLANE
ZONE: TX-SC 4204

ESRI World Imagery Basemap

0 125 250 500 Feet

Draft Date: 23Jan2020

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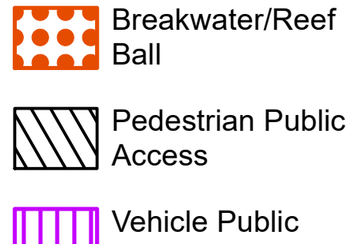

US Army Corps of Engineers ®
Galveston District

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US Army Corps of Engineers ®
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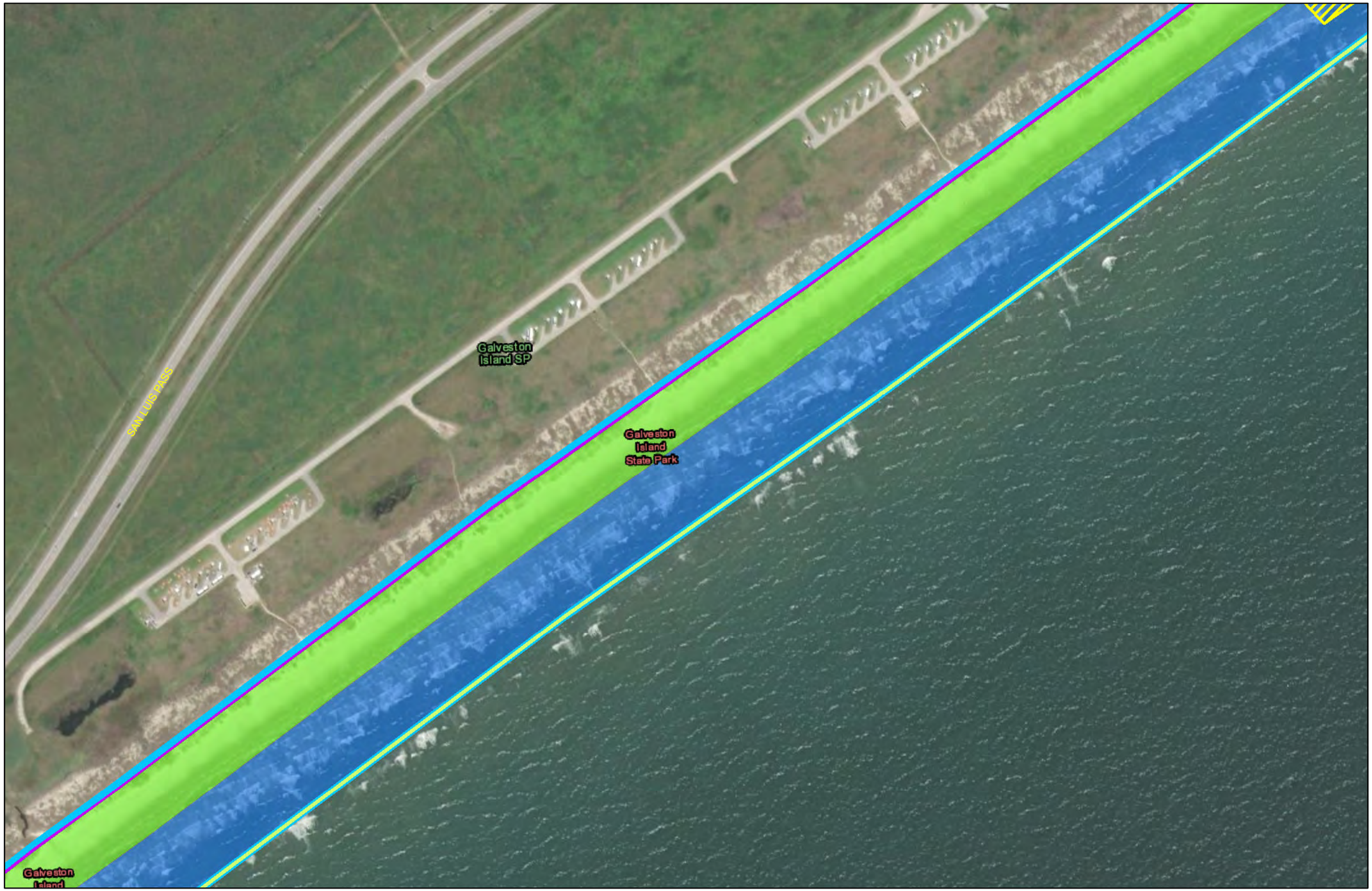

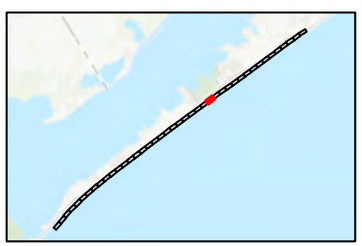

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Galveston District

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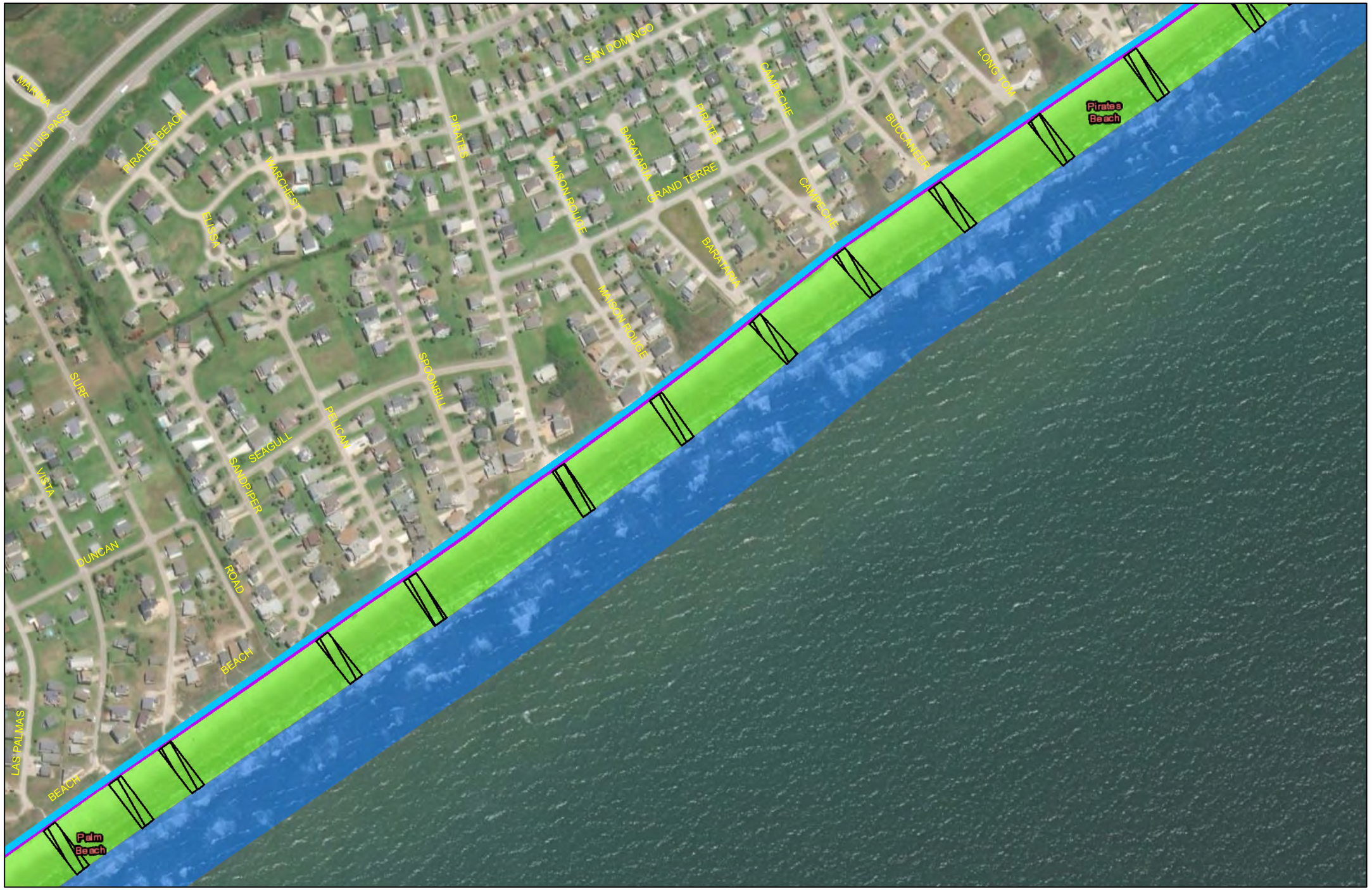

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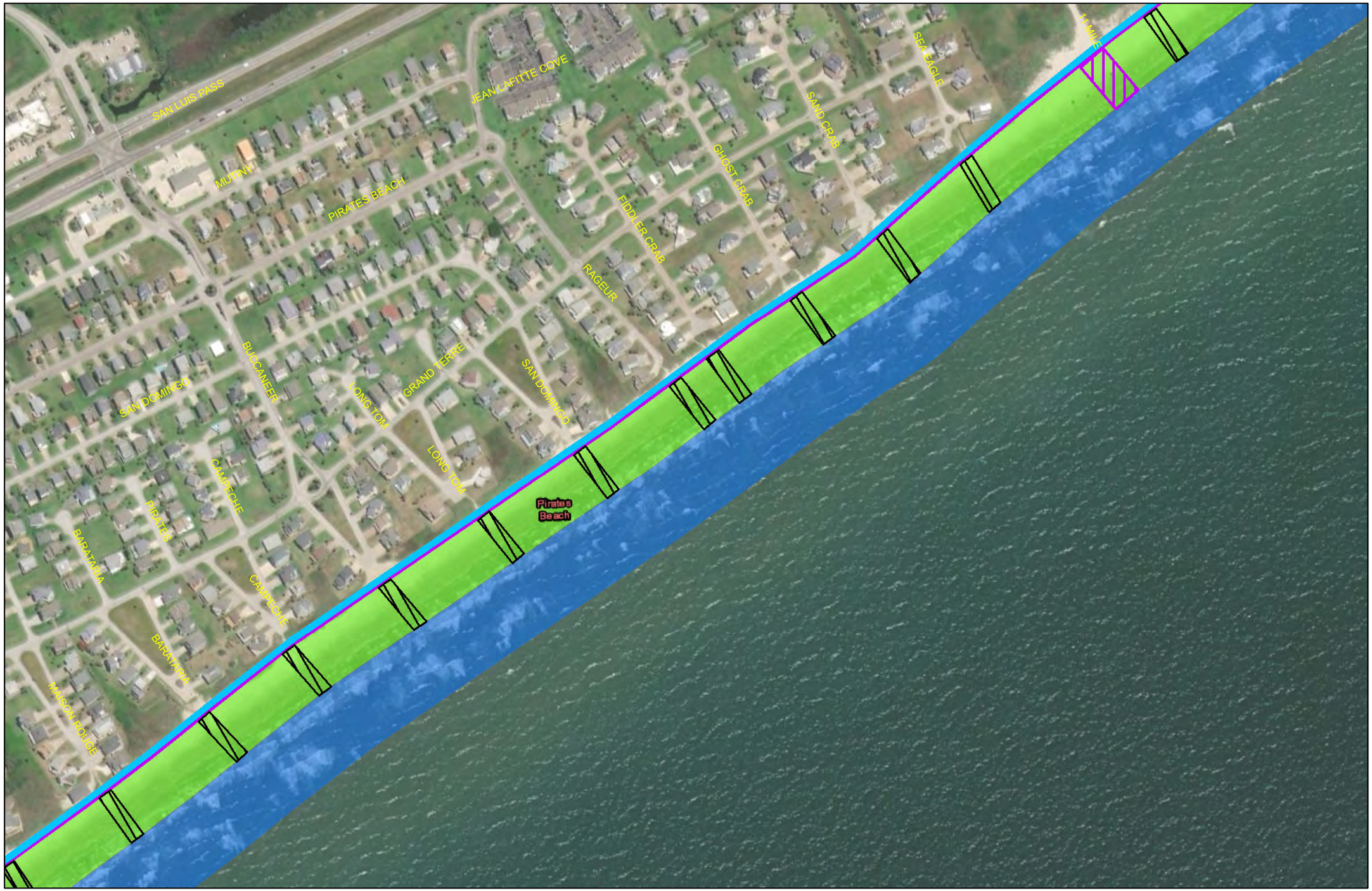

US Army Corps of Engineers ®
Galveston District

TEXAS GENERAL LAND OFFICE · ESTABLISHED 1836 ·

Coastal Texas Protection and Restoration Feasibility Study

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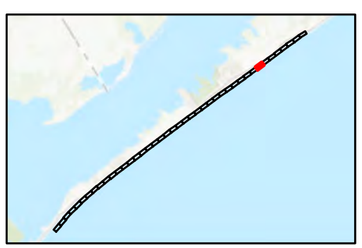

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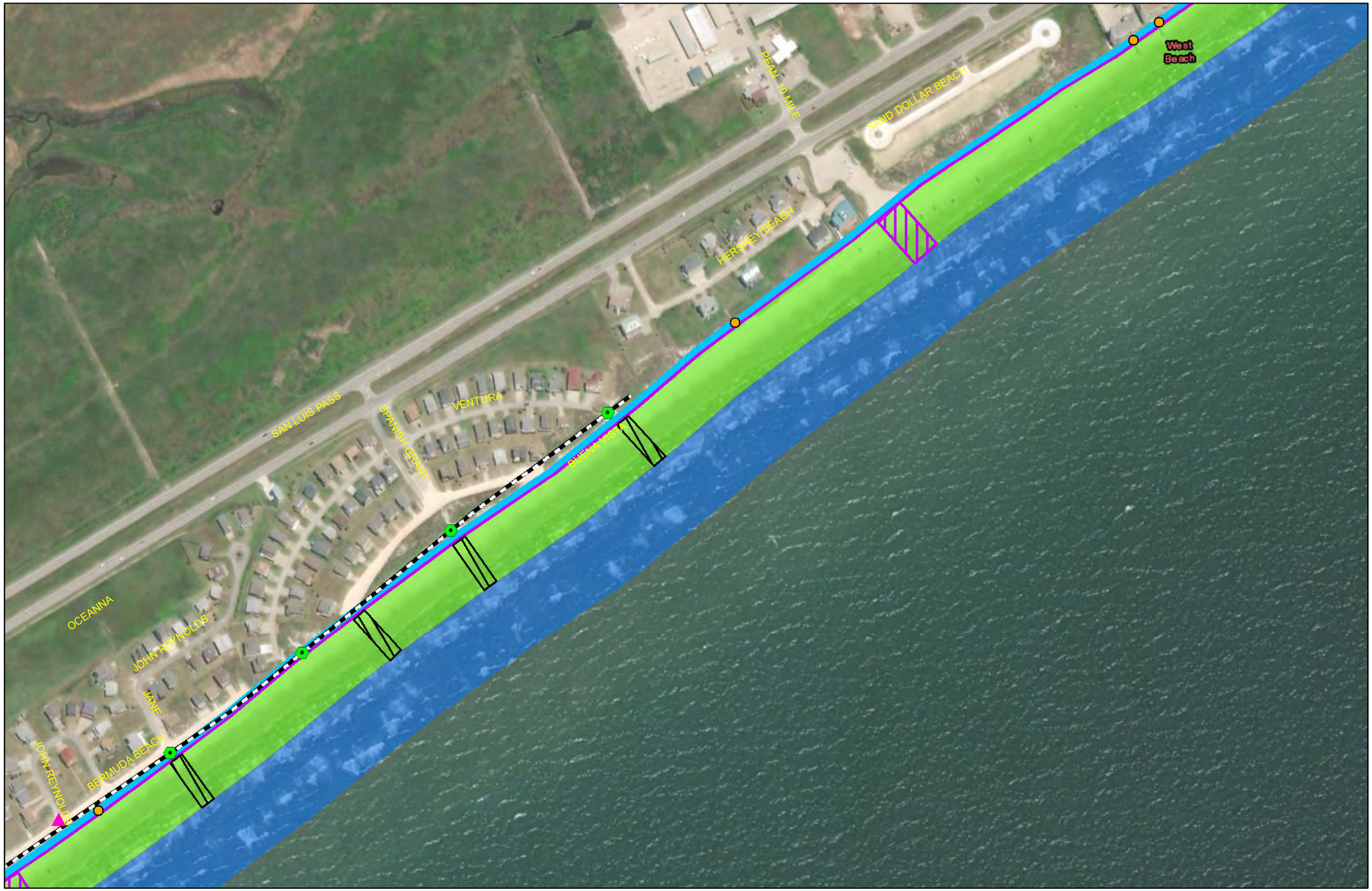

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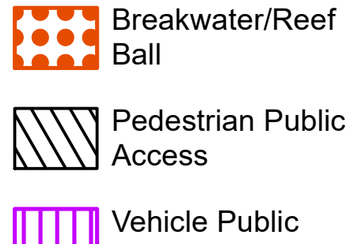

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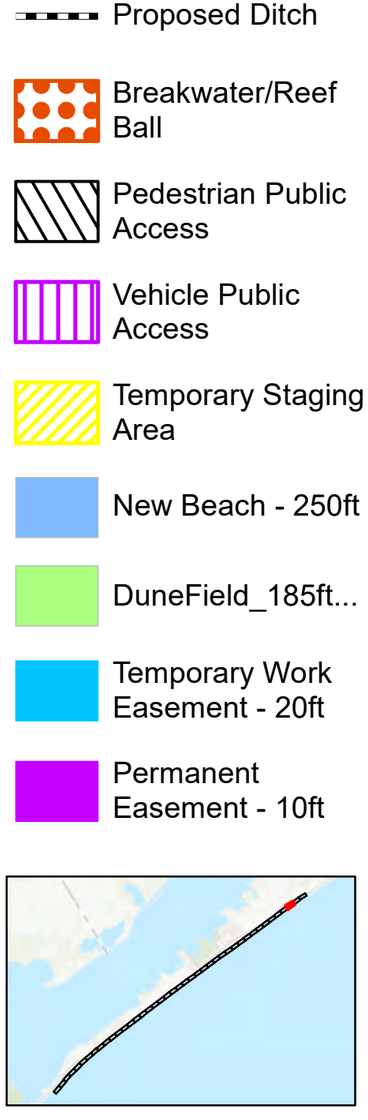

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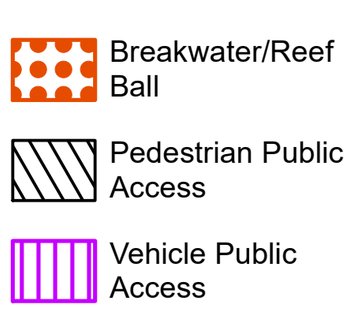

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Galveston District

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Coastal Texas Protection and Restoration Feasibility Study

City of Galveston Ring Barrier

- Drainage Structure
- Combiwall
- Seawall Improvement
- Circulation Gate
- Navigation Gate
- New Channel
- Levee

Transportation Access

- Access Gate
- Rail Closure
- Road Closure

Floodwall

Aprrox. Stick Up Height

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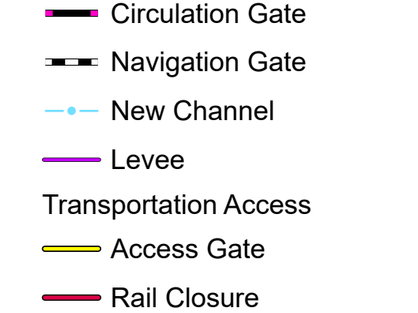

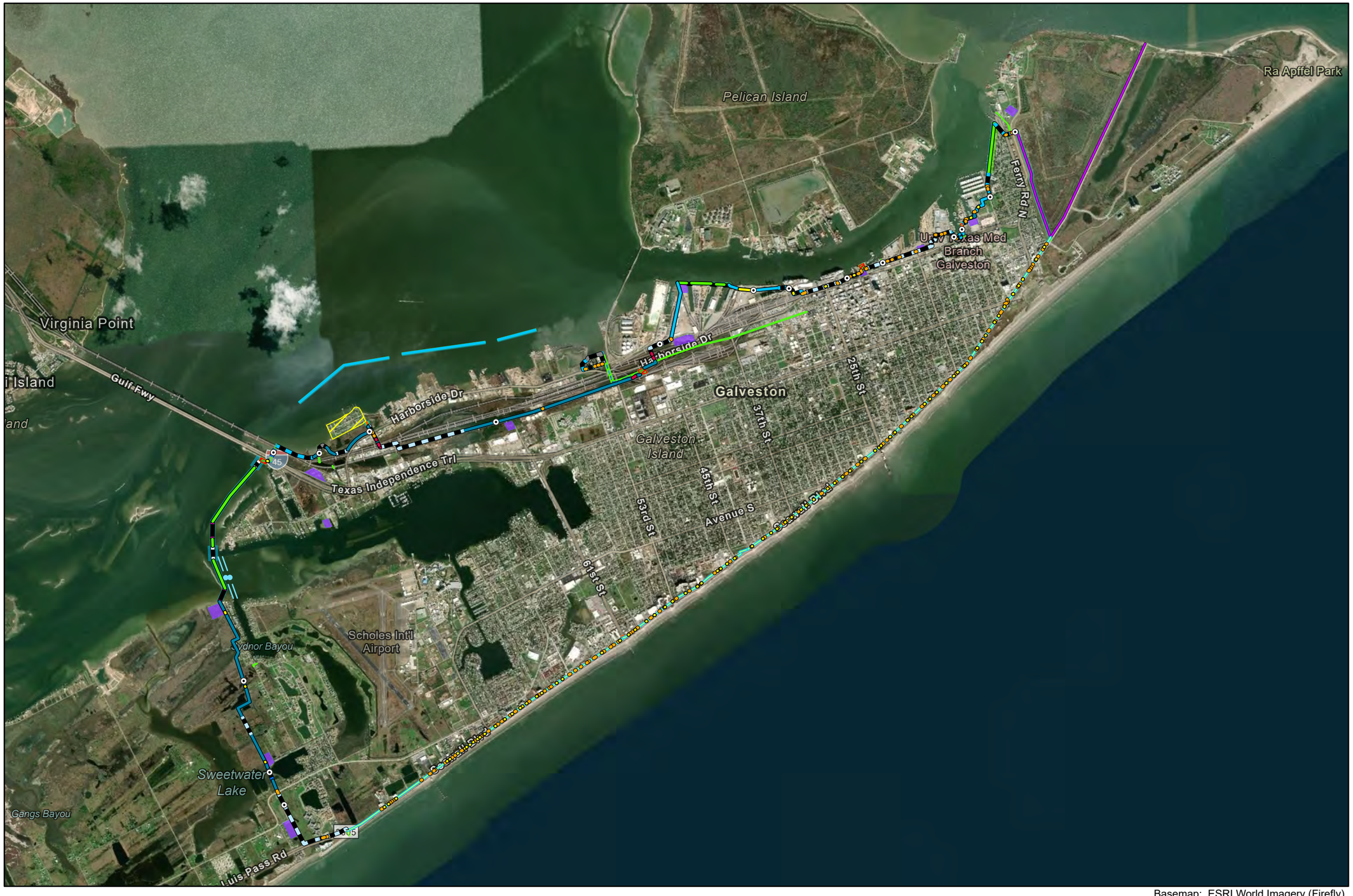

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Galveston District

- Drainage Mitigation
- Elevated Roadway
- Nonstructural Improvements
- Permanent Easement
- Temporary Easement
- Pump Station
- Breakwater
- Cofferdam
- Temporary Staging

Basemap: ESRI World Imagery (Firefly)

N W E S

0 0.5 1 Miles

DATUM: NAD 1983
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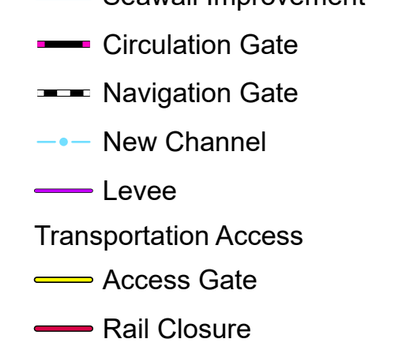

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Galveston District

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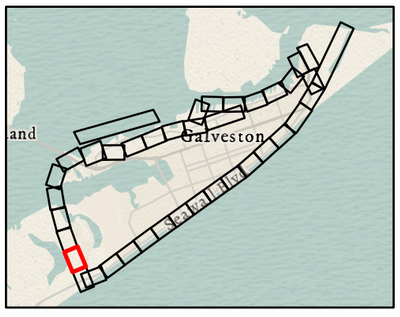

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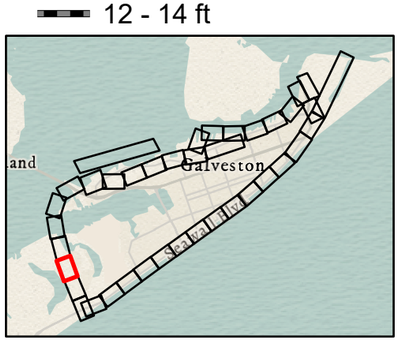

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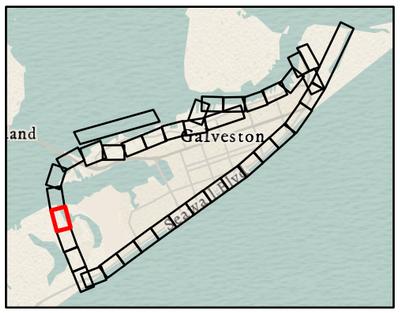

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ZONE: TX-SC 4204

0 250 500 Feet

Date: 29 April 2020

Coastal Texas Protection and Restoration Feasibility Study

City of Galveston Ring Barrier

- Drainage Structure
- Combiwall
- Seawall Improvement
- Circulation Gate
- Navigation Gate
- New Channel
- Levee

Transportation Access

- Access Gate
- Rail Closure
- Road Closure

Floodwall

Aprrox. Stick Up Height

- 0 - 2 ft
- 2 - 4 ft
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Basemap: ESRI World Imagery (Firefly)

US Army Corps of Engineers ®
Galveston District

- Drainage Mitigation
- Elevated Roadway
- Nonstructural Improvements
- Pump Station
- Breakwater
- Cofferdam
- Temporary Staging
- Temporary Easement
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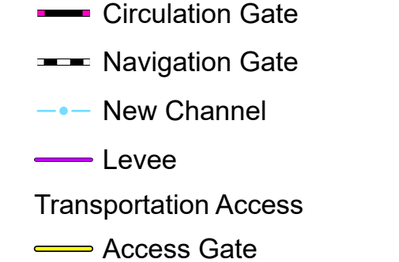

US Army Corps of Engineers ®
Galveston District

- Drainage Mitigation
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- Permanent Easement
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Basemap: ESRI World Imagery (Firefly)

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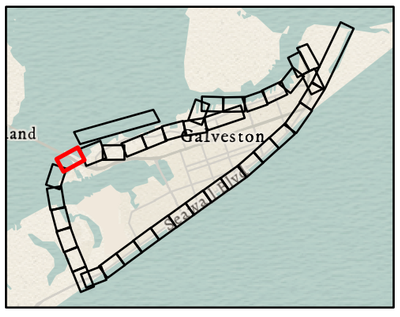

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Galveston District

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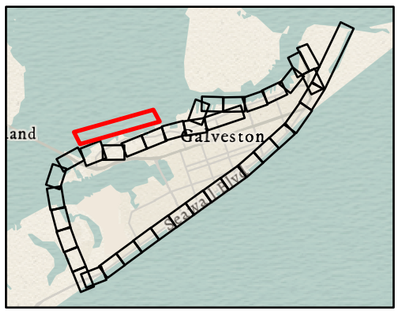

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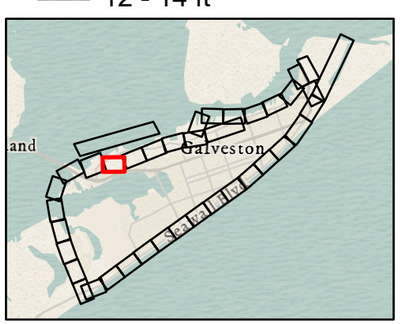

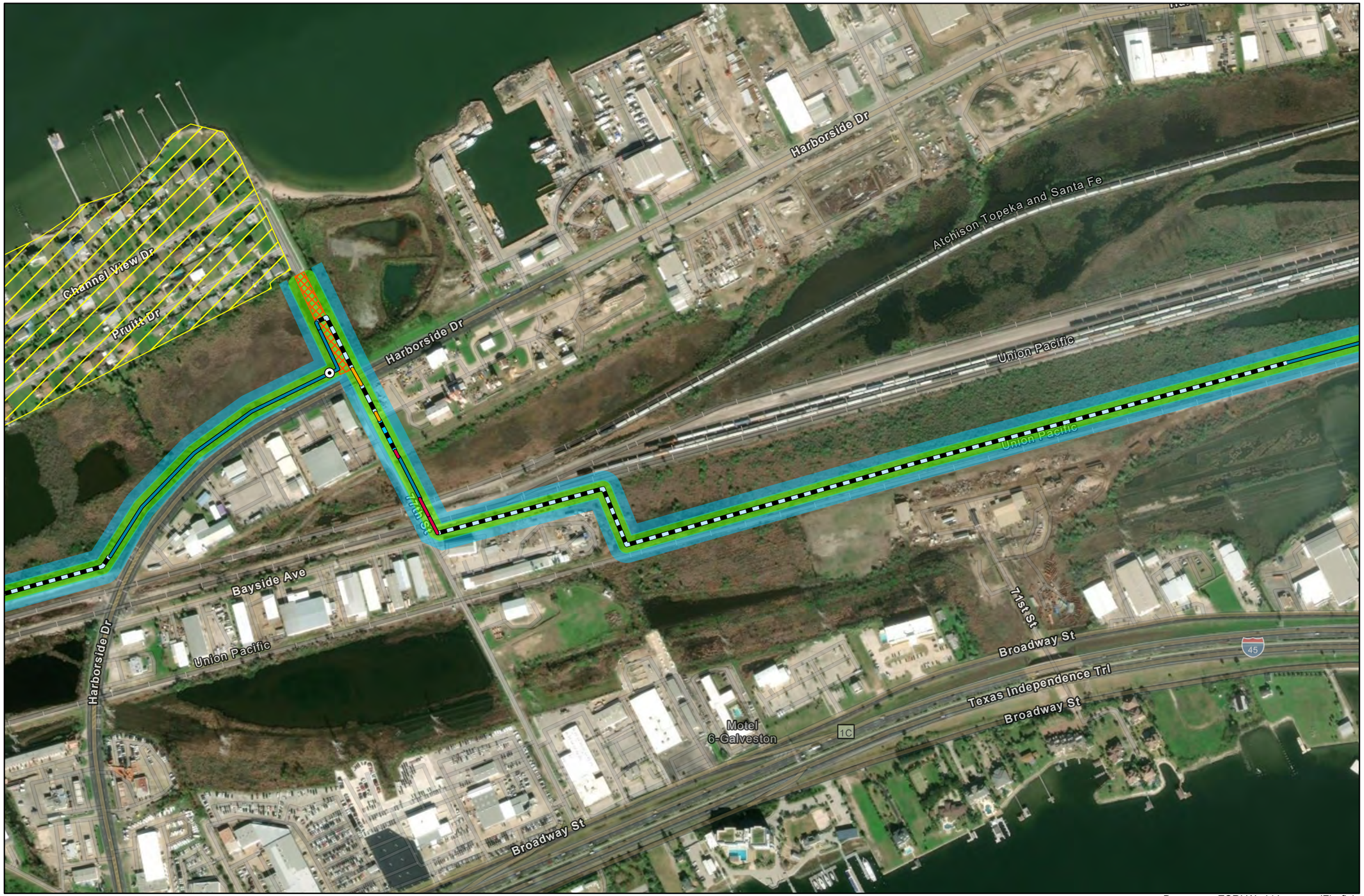

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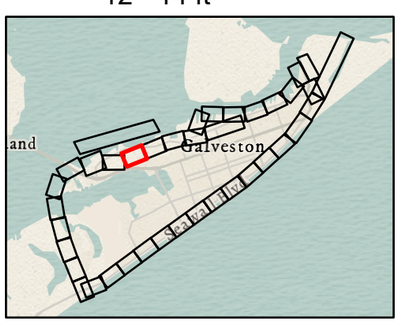

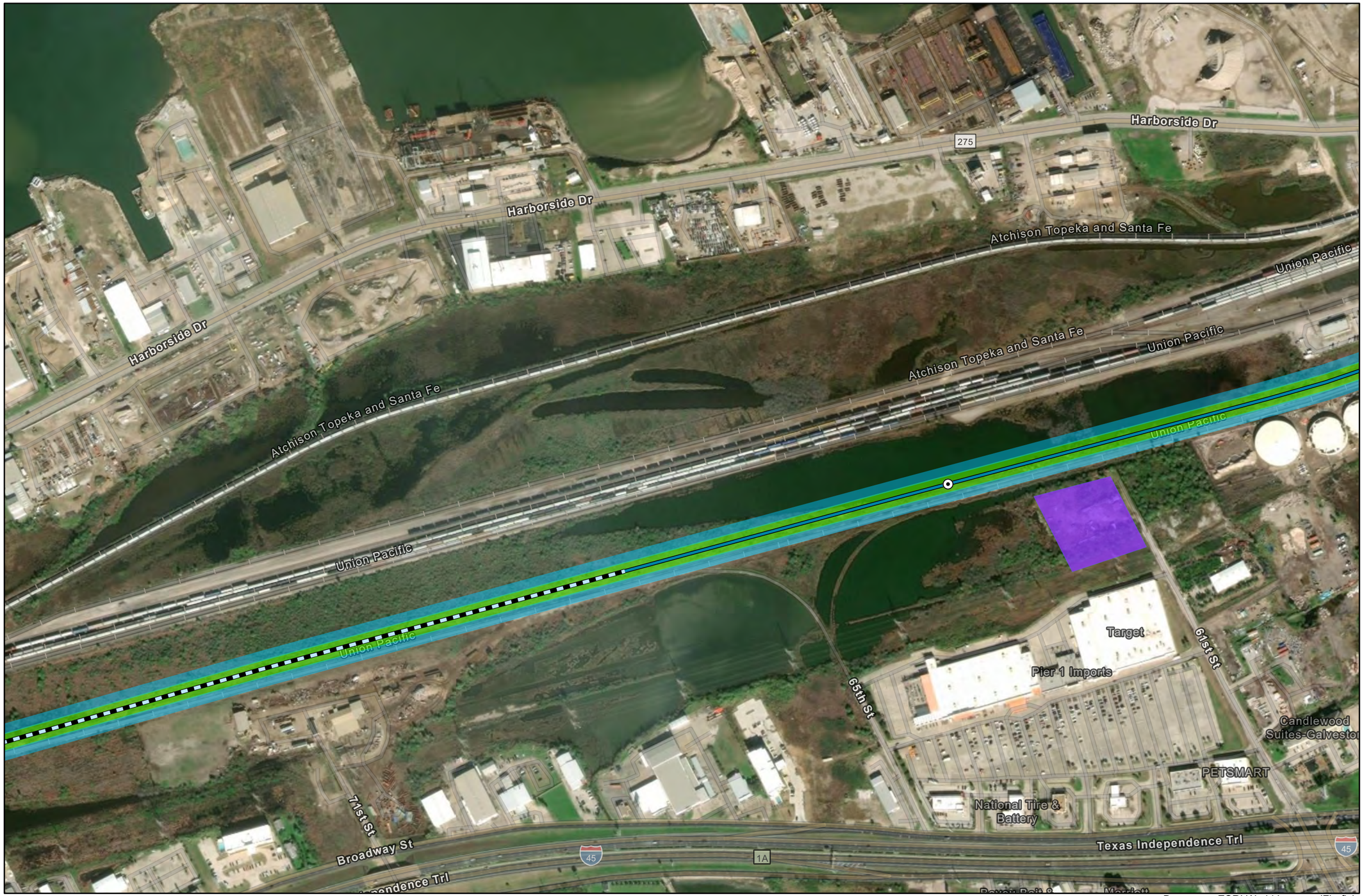

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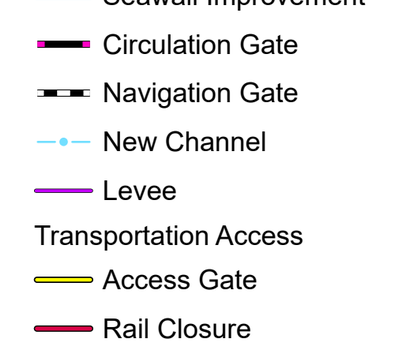

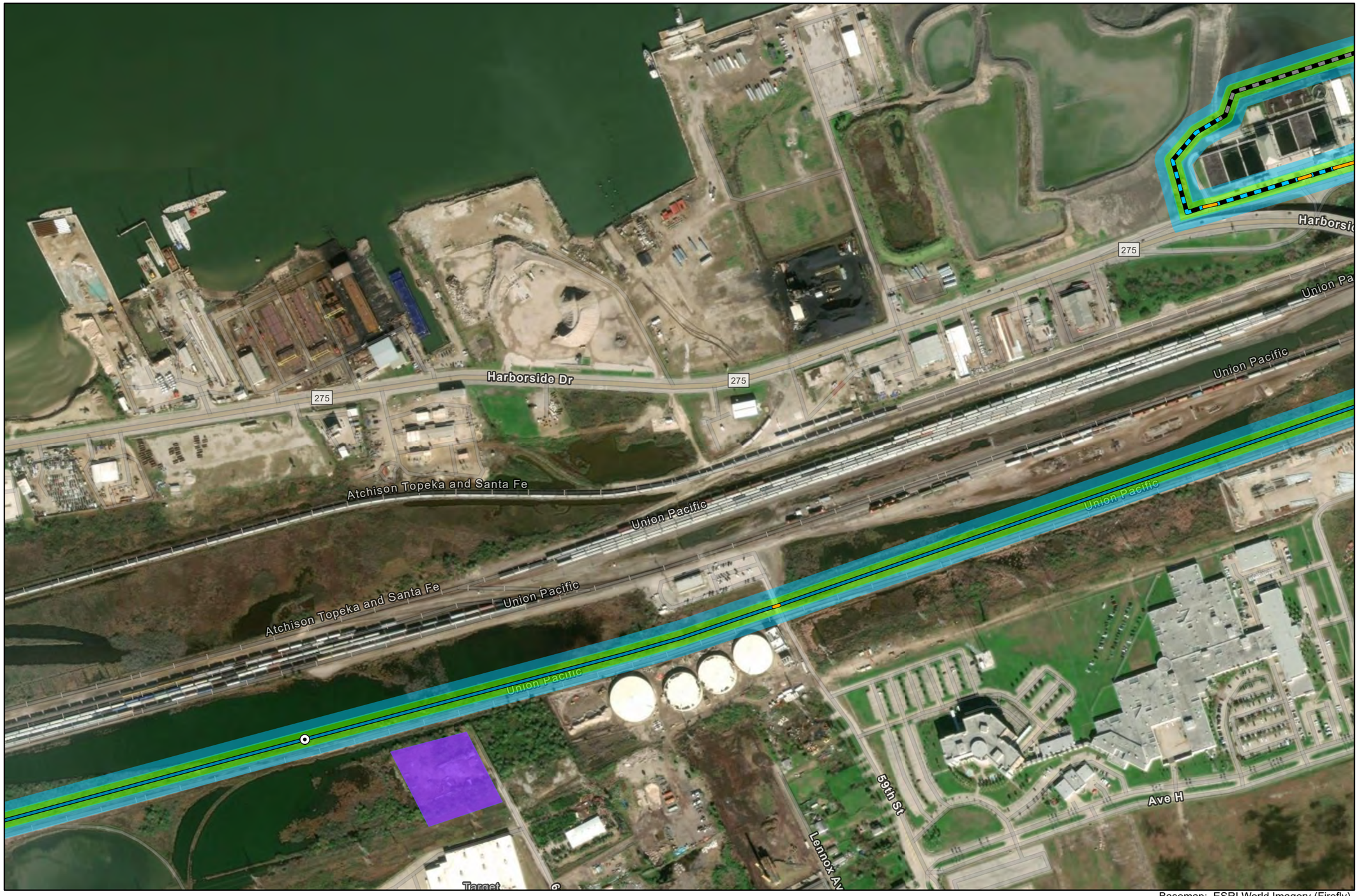

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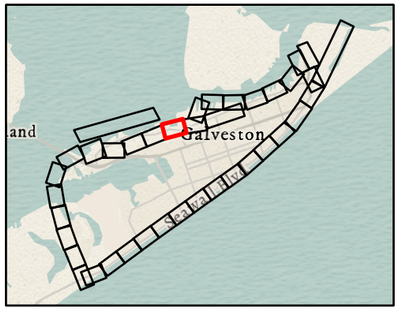

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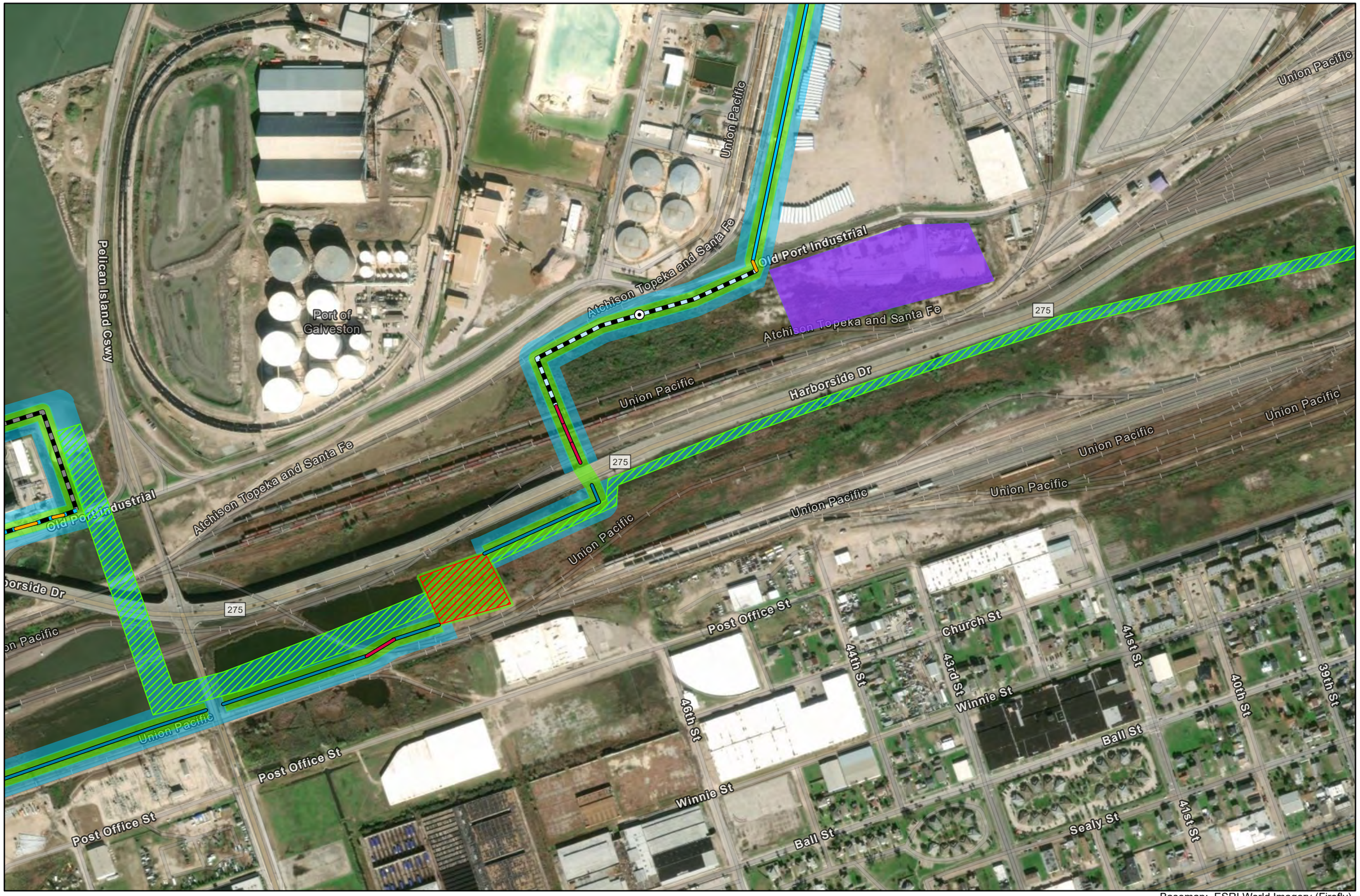

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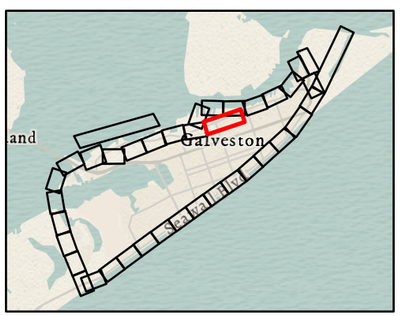

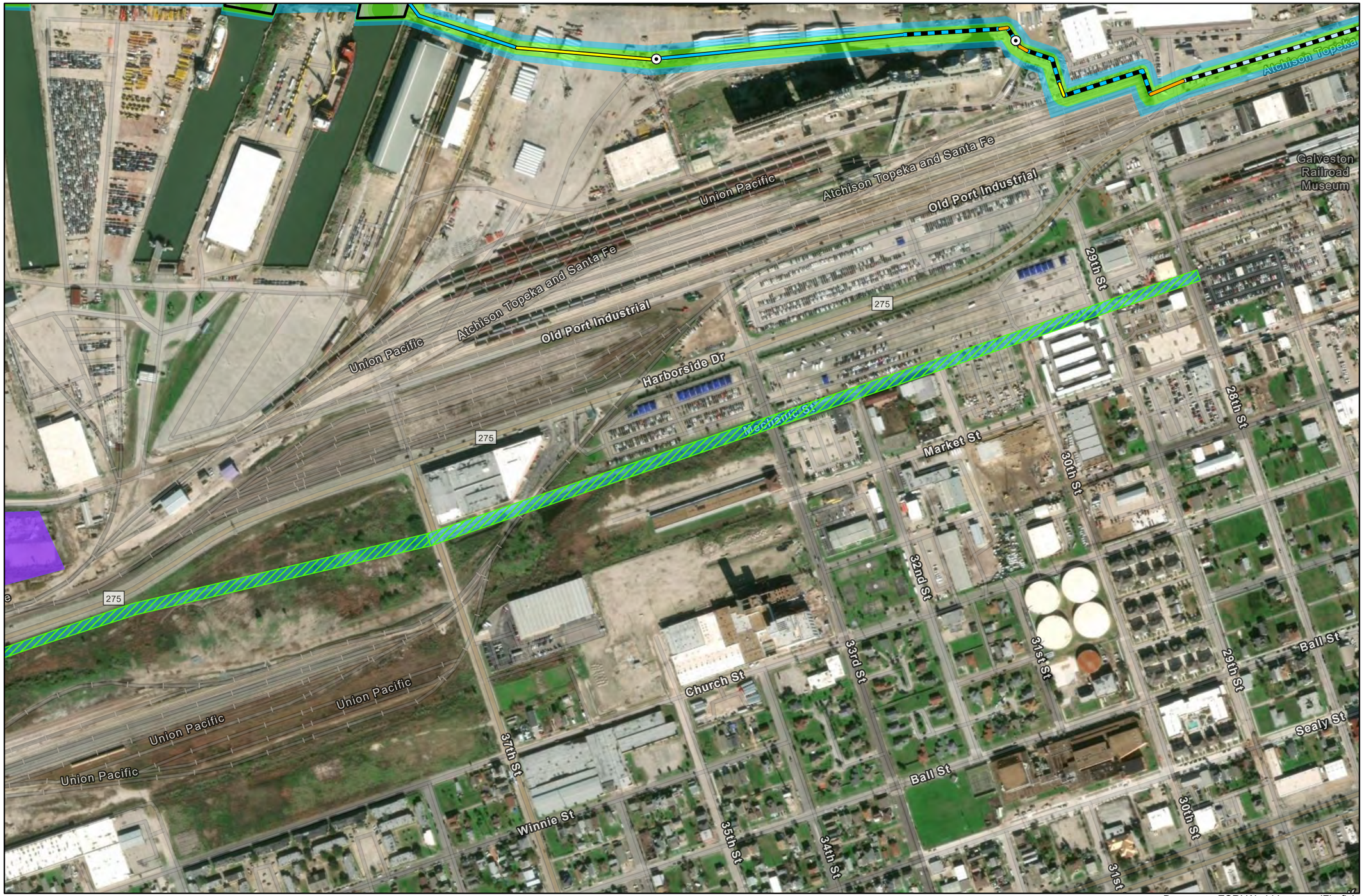

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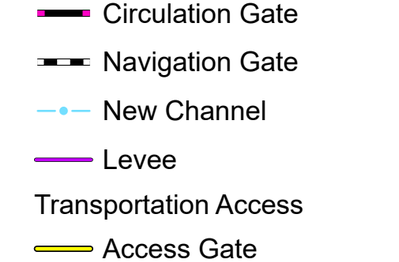

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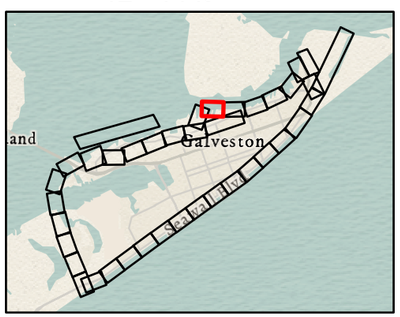

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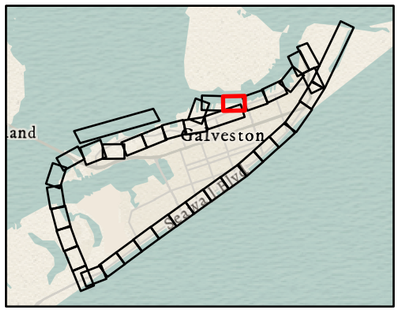

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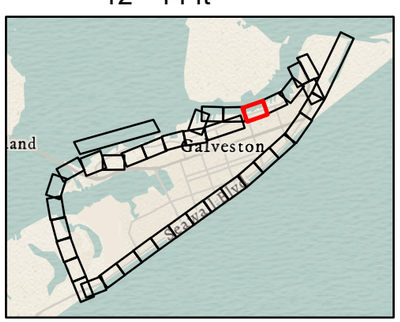

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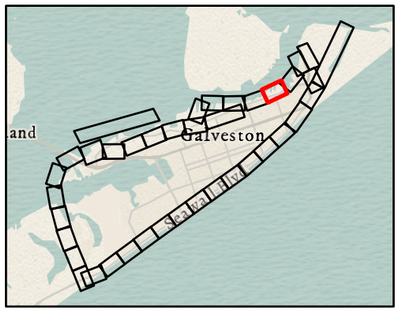

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US Army Corps of Engineers ®
Galveston District

TEXAS GENERAL LAND OFFICE
ESTABLISHED 1836

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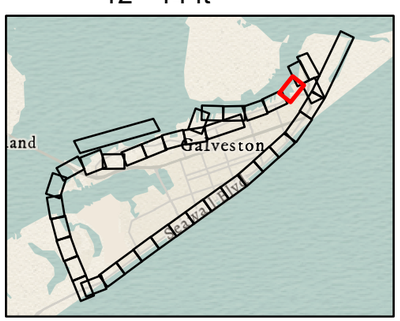

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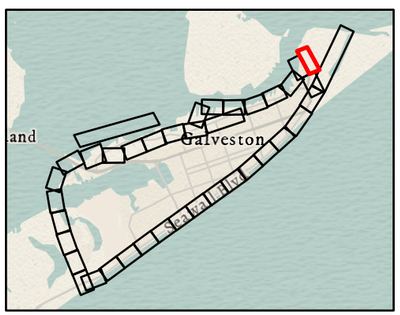

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- Road Closure

Floodwall

Aprrox. Stick Up Height

- 0 - 2 ft
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- 6 - 8 ft
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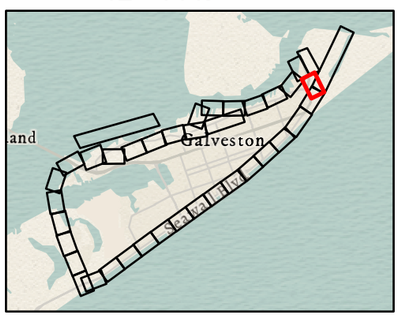

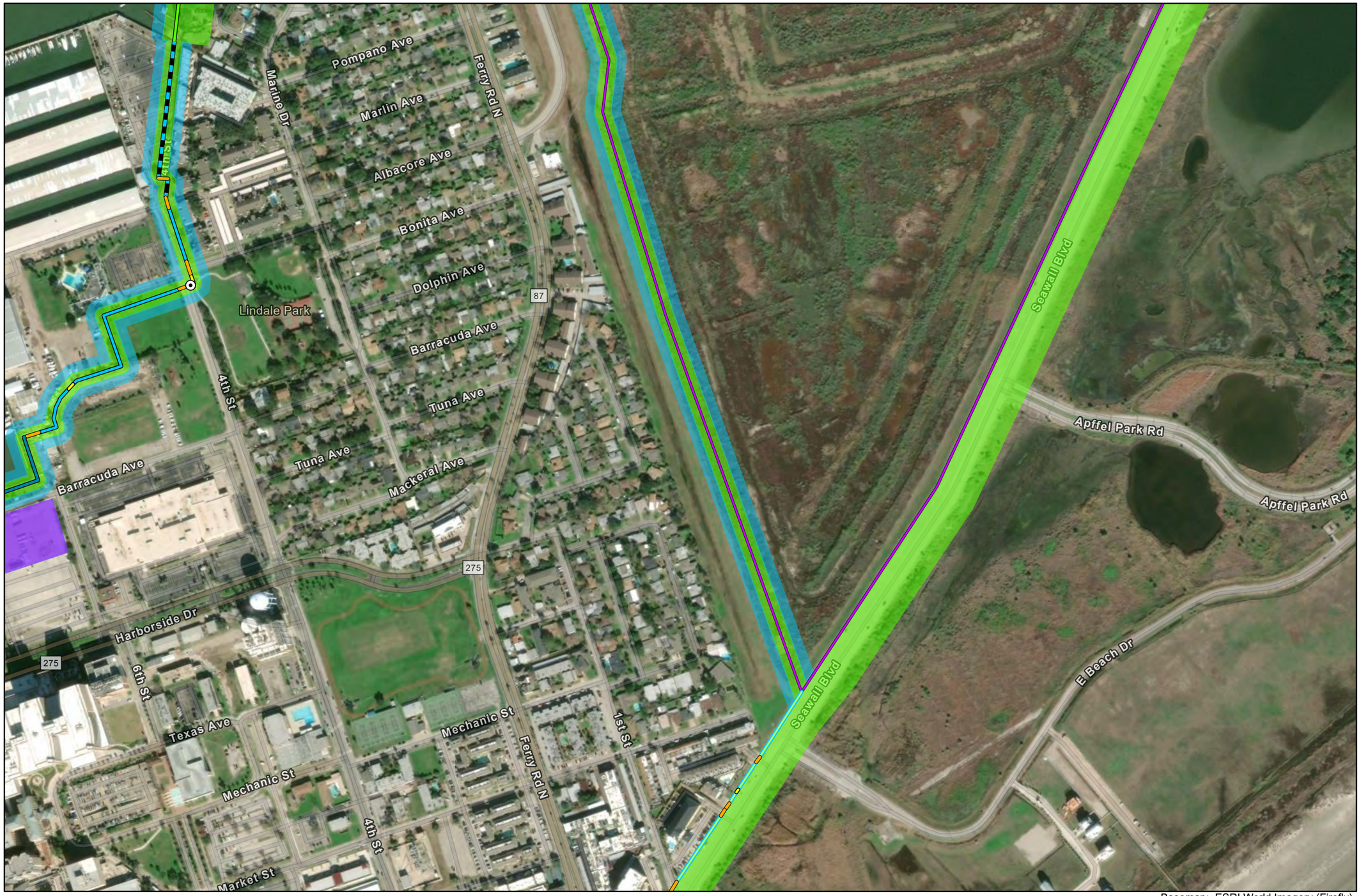

Basemap: ESRI World Imagery (Firefly)

US Army Corps of Engineers ®
Galveston District

- Drainage Mitigation
- Elevated Roadway
- Nonstructural Improvements
- Pump Station
- Breakwater
- Cofferdam
- Temporary Staging
- Temporary Easement
- Permanent Easement

N W E S

DATUM: NAD 1983
PROJECTION: STATE PLANE
ZONE: TX-SC 4204

0 250 500 Feet

Date: 29 April 2020

Coastal Texas Protection and Restoration Feasibility Study

City of Galveston Ring Barrier

- Drainage Structure
- Combiwall
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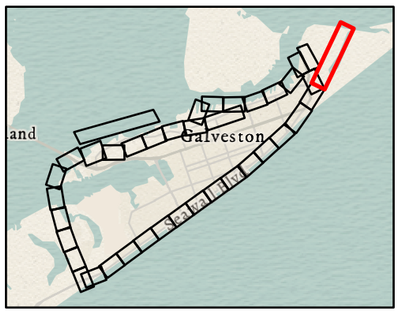

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US Army Corps of Engineers ®
Galveston District

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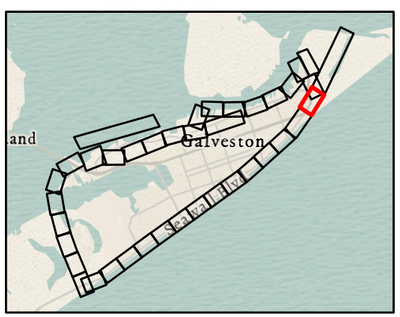

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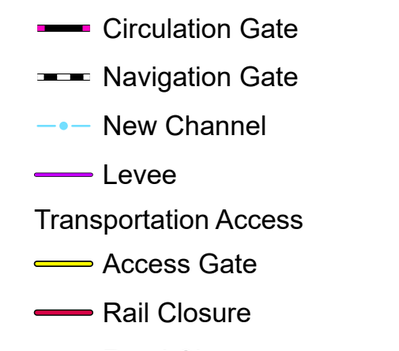

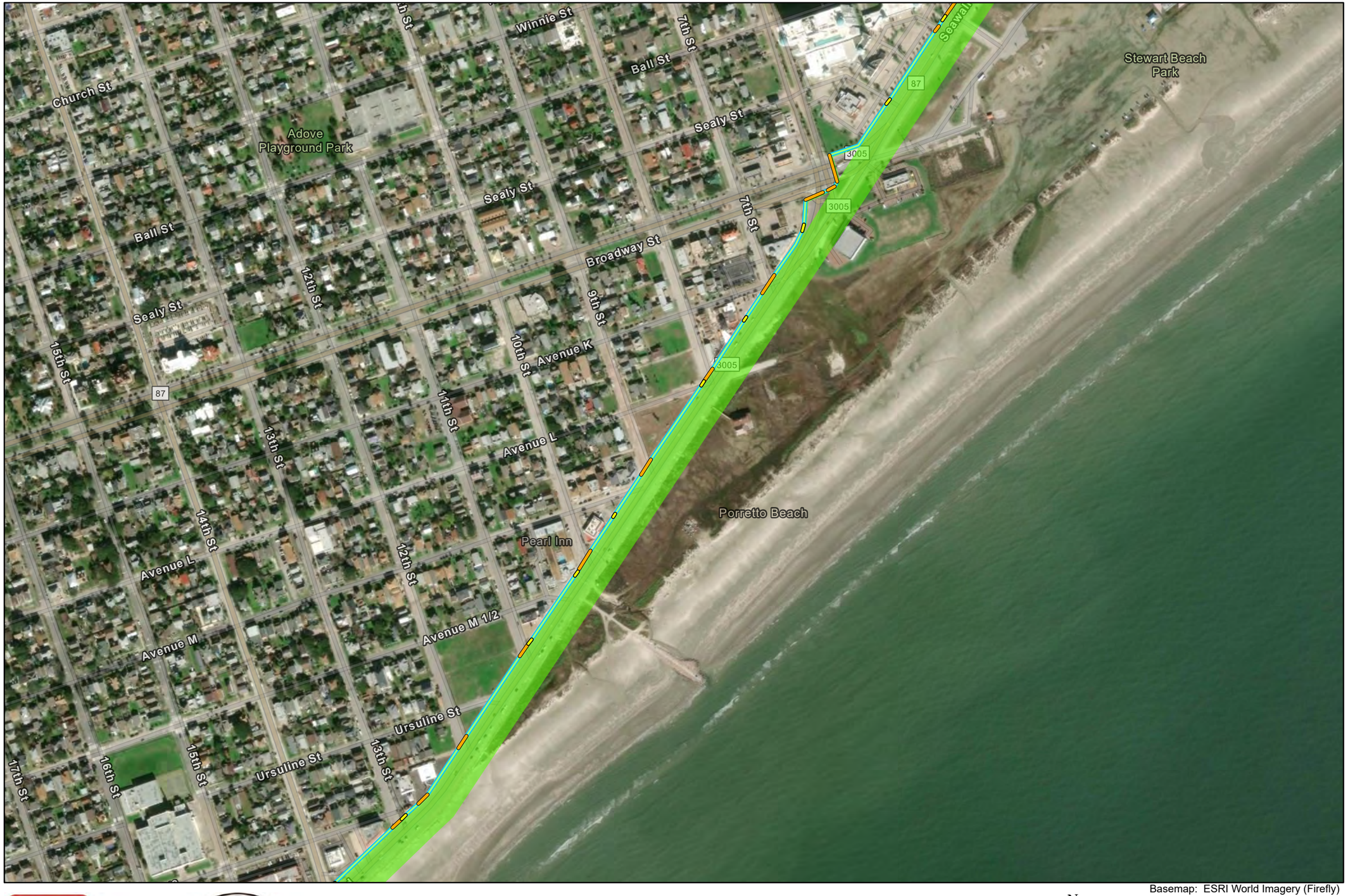

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US Army Corps of Engineers ®
Galveston District

TEXAS GENERAL LAND OFFICE ESTABLISHED 1836

- Drainage Mitigation
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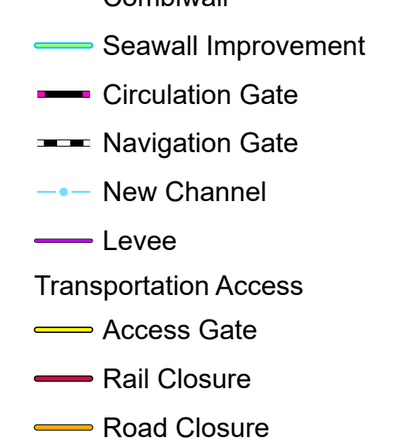

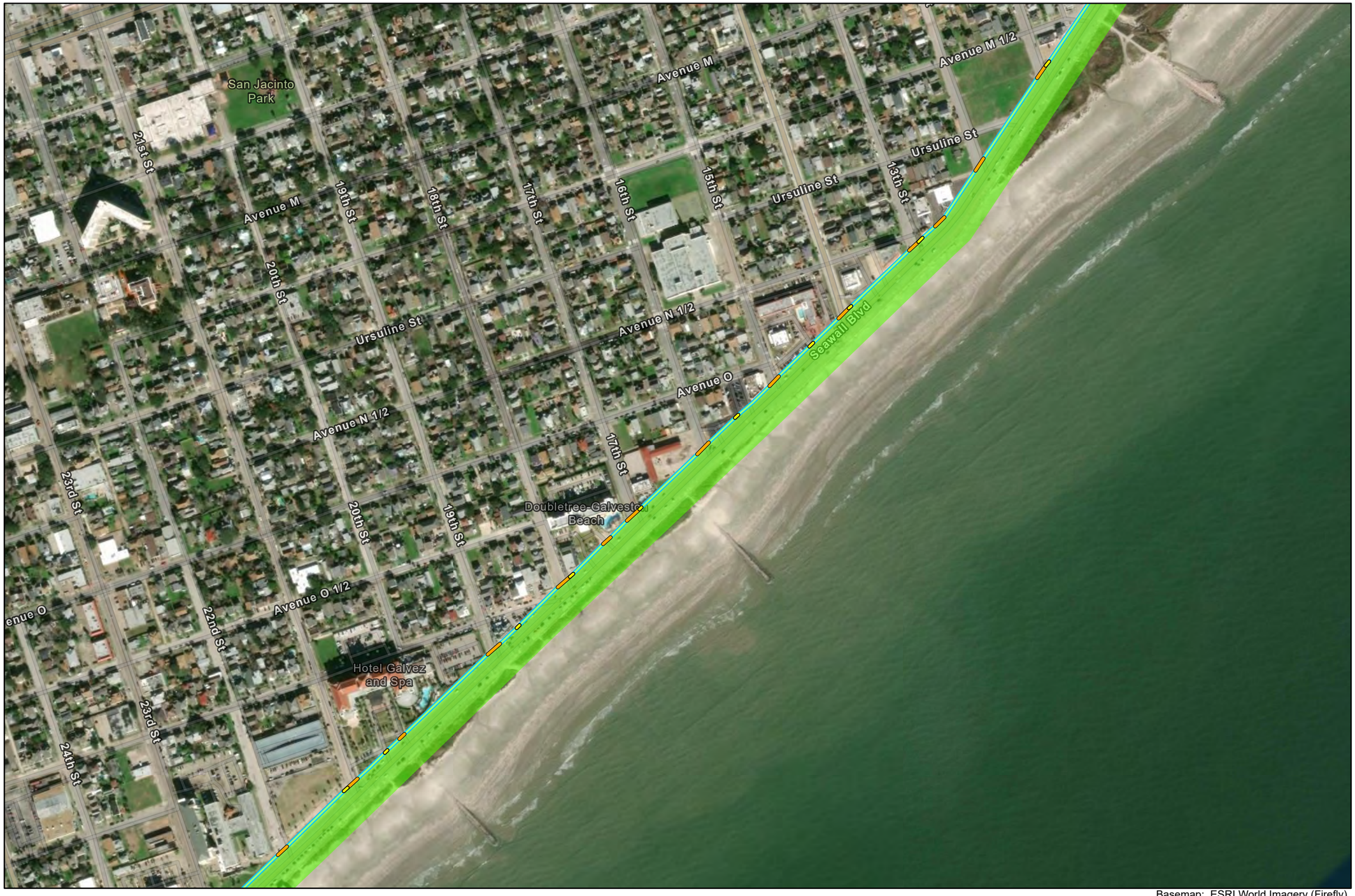

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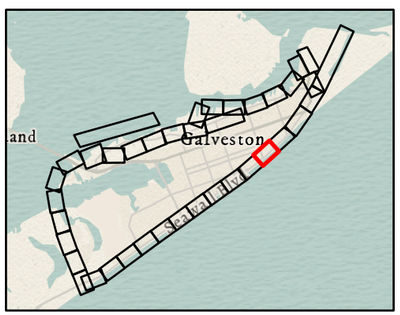

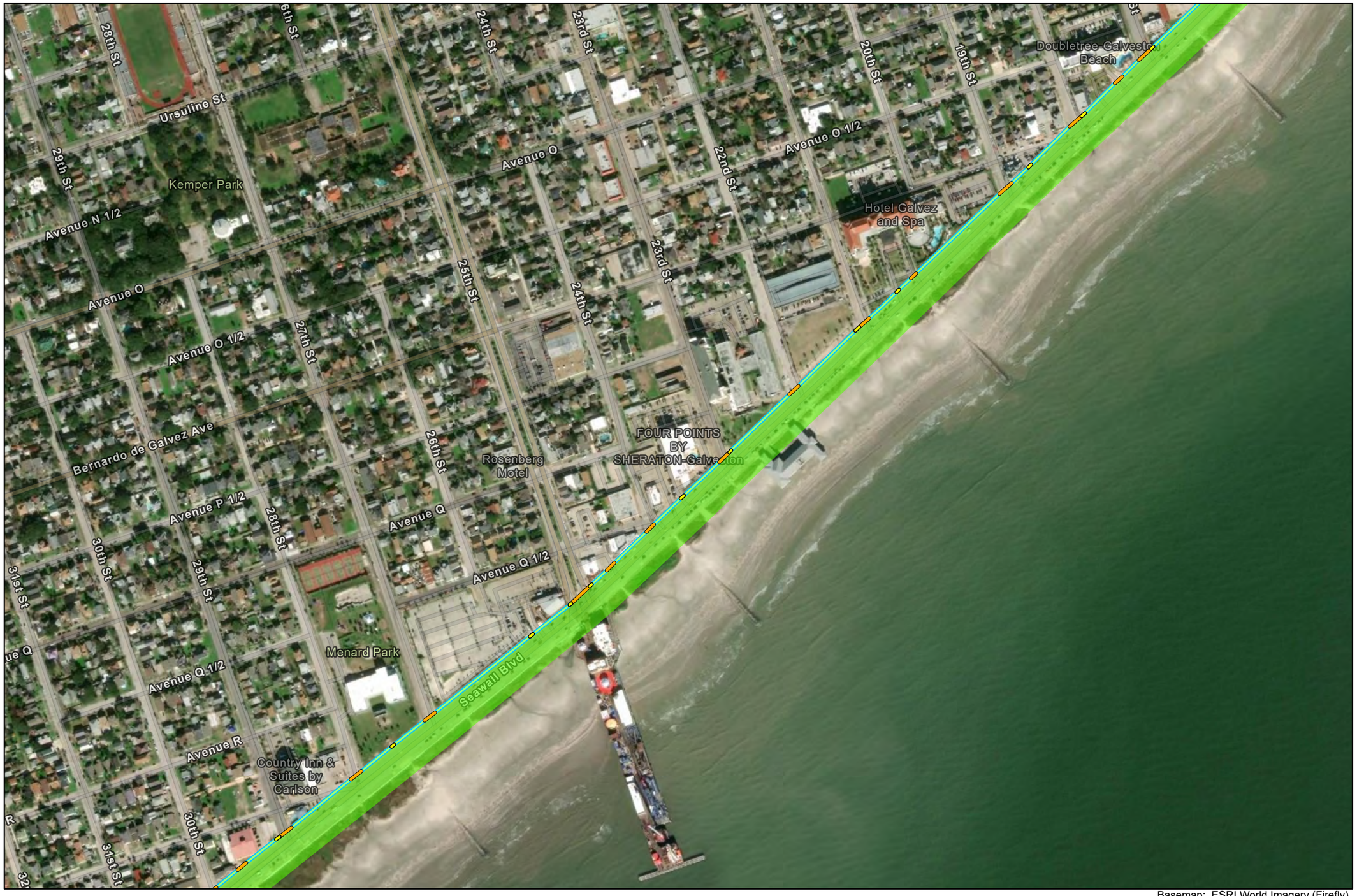

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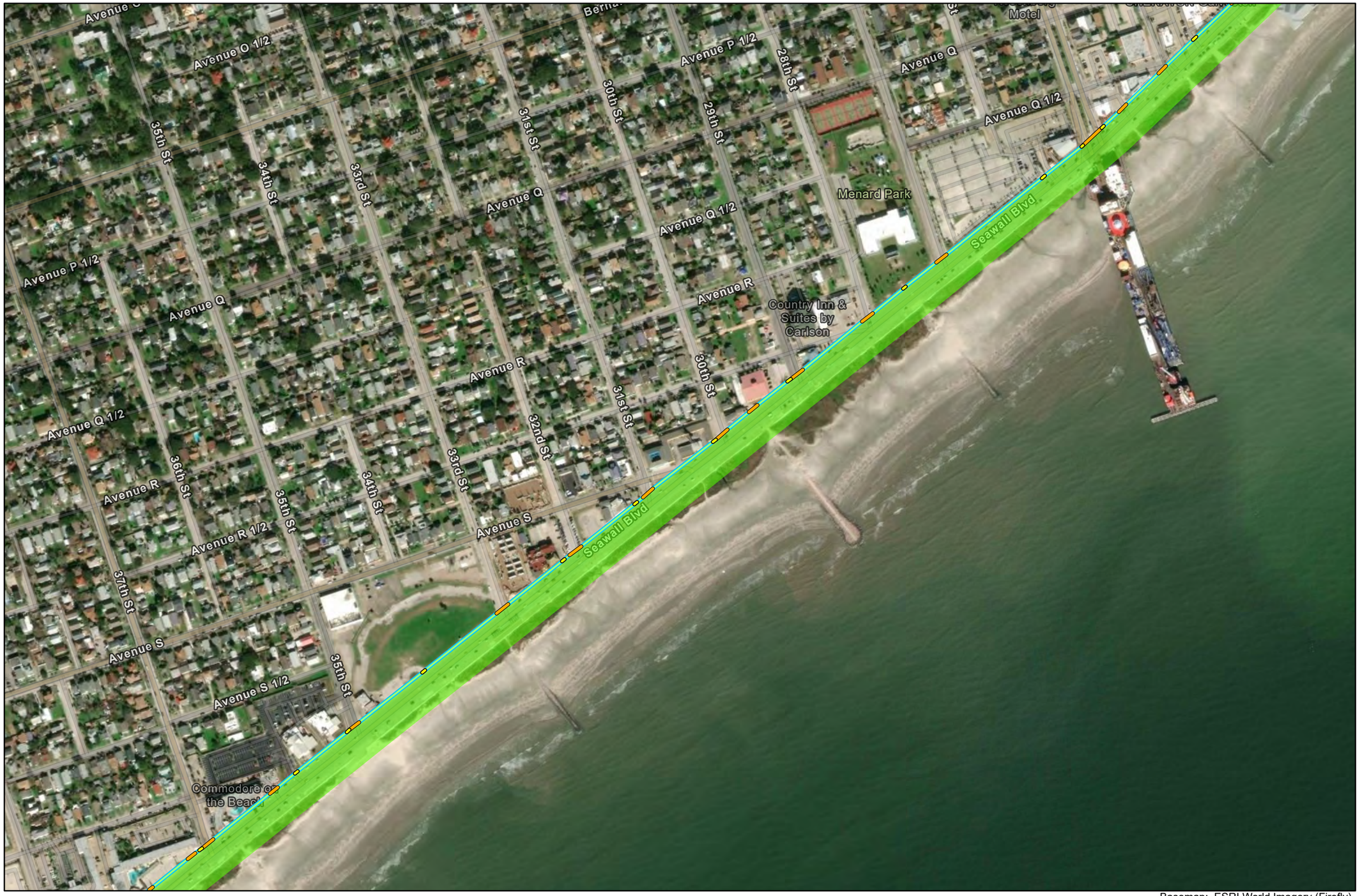

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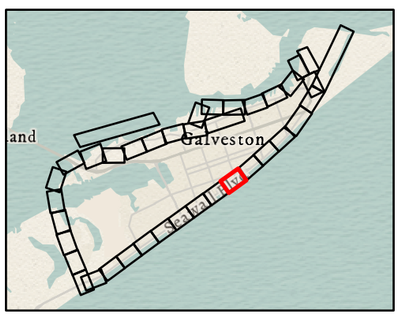

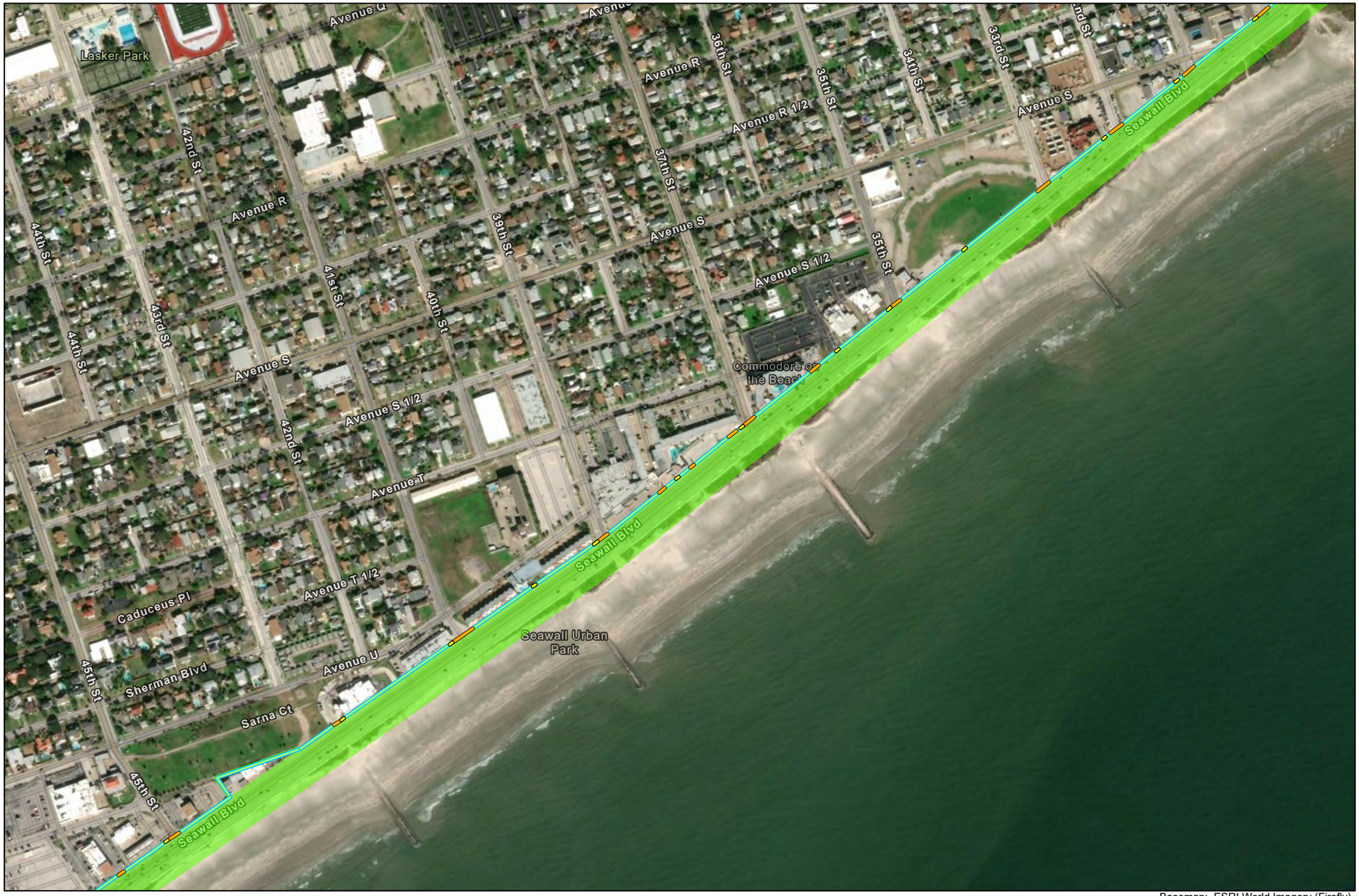

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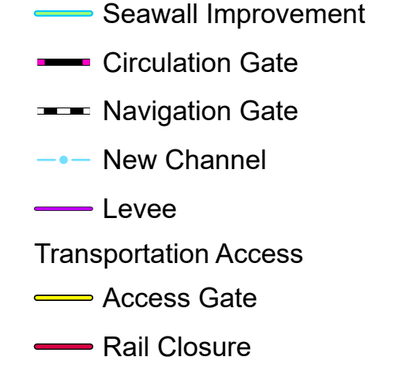

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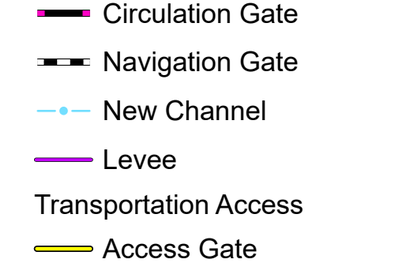

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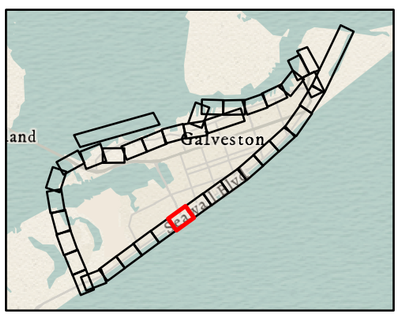

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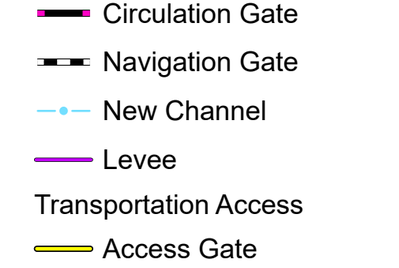

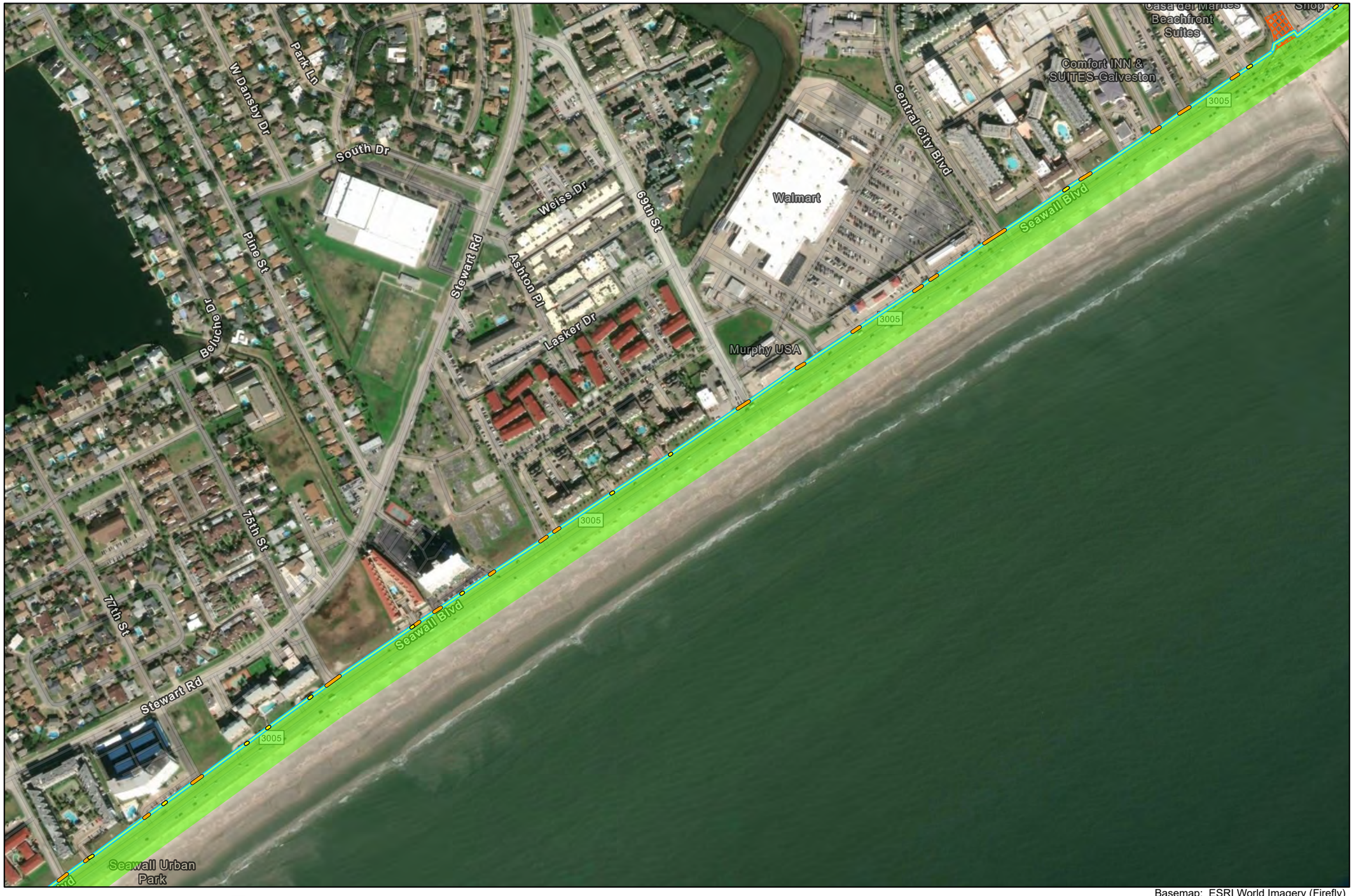

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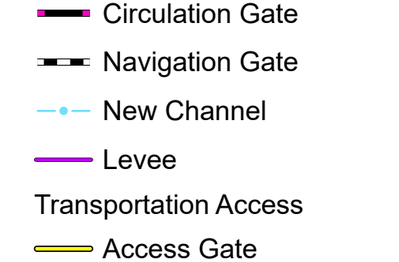

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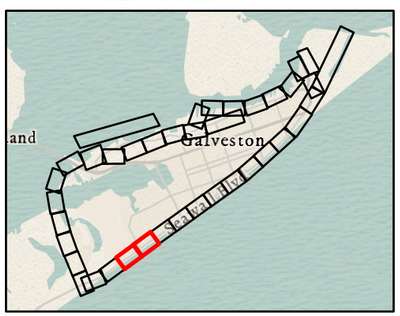

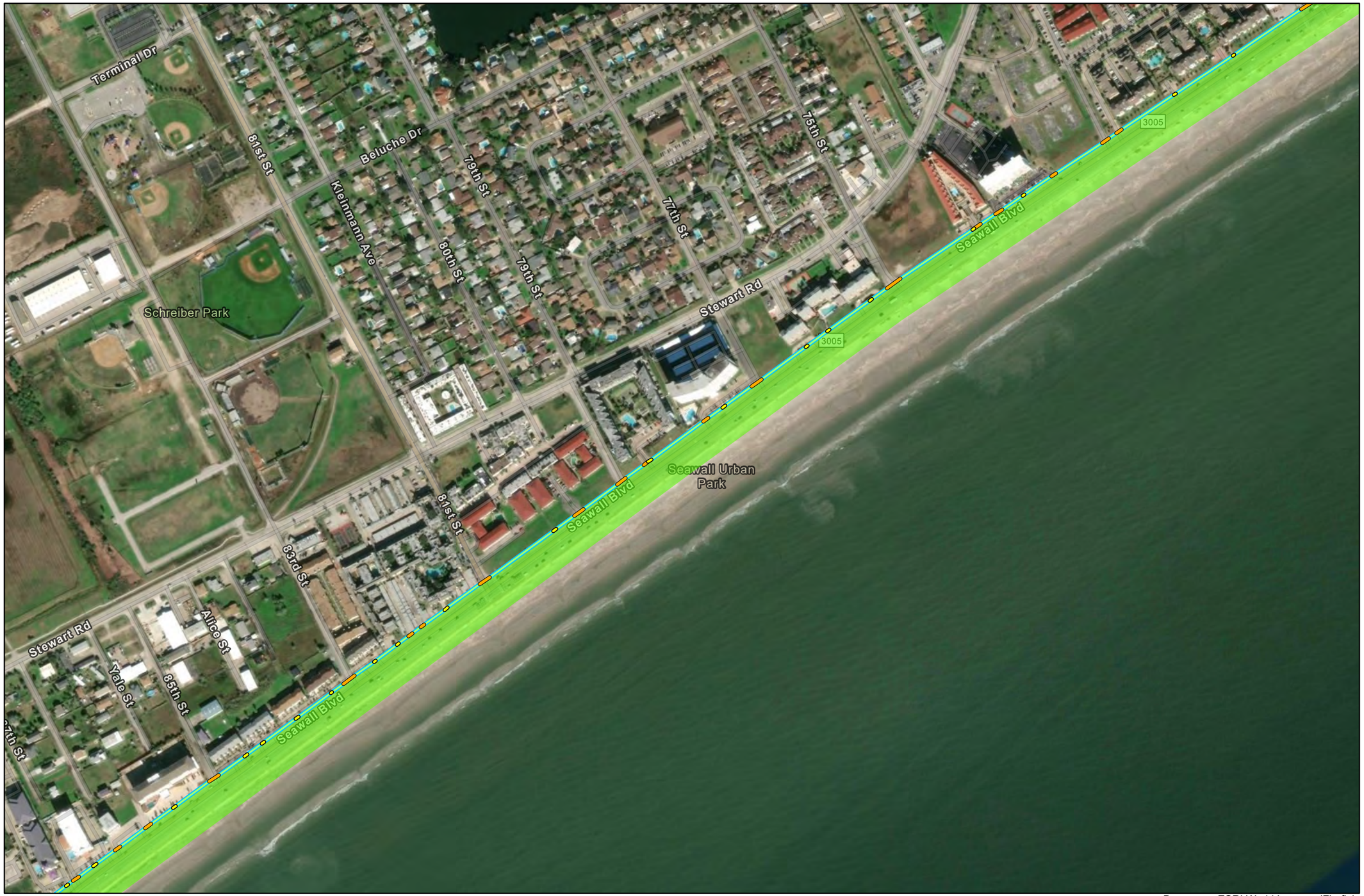

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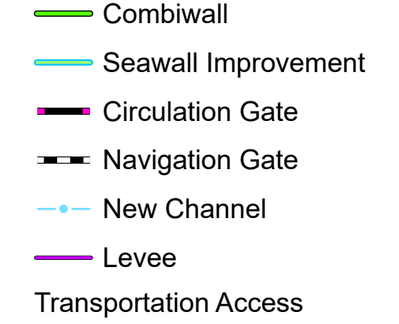

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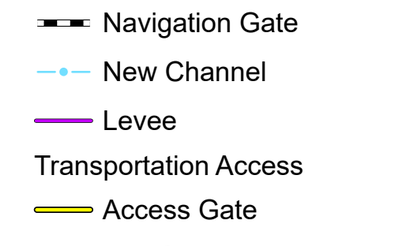

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Attachment B

Official Species List Request

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
Phone: (281) 286-8282 Fax: (281) 488-5882
http://www.fws.gov/southwest/es/TexasCoastal/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

In Reply Refer To: January 03, 2020
Consultation Code: 02ETTX00-2020-SLI-0666
Event Code: 02ETTX00-2020-E-01360
Project Name: Coastal Texas Protection and Restoration Study - ER - G-28

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The U.S. Fish and Wildlife Service (Service) field offices in Clear Lake, Tx, and Corpus Christi, Tx, have combined administratively to form the Texas Coastal Ecological Services Field Office. A map of the Texas Coastal Ecological Services Field Office area of responsibility can be found at: http://www.fws.gov/southwest/es/TexasCoastal/Map.html. All project related correspondence should be sent to the field office responsible for the area in which your project occurs. For projects located in southeast Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; 17629 El Camino Real Ste. 211; Houston, Texas 77058. For projects located in southern Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; P.O. Box 81468; Corpus Christi, Texas 78468-1468. For projects located in six counties in southern Texas (Cameron, Hidalgo, Starr, Webb, Willacy, and Zapata) please write: Santa Ana NWR, ATTN: Ecological Services Sub Office, 3325 Green Jay Road, Alamo, Texas 78516.

The enclosed species list identifies federally threatened, endangered, and proposed to be listed species; designated critical habitat; and candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project.

New information from updated surveys, changes in the abundance and distribution of species, changes in habitat conditions, or other factors could change the list. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the ECOS-IPaC website http://ecos.fws.gov/ipac/ at regular intervals during project planning and implementation for updates to species list and information. An updated list may be

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Section 7

Section 7 of the Act requires that all Federal agencies consult with the Service to ensure that actions authorized, funded or carried out by such agencies do not jeopardize the continued existence of any listed threatened or endangered species or adversely modify or destroy critical habitat of such species. It is the responsibility of the Federal action agency to determine if the proposed project may affect threatened or endangered species. If a "may affect" determination is made, the Federal agency shall initiate the section 7 consultation process by writing to the office that has responsibility for the area in which your project occurs.

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Section 10

If there is no federal involvement and the proposed project is being funded or carried out by private interests and/or non-federal government agencies, and the project as proposed may affect listed species, a section 10(a)(1)(B) permit is recommended. The Habitat Conservation Planning Handbook is available at: http://www.fws.gov/endangered/esa-library/pdf/HCP_Handbook.pdf

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We request that you provide us with the final location and specifications of your proposed towers, as well as the recommendations implemented. A Tower Site Evaluation Form is also available via the above website; we recommend you complete this form and keep it in your files. If meteorological towers are to be constructed, please forward this completed form to our office.

More information concerning sections 7 and 10 of the Act, migratory birds, candidate species, and landowner tools can be found on our website at: http://www.fws.gov/southwest/es/TexasCoastal/ProjectReviews.html.

Wetlands and Wildlife Habitat

Wetlands and riparian zones provide valuable fish and wildlife habitat as well as contribute to flood control, water quality enhancement, and groundwater recharge. Wetland and riparian vegetation provides food and cover for wildlife, stabilizes banks and decreases soil erosion. These areas are inherently dynamic and very sensitive to changes caused by such activities as overgrazing, logging, major construction, or earth disturbance. Executive Order 11990 asserts that each agency shall provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial value of wetlands in carrying out the agency's responsibilities. Construction activities near riparian zones should be carefully designed to minimize impacts. If vegetation clearing is needed in these riparian areas, they should be re-vegetated with native wetland and riparian vegetation to prevent erosion or loss of habitat. We recommend minimizing the area of soil scarification and initiating incremental re-establishment of herbaceous vegetation at the proposed work sites. Denuded and/or disturbed areas should be re-vegetated with a mixture of native legumes and grasses. Species commonly used for soil stabilization are listed in the Texas Department of Agriculture's (TDA) Native Tree and Plant Directory, available from TDA at P.O. Box 12847, Austin, Texas 78711. The Service also urges taking precautions to ensure sediment loading does not occur to any receiving streams in the proposed project area. To prevent and/or minimize soil erosion and compaction associated with construction activities, avoid any unnecessary clearing of vegetation, and follow established rights-of-way whenever possible. All machinery and petroleum products should be stored outside the floodplain and/or wetland area during construction to prevent possible contamination of water and soils.

Wetlands and riparian areas are high priority fish and wildlife habitat, serving as important sources of food, cover, and shelter for numerous species of resident and migratory wildlife. Waterfowl and other migratory birds use wetlands and riparian corridors as stopover, feeding, and nesting areas. We strongly recommend that the selected project site not impact wetlands and riparian areas, and be located as far as practical from these areas. Migratory birds tend to concentrate in or near wetlands and riparian areas and use these areas as migratory flyways or corridors. After every effort has been made to avoid impacting wetlands, you anticipate unavoidable wetland impacts will occur; you should contact the appropriate U.S. Army Corps of Engineers office to determine if a permit is necessary prior to commencement of construction activities.

If your project will involve filling, dredging, or trenching of a wetland or riparian area it may require a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (COE). For permitting requirements please contact the U.S. Corps of Engineers, District Engineer, P.O. Box 1229, Galveston, Texas 77553-1229, (409) 766-3002.

Beneficial Landscaping

In accordance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping (42 C.F.R. 26961), where possible, any landscaping associated with project plans should be limited to seeding and replanting with native species. A mixture of grasses and forbs appropriate to address potential erosion problems and long-term cover should be planted when seed is reasonably available. Although Bermuda grass is listed in seed mixtures, this species and other introduced species should be avoided as much as possible. The Service also recommends the use of native trees, shrubs, and herbaceous species that are adaptable, drought tolerant and conserve water.

State Listed Species

The State of Texas protects certain species. Please contact the Texas Parks and Wildlife Department (Endangered Resources Branch), 4200 Smith School Road, Austin, Texas 78744 (telephone 512/389-8021) for information concerning fish, wildlife, and plants of State concern or visit their website at: http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/listed_species/.

If we can be of further assistance, or if you have any questions about these comments, please contact 281/286-8282 if your project is in southeast Texas, or 361/994-9005, ext. 246, if your project is in southern Texas. Please refer to the Service consultation number listed above in any future correspondence regarding this project.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
(281) 286-8282

Project Summary

Consultation Code: 02ETTX00-2020-SLI-0666

Event Code: 02ETTX00-2020-E-01360

Project Name: Coastal Texas Protection and Restoration Study - ER - G-28

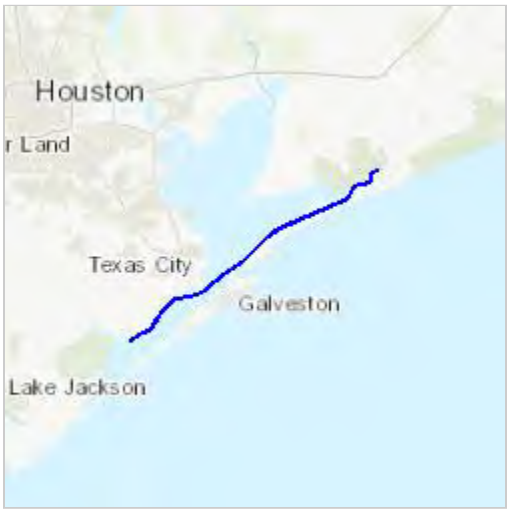
Project Type: LAND - RESTORATION / ENHANCEMENT

Project Description: Measure G-28 – Bolivar Peninsula and West Bay GIWW Shoreline and Island Protection
Project Description. Install breakwaters and restore marsh habitat to protect 27 miles of marsh habitat along the
GIWW on Bolivar Peninsula and 9 miles of shoreline along the north shore of West Bay. Use sediment to
restore, create, and/or enhance islands adjacent to the GIWW to protect 5 miles of shoreline habitat along the
north shore of West Bay, which is eroding. Subsequently in the future, based on RSLR, renourish 6,891 acres
of marsh identified as “unconsolidated shore” using the NOAA (2017a) marsh migration layer.
Project Benefits. Breakwaters are a proven method to greatly reduce, and sometimes reverse, the loss of marsh
habitat that erodes along the GIWW due to barge wakes. The shoreline and marshes in these areas would be
restored and protected from storm surge and erosion. Beyond the ecological lift just described, this project also
could reduce maintenance dredging of the GIWW.
FWOP If the habitat along the shoreline is not protected, approximately 18,000 acres of existing intertidal to
high marsh along the south shore of the GIWW through Bolivar Peninsula and the north shore of West Bay
would be inundated at a RSLR of 3 feet (NOAA, 2017a). This marsh habitat also serves as a buffer from some
storm impacts to area infrastructure.
Ancillary benefits can be expected when the ecological habitat is restored in this way. Aside from the ecological
loss when sediment is lost from the marsh, the accumulation in the GIWW increases shoaling and maintenance
dredging frequency. The increased width of open water in the GIWW due to the loss of marsh and the erosion of the islands adjacent to the GIWW can change the waves and currents and accelerate erosion. These factors can negatively impact navigation.
Protecting the bay shoreline of Bolivar Peninsula reduces the likelihood it

will breach to the Gulf since, at 3 feet
of RSLR, portions of the peninsula may narrow to less than 2,000 feet wide. Breaching can increase salinities
in East Bay, which impact bay habitat.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/29.385775471870915N94.76730673832407W



Counties: Brazoria, TX | Chambers, TX | Galveston, TX

Endangered Species Act Species

There is a total of 10 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
West Indian Manatee *Trichechus manatus* There is **final** critical habitat for this species. Your location is outside the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4469	Threatened

Birds

NAME	STATUS
Attwater's Greater Prairie-chicken *Tympanuchus cupido attwateri* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7259	Endangered
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane *Grus americana* Population: Wherever found, except where listed as an experimental population There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/758	Endangered

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Critical habitats

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Piping Plover *Charadrius melodus* https://ecos.fws.gov/ecp/species/6039#crithab	Final

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
Phone: (281) 286-8282 Fax: (281) 488-5882
http://www.fws.gov/southwest/es/TexasCoastal/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

In Reply Refer To: December 30, 2019
Consultation Code: 02ETTX00-2020-SLI-0607
Event Code: 02ETTX00-2020-E-01235
Project Name: Coastal Texas Protection and Restoration Study - Ecosystem Restoration - B-2

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The U.S. Fish and Wildlife Service (Service) field offices in Clear Lake, Tx, and Corpus Christi, Tx, have combined administratively to form the Texas Coastal Ecological Services Field Office. A map of the Texas Coastal Ecological Services Field Office area of responsibility can be found at: http://www.fws.gov/southwest/es/TexasCoastal/Map.html. All project related correspondence should be sent to the field office responsible for the area in which your project occurs. For projects located in southeast Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; 17629 El Camino Real Ste. 211; Houston, Texas 77058. For projects located in southern Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; P.O. Box 81468; Corpus Christi, Texas 78468-1468. For projects located in six counties in southern Texas (Cameron, Hidalgo, Starr, Webb, Willacy, and Zapata) please write: Santa Ana NWR, ATTN: Ecological Services Sub Office, 3325 Green Jay Road, Alamo, Texas 78516.

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More information concerning sections 7 and 10 of the Act, migratory birds, candidate species, and landowner tools can be found on our website at: http://www.fws.gov/southwest/es/TexasCoastal/ProjectReviews.html.

Wetlands and Wildlife Habitat

Wetlands and riparian zones provide valuable fish and wildlife habitat as well as contribute to flood control, water quality enhancement, and groundwater recharge. Wetland and riparian vegetation provides food and cover for wildlife, stabilizes banks and decreases soil erosion. These areas are inherently dynamic and very sensitive to changes caused by such activities as overgrazing, logging, major construction, or earth disturbance. Executive Order 11990 asserts that each agency shall provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial value of wetlands in carrying out the agency's responsibilities. Construction activities near riparian zones should be carefully designed to minimize impacts. If vegetation clearing is needed in these riparian areas, they should be re-vegetated with native wetland and riparian vegetation to prevent erosion or loss of habitat. We recommend minimizing the area of soil scarification and initiating incremental re-establishment of herbaceous vegetation at the proposed work sites. Denuded and/or disturbed areas should be re-vegetated with a mixture of native legumes and grasses. Species commonly used for soil stabilization are listed in the Texas Department of Agriculture's (TDA) Native Tree and Plant Directory, available from TDA at P.O. Box 12847, Austin, Texas 78711. The Service also urges taking precautions to ensure sediment loading does not occur to any receiving streams in the proposed project area. To prevent and/or minimize soil erosion and compaction associated with construction activities, avoid any unnecessary clearing of vegetation, and follow established rights-of-way whenever possible. All machinery and petroleum products should be stored outside the floodplain and/or wetland area during construction to prevent possible contamination of water and soils.

Wetlands and riparian areas are high priority fish and wildlife habitat, serving as important sources of food, cover, and shelter for numerous species of resident and migratory wildlife. Waterfowl and other migratory birds use wetlands and riparian corridors as stopover, feeding, and nesting areas. We strongly recommend that the selected project site not impact wetlands and riparian areas, and be located as far as practical from these areas. Migratory birds tend to concentrate in or near wetlands and riparian areas and use these areas as migratory flyways or corridors. After every effort has been made to avoid impacting wetlands, you anticipate unavoidable wetland impacts will occur; you should contact the appropriate U.S. Army Corps of Engineers office to determine if a permit is necessary prior to commencement of construction activities.

If your project will involve filling, dredging, or trenching of a wetland or riparian area it may require a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (COE). For permitting requirements please contact the U.S. Corps of Engineers, District Engineer, P.O. Box 1229, Galveston, Texas 77553-1229, (409) 766-3002.

Beneficial Landscaping

In accordance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping (42 C.F.R. 26961), where possible, any landscaping associated with project plans should be limited to seeding and replanting with native species. A mixture of grasses and forbs appropriate to address potential erosion problems and long-term cover should be planted when seed is reasonably available. Although Bermuda grass is listed in seed mixtures, this species and other introduced species should be avoided as much as possible. The Service also recommends the use of native trees, shrubs, and herbaceous species that are adaptable, drought tolerant and conserve water.

State Listed Species

The State of Texas protects certain species. Please contact the Texas Parks and Wildlife Department (Endangered Resources Branch), 4200 Smith School Road, Austin, Texas 78744 (telephone 512/389-8021) for information concerning fish, wildlife, and plants of State concern or visit their website at: http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/listed_species/.

If we can be of further assistance, or if you have any questions about these comments, please contact 281/286-8282 if your project is in southeast Texas, or 361/994-9005, ext. 246, if your project is in southern Texas. Please refer to the Service consultation number listed above in any future correspondence regarding this project.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
(281) 286-8282

Project Summary

Consultation Code: 02ETTX00-2020-SLI-0607

Event Code: 02ETTX00-2020-E-01235

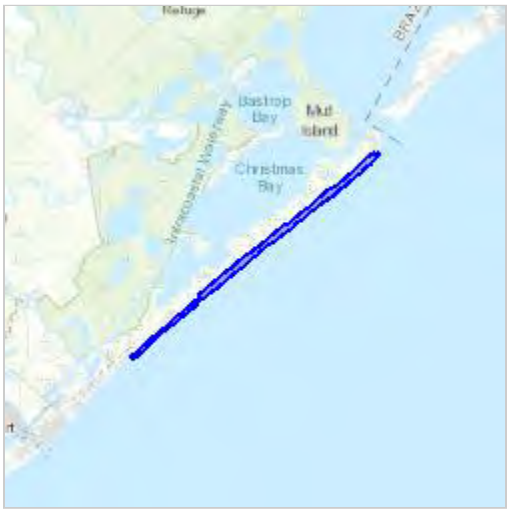
Project Name: Coastal Texas Protection and Restoration Study - Ecosystem Restoration - B-2

Project Type: LAND - RESTORATION / ENHANCEMENT

Project Description: Gulf Beach and Dune Restoration – Follets Island (S2G Measure 5-11), Brazoria County: The plan would also restore and/or enhance beach and dune complex on approximately 10 miles of Gulf shoreline on Follets Island in Brazoria County. A total of 1,113.8 acres would be restored, created, protected, and/or enhanced by placing 8.7 million cy of beach fill from an offshore source.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/29.023231677277856N95.19087585808875W



Counties: Brazoria, TX

Endangered Species Act Species

There is a total of 9 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
West Indian Manatee *Trichechus manatus* There is **final** critical habitat for this species. Your location is outside the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4469	Threatened

Birds

NAME	STATUS
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane *Grus americana* Population: Wherever found, except where listed as an experimental population There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/758	Endangered

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
Phone: (281) 286-8282 Fax: (281) 488-5882
http://www.fws.gov/southwest/es/TexasCoastal/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

In Reply Refer To: December 30, 2019
Consultation Code: 02ETTX00-2020-SLI-0608
Event Code: 02ETTX00-2020-E-01237
Project Name: Coastal Texas Protection and Restoration Study - Ecosystem Restoration - B-12

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The U.S. Fish and Wildlife Service (Service) field offices in Clear Lake, Tx, and Corpus Christi, Tx, have combined administratively to form the Texas Coastal Ecological Services Field Office. A map of the Texas Coastal Ecological Services Field Office area of responsibility can be found at: http://www.fws.gov/southwest/es/TexasCoastal/Map.html. All project related correspondence should be sent to the field office responsible for the area in which your project occurs. For projects located in southeast Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; 17629 El Camino Real Ste. 211; Houston, Texas 77058. For projects located in southern Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; P.O. Box 81468; Corpus Christi, Texas 78468-1468. For projects located in six counties in southern Texas (Cameron, Hidalgo, Starr, Webb, Willacy, and Zapata) please write: Santa Ana NWR, ATTN: Ecological Services Sub Office, 3325 Green Jay Road, Alamo, Texas 78516.

The enclosed species list identifies federally threatened, endangered, and proposed to be listed species; designated critical habitat; and candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project.

New information from updated surveys, changes in the abundance and distribution of species, changes in habitat conditions, or other factors could change the list. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the ECOS-IPaC website http://ecos.fws.gov/ipac/ at regular intervals during project planning and implementation for updates to species list and information. An updated list may be

requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

Candidate species have no protection under the Act but are included for consideration because they could be listed prior to the completion of your project. The other species information should help you determine if suitable habitat for these listed species exists in any of the proposed project areas or if project activities may affect species on-site, off-site, and/or result in "take" of a federally listed species.

"Take" is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. In addition to the direct take of an individual animal, habitat destruction or modification can be considered take, regardless of whether it has been formally designated as critical habitat, if the activity results in the death or injury of wildlife by removing essential habitat components or significantly alters essential behavior patterns, including breeding, feeding, or sheltering.

Section 7

Section 7 of the Act requires that all Federal agencies consult with the Service to ensure that actions authorized, funded or carried out by such agencies do not jeopardize the continued existence of any listed threatened or endangered species or adversely modify or destroy critical habitat of such species. It is the responsibility of the Federal action agency to determine if the proposed project may affect threatened or endangered species. If a "may affect" determination is made, the Federal agency shall initiate the section 7 consultation process by writing to the office that has responsibility for the area in which your project occurs.

Is not likely to adversely affect - the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effects. The Federal agency or the designated non-Federal representative should seek written concurrence from the Service that adverse effects have been eliminated. Be sure to include all of the information and documentation used to reach your decision with your request for concurrence. The Service must have this documentation before issuing a concurrence.

Is likely to adversely affect - adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. If the overall effect of the proposed action is beneficial to the listed species but also is likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species. An "is likely to adversely affect" determination requires the Federal action agency to initiate formal section 7 consultation with this office.

No effect - the proposed action will not affect federally listed species or critical habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area). No further coordination or contact with the Service is necessary. However, if the

project changes or additional information on the distribution of listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered.

Regardless of your determination, the Service recommends that you maintain a complete record of the evaluation, including steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related articles.

Please be advised that while a Federal agency may designate a non-Federal representative to conduct informal consultations with the Service, assess project effects, or prepare a biological assessment, the Federal agency must notify the Service in writing of such a designation. The Federal agency shall also independently review and evaluate the scope and contents of a biological assessment prepared by their designated non-Federal representative before that document is submitted to the Service.

The Service's Consultation Handbook is available online to assist you with further information on definitions, process, and fulfilling Act requirements for your projects at: http://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf

Section 10

If there is no federal involvement and the proposed project is being funded or carried out by private interests and/or non-federal government agencies, and the project as proposed may affect listed species, a section 10(a)(1)(B) permit is recommended. The Habitat Conservation Planning Handbook is available at: http://www.fws.gov/endangered/esa-library/pdf/HCP_Handbook.pdf

Service Response

Please note that the Service strives to respond to requests for project review within 30 days of receipt, however, this time period is not mandated by regulation. Responses may be delayed due to workload and lack of staff. Failure to meet the 30-day timeframe does not constitute a concurrence from the Service that the proposed project will not have impacts to threatened and endangered species.

Proposed Species and/or Proposed Critical Habitat

While consultations are required when the proposed action may affect listed species, section 7(a)(4) was added to the ESA to provide a mechanism for identifying and resolving potential conflicts between a proposed action and proposed species or proposed critical habitat at an early planning stage. The action agency should seek conference from the Service to assist the action agency in determining effects and to advise the agency on ways to avoid or minimize adverse effect to proposed species or proposed critical habitat.

Candidate Species

Candidate species are species that are being considered for possible addition to the threatened and endangered species list. They currently have no legal protection under the ESA. If you find you have potential project impacts to these species the Service would like to provide technical

assistance to help avoid or minimize adverse effects. Addressing potential impacts to these species at this stage could better provide for overall ecosystem healh in the local area and ay avert potential future listing.

Several species of freshwater mussels occur in Texas and four are candidates for listing under the ESA. The Service is also reviewing the status of six other species for potential listing under the ESA. One of the main contributors to mussel die offs is sedimentation, which smothers and suffocates mussels. To reduce sedimentation within rivers, streams, and tributaries crossed by a project, the Service recommends that that you implement the best management practices found at: http://www.fws.gov/southwest/es/TexasCoastal/FreshwaterMussels.html.

Candidate Conservation Agreements (CCAs) or Candidate Conservation Agreements with Assurances (CCAAs) are voluntary agreements between the Service and public or private entities to implement conservation measures to address threats to candidate species. Implementing conservation efforts before species are listed increases the likelihood that simpler, flexible, and more cost-effective conservation options are available. A CCAA can provide participants with assurances that if they engage in conservation actions, they will not be required to implement additional conservation measures beyond those in the agreement. For additional information on CCAs/CCAAs please visit the Service's website at http://www.fws.gov/endangered/what-we-do/cca.html.

Migratory Birds

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions for the protection of migratory birds. Under the MBTA, taking, killing, or possessing migratory birds is unlawful. Many may nest in trees, brush areas or other suitable habitat. The Service recommends activities requiring vegetation removal or disturbance avoid the peak nesting period of March through August to avoid destruction of individuals or eggs. If project activities must be conducted during this time, we recommend surveying for active nests prior to commencing work. A list of migratory birds may be viewed at http://www.fws.gov/migratorybirds/regulationspolicies/mbta/mbtandx.html.

The bald eagle (*Haliaeetus leucocephalus*) was delisted under the Act on August 9, 2007. Both the bald eagle and the goden eagle (*Aquila chrysaetos*) are still protected under the MBTA and BGEPA. The BGEPA affords both eagles protection in addition to that provided by the MBTA, in particular, by making it unlawful to "disturb" eagles. Under the BGEPA, the Service may issue limited permits to incidentally "take" eagles (e.g., injury, interfering with normal breeding, feeding, or sheltering behavior nest abandonment). For more information on bald and golden eagle management guidlines, we recommend you review information provided at http://www.fws.gov/midwest/eagle/pdf/NationalBaldEagleManagementGuidelines.pdf.

The construction of overhead power lines creates threats of avian collision and electrocution. The Service recommends the installation of underground rather than overhead power lines whenever possible. For new overhead lines or retrofitting of old lines, we recommend that project

developers implement, to the maximum extent practicable, the Avian Power Line Interaction Committee guidelines found at http://www.aplic.org/.

Meteorological and communication towers are estimated to kill millions of birds per year. We recommend following the guidance set forth in the Service Interim Guidelines for Recommendations on Communications Tower Siting, Constructions, Operation and Decommissioning, found online at: http://www.fws.gov/habitatconservation/communicationtowers.html, to minimize the threat of avian mortality at these towers. Monitoring at these towers would provide insight into the effectiveness of the minimization measures. We request the results of any wildlife mortality monitoring at towers associated with this project.

We request that you provide us with the final location and specifications of your proposed towers, as well as the recommendations implemented. A Tower Site Evaluation Form is also available via the above website; we recommend you complete this form and keep it in your files. If meteorological towers are to be constructed, please forward this completed form to our office.

More information concerning sections 7 and 10 of the Act, migratory birds, candidate species, and landowner tools can be found on our website at: http://www.fws.gov/southwest/es/TexasCoastal/ProjectReviews.html.

Wetlands and Wildlife Habitat

Wetlands and riparian zones provide valuable fish and wildlife habitat as well as contribute to flood control, water quality enhancement, and groundwater recharge. Wetland and riparian vegetation provides food and cover for wildlife, stabilizes banks and decreases soil erosion. These areas are inherently dynamic and very sensitive to changes caused by such activities as overgrazing, logging, major construction, or earth disturbance. Executive Order 11990 asserts that each agency shall provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial value of wetlands in carrying out the agency's responsibilities. Construction activities near riparian zones should be carefully designed to minimize impacts. If vegetation clearing is needed in these riparian areas, they should be re-vegetated with native wetland and riparian vegetation to prevent erosion or loss of habitat. We recommend minimizing the area of soil scarification and initiating incremental re-establishment of herbaceous vegetation at the proposed work sites. Denuded and/or disturbed areas should be re-vegetated with a mixture of native legumes and grasses. Species commonly used for soil stabilization are listed in the Texas Department of Agriculture's (TDA) Native Tree and Plant Directory, available from TDA at P.O. Box 12847, Austin, Texas 78711. The Service also urges taking precautions to ensure sediment loading does not occur to any receiving streams in the proposed project area. To prevent and/or minimize soil erosion and compaction associated with construction activities, avoid any unnecessary clearing of vegetation, and follow established rights-of-way whenever possible. All machinery and petroleum products should be stored outside the floodplain and/or wetland area during construction to prevent possible contamination of water and soils.

Wetlands and riparian areas are high priority fish and wildlife habitat, serving as important sources of food, cover, and shelter for numerous species of resident and migratory wildlife. Waterfowl and other migratory birds use wetlands and riparian corridors as stopover, feeding, and nesting areas. We strongly recommend that the selected project site not impact wetlands and riparian areas, and be located as far as practical from these areas. Migratory birds tend to concentrate in or near wetlands and riparian areas and use these areas as migratory flyways or corridors. After every effort has been made to avoid impacting wetlands, you anticipate unavoidable wetland impacts will occur; you should contact the appropriate U.S. Army Corps of Engineers office to determine if a permit is necessary prior to commencement of construction activities.

If your project will involve filling, dredging, or trenching of a wetland or riparian area it may require a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (COE). For permitting requirements please contact the U.S. Corps of Engineers, District Engineer, P.O. Box 1229, Galveston, Texas 77553-1229, (409) 766-3002.

Beneficial Landscaping

In accordance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping (42 C.F.R. 26961), where possible, any landscaping associated with project plans should be limited to seeding and replanting with native species. A mixture of grasses and forbs appropriate to address potential erosion problems and long-term cover should be planted when seed is reasonably available. Although Bermuda grass is listed in seed mixtures, this species and other introduced species should be avoided as much as possible. The Service also recommends the use of native trees, shrubs, and herbaceous species that are adaptable, drought tolerant and conserve water.

State Listed Species

The State of Texas protects certain species. Please contact the Texas Parks and Wildlife Department (Endangered Resources Branch), 4200 Smith School Road, Austin, Texas 78744 (telephone 512/389-8021) for information concerning fish, wildlife, and plants of State concern or visit their website at: http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/listed_species/.

If we can be of further assistance, or if you have any questions about these comments, please contact 281/286-8282 if your project is in southeast Texas, or 361/994-9005, ext. 246, if your project is in southern Texas. Please refer to the Service consultation number listed above in any future correspondence regarding this project.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
(281) 286-8282

Project Summary

Consultation Code: 02ETTX00-2020-SLI-0608

Event Code: 02ETTX00-2020-E-01237

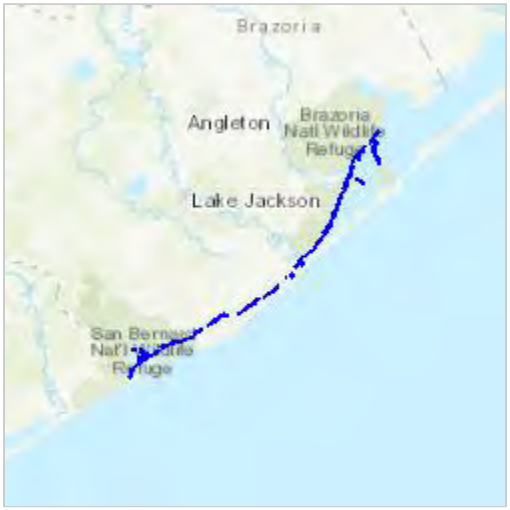
Project Name: Coastal Texas Protection and Restoration Study - Ecosystem Restoration - B-12

Project Type: LAND - RESTORATION / ENHANCEMENT

Project Description: In the bay complex of Bastrop Bay, Oyster Lake, Cowtrap Lakes, and the western side of West Bay, the plan would restore, create, and/or enhance critical areas of shoreline (Measure B-12). A total of 551 acres of estuarine marsh would be restored using an estimated 400,000 cy of fill material. A total of 43.2 miles of breakwaters would be placed on the western side of West Bay and Cowtrap Lakes, and along selected segments of the GIWW in Brazoria County. In the area of Oyster Lake, 3,708 linear feet of oyster reef or 0.17 acre of oyster reef would be created to prevent the lake from joining with West Bay. Also, subsequently in the future, the plan would, through future construction activities, would nourish 19,800 acres of marsh along the GIWW which is expected to be lost based on RSLR impacts.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/28.84709668741528N95.51688858981944W



Counties: Brazoria, TX | Matagorda, TX

Endangered Species Act Species

There is a total of 11 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
West Indian Manatee *Trichechus manatus* There is **final** critical habitat for this species. Your location is outside the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4469	Threatened

Birds

NAME	STATUS
Northern Aplomado Falcon *Falco femoralis septentrionalis* Population: Wherever found, except where listed as an experimental population No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1923	Endangered
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane *Grus americana* Population: Wherever found, except where listed as an experimental population There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/758	Endangered

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Clams

NAME	STATUS
Texas Fawnsfoot *Truncilla macrodon*	Candidate

No critical habitat has been designated for this species.

Species profile: https://ecos.fws.gov/ecp/species/8965

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
Phone: (281) 286-8282 Fax: (281) 488-5882
http://www.fws.gov/southwest/es/TexasCoastal/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

In Reply Refer To: December 30, 2019
Consultation Code: 02ETTX00-2020-SLI-0610
Event Code: 02ETTX00-2020-E-01241
Project Name: Coastal Texas Protection and Restoration Study - Ecosystem Restoration -CA5

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The U.S. Fish and Wildlife Service (Service) field offices in Clear Lake, Tx, and Corpus Christi, Tx, have combined administratively to form the Texas Coastal Ecological Services Field Office. A map of the Texas Coastal Ecological Services Field Office area of responsibility can be found at: http://www.fws.gov/southwest/es/TexasCoastal/Map.html. All project related correspondence should be sent to the field office responsible for the area in which your project occurs. For projects located in southeast Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; 17629 El Camino Real Ste. 211; Houston, Texas 77058. For projects located in southern Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; P.O. Box 81468; Corpus Christi, Texas 78468-1468. For projects located in six counties in southern Texas (Cameron, Hidalgo, Starr, Webb, Willacy, and Zapata) please write: Santa Ana NWR, ATTN: Ecological Services Sub Office, 3325 Green Jay Road, Alamo, Texas 78516.

The enclosed species list identifies federally threatened, endangered, and proposed to be listed species; designated critical habitat; and candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project.

New information from updated surveys, changes in the abundance and distribution of species, changes in habitat conditions, or other factors could change the list. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the ECOS-IPaC website http://ecos.fws.gov/ipac/ at regular intervals during project planning and implementation for updates to species list and information. An updated list may be

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Candidate species have no protection under the Act but are included for consideration because they could be listed prior to the completion of your project. The other species information should help you determine if suitable habitat for these listed species exists in any of the proposed project areas or if project activities may affect species on-site, off-site, and/or result in "take" of a federally listed species.

"Take" is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. In addition to the direct take of an individual animal, habitat destruction or modification can be considered take, regardless of whether it has been formally designated as critical habitat, if the activity results in the death or injury of wildlife by removing essential habitat components or significantly alters essential behavior patterns, including breeding, feeding, or sheltering.

Section 7

Section 7 of the Act requires that all Federal agencies consult with the Service to ensure that actions authorized, funded or carried out by such agencies do not jeopardize the continued existence of any listed threatened or endangered species or adversely modify or destroy critical habitat of such species. It is the responsibility of the Federal action agency to determine if the proposed project may affect threatened or endangered species. If a "may affect" determination is made, the Federal agency shall initiate the section 7 consultation process by writing to the office that has responsibility for the area in which your project occurs.

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Section 10

If there is no federal involvement and the proposed project is being funded or carried out by private interests and/or non-federal government agencies, and the project as proposed may affect listed species, a section 10(a)(1)(B) permit is recommended. The Habitat Conservation Planning Handbook is available at: http://www.fws.gov/endangered/esa-library/pdf/HCP_Handbook.pdf

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We request that you provide us with the final location and specifications of your proposed towers, as well as the recommendations implemented. A Tower Site Evaluation Form is also available via the above website; we recommend you complete this form and keep it in your files. If meteorological towers are to be constructed, please forward this completed form to our office.

More information concerning sections 7 and 10 of the Act, migratory birds, candidate species, and landowner tools can be found on our website at: http://www.fws.gov/southwest/es/TexasCoastal/ProjectReviews.html.

Wetlands and Wildlife Habitat

Wetlands and riparian zones provide valuable fish and wildlife habitat as well as contribute to flood control, water quality enhancement, and groundwater recharge. Wetland and riparian vegetation provides food and cover for wildlife, stabilizes banks and decreases soil erosion. These areas are inherently dynamic and very sensitive to changes caused by such activities as overgrazing, logging, major construction, or earth disturbance. Executive Order 11990 asserts that each agency shall provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial value of wetlands in carrying out the agency's responsibilities. Construction activities near riparian zones should be carefully designed to minimize impacts. If vegetation clearing is needed in these riparian areas, they should be re-vegetated with native wetland and riparian vegetation to prevent erosion or loss of habitat. We recommend minimizing the area of soil scarification and initiating incremental re-establishment of herbaceous vegetation at the proposed work sites. Denuded and/or disturbed areas should be re-vegetated with a mixture of native legumes and grasses. Species commonly used for soil stabilization are listed in the Texas Department of Agriculture's (TDA) Native Tree and Plant Directory, available from TDA at P.O. Box 12847, Austin, Texas 78711. The Service also urges taking precautions to ensure sediment loading does not occur to any receiving streams in the proposed project area. To prevent and/or minimize soil erosion and compaction associated with construction activities, avoid any unnecessary clearing of vegetation, and follow established rights-of-way whenever possible. All machinery and petroleum products should be stored outside the floodplain and/or wetland area during construction to prevent possible contamination of water and soils.

Wetlands and riparian areas are high priority fish and wildlife habitat, serving as important sources of food, cover, and shelter for numerous species of resident and migratory wildlife. Waterfowl and other migratory birds use wetlands and riparian corridors as stopover, feeding, and nesting areas. We strongly recommend that the selected project site not impact wetlands and riparian areas, and be located as far as practical from these areas. Migratory birds tend to concentrate in or near wetlands and riparian areas and use these areas as migratory flyways or corridors. After every effort has been made to avoid impacting wetlands, you anticipate unavoidable wetland impacts will occur; you should contact the appropriate U.S. Army Corps of Engineers office to determine if a permit is necessary prior to commencement of construction activities.

If your project will involve filling, dredging, or trenching of a wetland or riparian area it may require a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (COE). For permitting requirements please contact the U.S. Corps of Engineers, District Engineer, P.O. Box 1229, Galveston, Texas 77553-1229, (409) 766-3002.

Beneficial Landscaping

In accordance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping (42 C.F.R. 26961), where possible, any landscaping associated with project plans should be limited to seeding and replanting with native species. A mixture of grasses and forbs appropriate to address potential erosion problems and long-term cover should be planted when seed is reasonably available. Although Bermuda grass is listed in seed mixtures, this species and other introduced species should be avoided as much as possible. The Service also recommends the use of native trees, shrubs, and herbaceous species that are adaptable, drought tolerant and conserve water.

State Listed Species

The State of Texas protects certain species. Please contact the Texas Parks and Wildlife Department (Endangered Resources Branch), 4200 Smith School Road, Austin, Texas 78744 (telephone 512/389-8021) for information concerning fish, wildlife, and plants of State concern or visit their website at: http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/listed_species/.

If we can be of further assistance, or if you have any questions about these comments, please contact 281/286-8282 if your project is in southeast Texas, or 361/994-9005, ext. 246, if your project is in southern Texas. Please refer to the Service consultation number listed above in any future correspondence regarding this project.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
(281) 286-8282

Project Summary

Consultation Code: 02ETTX00-2020-SLI-0610

Event Code: 02ETTX00-2020-E-01241

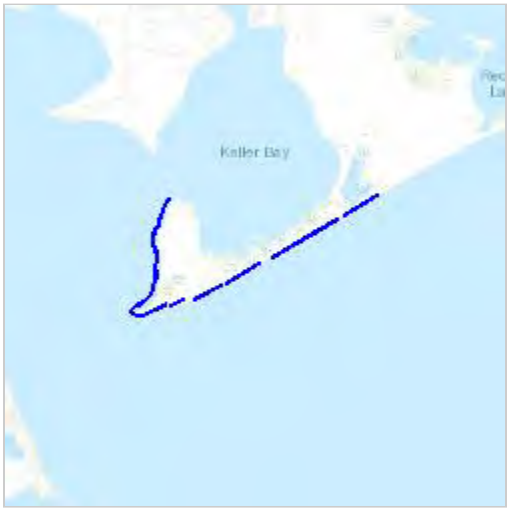
Project Name: Coastal Texas Protection and Restoration Study - Ecosystem Restoration -CA5

Project Type: LAND - RESTORATION / ENHANCEMENT

Project Description: Along the Matagorda Bay shoreline between Matagorda Bay and Keller Bay, the plan would use breakwaters and/or living shorelines to restore, protect, create, and/or enhance approximately 6 miles of shoreline (Measure CA-5). A total of 3.8 miles of breakwaters would be placed along the southern reach the project area while 2.3 miles of oyster reef creation would be used on the western reaches of the project area. The plan would also, through future construction activities, nourish 623 acres of marsh directly behind the breakwaters.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/28.572510417810868N96.47770042680534W



Counties: Calhoun, TX

Endangered Species Act Species

There is a total of 12 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 1 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Gulf Coast Jaguarundi *Herpailurus (=Felis) yagouaroundi cacomitli* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3945	Endangered
West Indian Manatee *Trichechus manatus* There is **final** critical habitat for this species. Your location is outside the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4469	Threatened

Birds

NAME	STATUS
Least Tern *Sterna antillarum*	Endangered
Northern Aplomado Falcon *Falco femoralis septentrionalis*	Endangered
Piping Plover *Charadrius melodus*	Threatened
Red Knot *Calidris canutus rufa*	Threatened
Whooping Crane *Grus americana*	Endangered

Least Tern *Sterna antillarum*
Population: interior pop.
No critical habitat has been designated for this species.
This species only needs to be considered under the following conditions:
- Wind Related Projects Within Migratory Route

Species profile: https://ecos.fws.gov/ecp/species/8505

Northern Aplomado Falcon *Falco femoralis septentrionalis*
Population: Wherever found, except where listed as an experimental population
No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/1923

Piping Plover *Charadrius melodus*
Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered.
There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/6039

Red Knot *Calidris canutus rufa*
No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/1864

Whooping Crane *Grus americana*
Population: Wherever found, except where listed as an experimental population
There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/758

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
Phone: (281) 286-8282 Fax: (281) 488-5882
http://www.fws.gov/southwest/es/TexasCoastal/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

In Reply Refer To: December 30, 2019
Consultation Code: 02ETTX00-2020-SLI-0611
Event Code: 02ETTX00-2020-E-01243
Project Name: Coastal Texas Protection and Restoration Study - Ecosystem Restoration - CA6

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

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More information concerning sections 7 and 10 of the Act, migratory birds, candidate species, and landowner tools can be found on our website at: http://www.fws.gov/southwest/es/TexasCoastal/ProjectReviews.html.

Wetlands and Wildlife Habitat

Wetlands and riparian zones provide valuable fish and wildlife habitat as well as contribute to flood control, water quality enhancement, and groundwater recharge. Wetland and riparian vegetation provides food and cover for wildlife, stabilizes banks and decreases soil erosion. These areas are inherently dynamic and very sensitive to changes caused by such activities as overgrazing, logging, major construction, or earth disturbance. Executive Order 11990 asserts that each agency shall provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial value of wetlands in carrying out the agency's responsibilities. Construction activities near riparian zones should be carefully designed to minimize impacts. If vegetation clearing is needed in these riparian areas, they should be re-vegetated with native wetland and riparian vegetation to prevent erosion or loss of habitat. We recommend minimizing the area of soil scarification and initiating incremental re-establishment of herbaceous vegetation at the proposed work sites. Denuded and/or disturbed areas should be re-vegetated with a mixture of native legumes and grasses. Species commonly used for soil stabilization are listed in the Texas Department of Agriculture's (TDA) Native Tree and Plant Directory, available from TDA at P.O. Box 12847, Austin, Texas 78711. The Service also urges taking precautions to ensure sediment loading does not occur to any receiving streams in the proposed project area. To prevent and/or minimize soil erosion and compaction associated with construction activities, avoid any unnecessary clearing of vegetation, and follow established rights-of-way whenever possible. All machinery and petroleum products should be stored outside the floodplain and/or wetland area during construction to prevent possible contamination of water and soils.

Wetlands and riparian areas are high priority fish and wildlife habitat, serving as important sources of food, cover, and shelter for numerous species of resident and migratory wildlife. Waterfowl and other migratory birds use wetlands and riparian corridors as stopover, feeding, and nesting areas. We strongly recommend that the selected project site not impact wetlands and riparian areas, and be located as far as practical from these areas. Migratory birds tend to concentrate in or near wetlands and riparian areas and use these areas as migratory flyways or corridors. After every effort has been made to avoid impacting wetlands, you anticipate unavoidable wetland impacts will occur; you should contact the appropriate U.S. Army Corps of Engineers office to determine if a permit is necessary prior to commencement of construction activities.

If your project will involve filling, dredging, or trenching of a wetland or riparian area it may require a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (COE). For permitting requirements please contact the U.S. Corps of Engineers, District Engineer, P.O. Box 1229, Galveston, Texas 77553-1229, (409) 766-3002.

Beneficial Landscaping

In accordance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping (42 C.F.R. 26961), where possible, any landscaping associated with project plans should be limited to seeding and replanting with native species. A mixture of grasses and forbs appropriate to address potential erosion problems and long-term cover should be planted when seed is reasonably available. Although Bermuda grass is listed in seed mixtures, this species and other introduced species should be avoided as much as possible. The Service also recommends the use of native trees, shrubs, and herbaceous species that are adaptable, drought tolerant and conserve water.

State Listed Species

The State of Texas protects certain species. Please contact the Texas Parks and Wildlife Department (Endangered Resources Branch), 4200 Smith School Road, Austin, Texas 78744 (telephone 512/389-8021) for information concerning fish, wildlife, and plants of State concern or visit their website at: http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/listed_species/.

If we can be of further assistance, or if you have any questions about these comments, please contact 281/286-8282 if your project is in southeast Texas, or 361/994-9005, ext. 246, if your project is in southern Texas. Please refer to the Service consultation number listed above in any future correspondence regarding this project.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
(281) 286-8282

Project Summary

Consultation Code: 02ETTX00-2020-SLI-0611

Event Code: 02ETTX00-2020-E-01243

Project Name: Coastal Texas Protection and Restoration Study - Ecosystem Restoration - CA6

Project Type: LAND - RESTORATION / ENHANCEMENT

Project Description: Near the Powderhorn Lake area, along Matagorda Bay the plan would restore, create, and/or enhance critical areas of shoreline (Measure CA-6). A total of 5 miles of breakwaters would be used for shoreline stabilization, fronting the portions of Indianola, the Powderhorn Lake estuary, and TPWD's Powderhorn Ranch. In addition, 531 acres of estuarine marsh restoration would be created using 385,760 cy of fill material in areas near the Powderhorn Lake estuary, which has converted to unconsolidated shorelines.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/28.50551712161721N96.47899341609546W

Counties: Calhoun, TX

Endangered Species Act Species

There is a total of 12 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 1 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Gulf Coast Jaguarundi *Herpailurus (=Felis) yagouaroundi cacomitli* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3945	Endangered
West Indian Manatee *Trichechus manatus* There is **final** critical habitat for this species. Your location is outside the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4469	Threatened

Birds

NAME	STATUS
Least Tern *Sterna antillarum*	Endangered
Northern Aplomado Falcon *Falco femoralis septentrionalis*	Endangered
Piping Plover *Charadrius melodus*	Threatened
Red Knot *Calidris canutus rufa*	Threatened
Whooping Crane *Grus americana*	Endangered

Least Tern *Sterna antillarum*
Population: interior pop.
No critical habitat has been designated for this species.
This species only needs to be considered under the following conditions:
- Wind Related Projects Within Migratory Route

Species profile: https://ecos.fws.gov/ecp/species/8505

Northern Aplomado Falcon *Falco femoralis septentrionalis*
Population: Wherever found, except where listed as an experimental population
No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/1923

Piping Plover *Charadrius melodus*
Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered.
There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/6039

Red Knot *Calidris canutus rufa*
No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/1864

Whooping Crane *Grus americana*
Population: Wherever found, except where listed as an experimental population
There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/758

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
Phone: (281) 286-8282 Fax: (281) 488-5882
http://www.fws.gov/southwest/es/TexasCoastal/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

In Reply Refer To: December 30, 2019
Consultation Code: 02ETTX00-2020-SLI-0609
Event Code: 02ETTX00-2020-E-01239
Project Name: Coastal Texas Protection and Restoration Study - Ecosystem Restoration - M8

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The U.S. Fish and Wildlife Service (Service) field offices in Clear Lake, Tx, and Corpus Christi, Tx, have combined administratively to form the Texas Coastal Ecological Services Field Office. A map of the Texas Coastal Ecological Services Field Office area of responsibility can be found at: http://www.fws.gov/southwest/es/TexasCoastal/Map.html. All project related correspondence should be sent to the field office responsible for the area in which your project occurs. For projects located in southeast Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; 17629 El Camino Real Ste. 211; Houston, Texas 77058. For projects located in southern Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; P.O. Box 81468; Corpus Christi, Texas 78468-1468. For projects located in six counties in southern Texas (Cameron, Hidalgo, Starr, Webb, Willacy, and Zapata) please write: Santa Ana NWR, ATTN: Ecological Services Sub Office, 3325 Green Jay Road, Alamo, Texas 78516.

The enclosed species list identifies federally threatened, endangered, and proposed to be listed species; designated critical habitat; and candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project.

New information from updated surveys, changes in the abundance and distribution of species, changes in habitat conditions, or other factors could change the list. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the ECOS-IPaC website http://ecos.fws.gov/ipac/ at regular intervals during project planning and implementation for updates to species list and information. An updated list may be

requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

Candidate species have no protection under the Act but are included for consideration because they could be listed prior to the completion of your project. The other species information should help you determine if suitable habitat for these listed species exists in any of the proposed project areas or if project activities may affect species on-site, off-site, and/or result in "take" of a federally listed species.

"Take" is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. In addition to the direct take of an individual animal, habitat destruction or modification can be considered take, regardless of whether it has been formally designated as critical habitat, if the activity results in the death or injury of wildlife by removing essential habitat components or significantly alters essential behavior patterns, including breeding, feeding, or sheltering.

Section 7

Section 7 of the Act requires that all Federal agencies consult with the Service to ensure that actions authorized, funded or carried out by such agencies do not jeopardize the continued existence of any listed threatened or endangered species or adversely modify or destroy critical habitat of such species. It is the responsibility of the Federal action agency to determine if the proposed project may affect threatened or endangered species. If a "may affect" determination is made, the Federal agency shall initiate the section 7 consultation process by writing to the office that has responsibility for the area in which your project occurs.

Is not likely to adversely affect - the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effects. The Federal agency or the designated non-Federal representative should seek written concurrence from the Service that adverse effects have been eliminated. Be sure to include all of the information and documentation used to reach your decision with your request for concurrence. The Service must have this documentation before issuing a concurrence.

Is likely to adversely affect - adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. If the overall effect of the proposed action is beneficial to the listed species but also is likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species. An "is likely to adversely affect" determination requires the Federal action agency to initiate formal section 7 consultation with this office.

No effect - the proposed action will not affect federally listed species or critical habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area). No further coordination or contact with the Service is necessary. However, if the

project changes or additional information on the distribution of listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered.

Regardless of your determination, the Service recommends that you maintain a complete record of the evaluation, including steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related articles.

Please be advised that while a Federal agency may designate a non-Federal representative to conduct informal consultations with the Service, assess project effects, or prepare a biological assessment, the Federal agency must notify the Service in writing of such a designation. The Federal agency shall also independently review and evaluate the scope and contents of a biological assessment prepared by their designated non-Federal representative before that document is submitted to the Service.

The Service's Consultation Handbook is available online to assist you with further information on definitions, process, and fulfilling Act requirements for your projects at: http://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf

Section 10

If there is no federal involvement and the proposed project is being funded or carried out by private interests and/or non-federal government agencies, and the project as proposed may affect listed species, a section 10(a)(1)(B) permit is recommended. The Habitat Conservation Planning Handbook is available at: http://www.fws.gov/endangered/esa-library/pdf/HCP_Handbook.pdf

Service Response

Please note that the Service strives to respond to requests for project review within 30 days of receipt, however, this time period is not mandated by regulation. Responses may be delayed due to workload and lack of staff. Failure to meet the 30-day timeframe does not constitute a concurrence from the Service that the proposed project will not have impacts to threatened and endangered species.

Proposed Species and/or Proposed Critical Habitat

While consultations are required when the proposed action may affect listed species, section 7(a)(4) was added to the ESA to provide a mechanism for identifying and resolving potential conflicts between a proposed action and proposed species or proposed critical habitat at an early planning stage. The action agency should seek conference from the Service to assist the action agency in determining effects and to advise the agency on ways to avoid or minimize adverse effect to proposed species or proposed critical habitat.

Candidate Species

Candidate species are species that are being considered for possible addition to the threatened and endangered species list. They currently have no legal protection under the ESA. If you find you have potential project impacts to these species the Service would like to provide technical

assistance to help avoid or minimize adverse effects. Addressing potential impacts to these species at this stage could better provide for overall ecosystem healh in the local area and ay avert potential future listing.

Several species of freshwater mussels occur in Texas and four are candidates for listing under the ESA. The Service is also reviewing the status of six other species for potential listing under the ESA. One of the main contributors to mussel die offs is sedimentation, which smothers and suffocates mussels. To reduce sedimentation within rivers, streams, and tributaries crossed by a project, the Service recommends that that you implement the best management practices found at: http://www.fws.gov/southwest/es/TexasCoastal/FreshwaterMussels.html.

Candidate Conservation Agreements (CCAs) or Candidate Conservation Agreements with Assurances (CCAAs) are voluntary agreements between the Service and public or private entities to implement conservation measures to address threats to candidate species. Implementing conservation efforts before species are listed increases the likelihood that simpler, flexible, and more cost-effective conservation options are available. A CCAA can provide participants with assurances that if they engage in conservation actions, they will not be required to implement additional conservation measures beyond those in the agreement. For additional information on CCAs/CCAAs please visit the Service's website at http://www.fws.gov/endangered/what-we-do/cca.html.

Migratory Birds

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions for the protection of migratory birds. Under the MBTA, taking, killing, or possessing migratory birds is unlawful. Many may nest in trees, brush areas or other suitable habitat. The Service recommends activities requiring vegetation removal or disturbance avoid the peak nesting period of March through August to avoid destruction of individuals or eggs. If project activities must be conducted during this time, we recommend surveying for active nests prior to commencing work. A list of migratory birds may be viewed at http://www.fws.gov/migratorybirds/regulationspolicies/mbta/mbtandx.html.

The bald eagle (*Haliaeetus leucocephalus*) was delisted under the Act on August 9, 2007. Both the bald eagle and the goden eagle (*Aquila chrysaetos*) are still protected under the MBTA and BGEPA. The BGEPA affords both eagles protection in addition to that provided by the MBTA, in particular, by making it unlawful to "disturb" eagles. Under the BGEPA, the Service may issue limited permits to incidentally "take" eagles (e.g., injury, interfering with normal breeding, feeding, or sheltering behavior nest abandonment). For more information on bald and golden eagle management guidlines, we recommend you review information provided at http://www.fws.gov/midwest/eagle/pdf/NationalBaldEagleManagementGuidelines.pdf.

The construction of overhead power lines creates threats of avian collision and electrocution. The Service recommends the installation of underground rather than overhead power lines whenever possible. For new overhead lines or retrofitting of old lines, we recommend that project

developers implement, to the maximum extent practicable, the Avian Power Line Interaction Committee guidelines found at http://www.aplic.org/.

Meteorological and communication towers are estimated to kill millions of birds per year. We recommend following the guidance set forth in the Service Interim Guidelines for Recommendations on Communications Tower Siting, Constructions, Operation and Decommissioning, found online at: http://www.fws.gov/habitatconservation/communicationtowers.html, to minimize the threat of avian mortality at these towers. Monitoring at these towers would provide insight into the effectiveness of the minimization measures. We request the results of any wildlife mortality monitoring at towers associated with this project.

We request that you provide us with the final location and specifications of your proposed towers, as well as the recommendations implemented. A Tower Site Evaluation Form is also available via the above website; we recommend you complete this form and keep it in your files. If meteorological towers are to be constructed, please forward this completed form to our office.

More information concerning sections 7 and 10 of the Act, migratory birds, candidate species, and landowner tools can be found on our website at: http://www.fws.gov/southwest/es/TexasCoastal/ProjectReviews.html.

Wetlands and Wildlife Habitat

Wetlands and riparian zones provide valuable fish and wildlife habitat as well as contribute to flood control, water quality enhancement, and groundwater recharge. Wetland and riparian vegetation provides food and cover for wildlife, stabilizes banks and decreases soil erosion. These areas are inherently dynamic and very sensitive to changes caused by such activities as overgrazing, logging, major construction, or earth disturbance. Executive Order 11990 asserts that each agency shall provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial value of wetlands in carrying out the agency's responsibilities. Construction activities near riparian zones should be carefully designed to minimize impacts. If vegetation clearing is needed in these riparian areas, they should be re-vegetated with native wetland and riparian vegetation to prevent erosion or loss of habitat. We recommend minimizing the area of soil scarification and initiating incremental re-establishment of herbaceous vegetation at the proposed work sites. Denuded and/or disturbed areas should be re-vegetated with a mixture of native legumes and grasses. Species commonly used for soil stabilization are listed in the Texas Department of Agriculture's (TDA) Native Tree and Plant Directory, available from TDA at P.O. Box 12847, Austin, Texas 78711. The Service also urges taking precautions to ensure sediment loading does not occur to any receiving streams in the proposed project area. To prevent and/or minimize soil erosion and compaction associated with construction activities, avoid any unnecessary clearing of vegetation, and follow established rights-of-way whenever possible. All machinery and petroleum products should be stored outside the floodplain and/or wetland area during construction to prevent possible contamination of water and soils.

Wetlands and riparian areas are high priority fish and wildlife habitat, serving as important sources of food, cover, and shelter for numerous species of resident and migratory wildlife. Waterfowl and other migratory birds use wetlands and riparian corridors as stopover, feeding, and nesting areas. We strongly recommend that the selected project site not impact wetlands and riparian areas, and be located as far as practical from these areas. Migratory birds tend to concentrate in or near wetlands and riparian areas and use these areas as migratory flyways or corridors. After every effort has been made to avoid impacting wetlands, you anticipate unavoidable wetland impacts will occur; you should contact the appropriate U.S. Army Corps of Engineers office to determine if a permit is necessary prior to commencement of construction activities.

If your project will involve filling, dredging, or trenching of a wetland or riparian area it may require a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (COE). For permitting requirements please contact the U.S. Corps of Engineers, District Engineer, P.O. Box 1229, Galveston, Texas 77553-1229, (409) 766-3002.

Beneficial Landscaping

In accordance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping (42 C.F.R. 26961), where possible, any landscaping associated with project plans should be limited to seeding and replanting with native species. A mixture of grasses and forbs appropriate to address potential erosion problems and long-term cover should be planted when seed is reasonably available. Although Bermuda grass is listed in seed mixtures, this species and other introduced species should be avoided as much as possible. The Service also recommends the use of native trees, shrubs, and herbaceous species that are adaptable, drought tolerant and conserve water.

State Listed Species

The State of Texas protects certain species. Please contact the Texas Parks and Wildlife Department (Endangered Resources Branch), 4200 Smith School Road, Austin, Texas 78744 (telephone 512/389-8021) for information concerning fish, wildlife, and plants of State concern or visit their website at: http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/listed_species/.

If we can be of further assistance, or if you have any questions about these comments, please contact 281/286-8282 if your project is in southeast Texas, or 361/994-9005, ext. 246, if your project is in southern Texas. Please refer to the Service consultation number listed above in any future correspondence regarding this project.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
(281) 286-8282

Project Summary

Consultation Code: 02ETTX00-2020-SLI-0609

Event Code: 02ETTX00-2020-E-01239

Project Name: Coastal Texas Protection and Restoration Study - Ecosystem Restoration - M8

Project Type: LAND - RESTORATION / ENHANCEMENT

Project Description: The plan includes the use of living shorelines and/or breakwaters to restore, protect, create, and/or enhance approximately 12.4 miles of shoreline and associated marsh along the Big Boggy NWR shoreline and eastward to the end of East Matagorda Bay (Measure M-8); however, no breakwaters would be constructed where portions of the GIWW shoreline are already stabilized by adjacent dredged material placement areas. The plan would also restore 96.1 acres/3.5 miles of islands adjacent to the Big Boggy NWR along the GIWW, using 1.1 million cy of fill. The 31,355 linear feet of oyster reefs on the bayside of the islands would also be created.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/28.740671893110505N95.8022795696657W

Counties: Matagorda, TX

Endangered Species Act Species

There is a total of 10 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
West Indian Manatee *Trichechus manatus* There is **final** critical habitat for this species. Your location is outside the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4469	Threatened

Birds

NAME	STATUS
Northern Aplomado Falcon *Falco femoralis septentrionalis* Population: Wherever found, except where listed as an experimental population No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1923	Endangered
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane *Grus americana* Population: Wherever found, except where listed as an experimental population There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/758	Endangered

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
Phone: (281) 286-8282 Fax: (281) 488-5882
http://www.fws.gov/southwest/es/TexasCoastal/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

In Reply Refer To: December 30, 2019
Consultation Code: 02ETTX00-2020-SLI-0613
Event Code: 02ETTX00-2020-E-01247
Project Name: Coastal Texas Protection and Restoration Study - Ecosystem Restoration - SP1

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The U.S. Fish and Wildlife Service (Service) field offices in Clear Lake, Tx, and Corpus Christi, Tx, have combined administratively to form the Texas Coastal Ecological Services Field Office. A map of the Texas Coastal Ecological Services Field Office area of responsibility can be found at: http://www.fws.gov/southwest/es/TexasCoastal/Map.html. All project related correspondence should be sent to the field office responsible for the area in which your project occurs. For projects located in southeast Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; 17629 El Camino Real Ste. 211; Houston, Texas 77058. For projects located in southern Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; P.O. Box 81468; Corpus Christi, Texas 78468-1468. For projects located in six counties in southern Texas (Cameron, Hidalgo, Starr, Webb, Willacy, and Zapata) please write: Santa Ana NWR, ATTN: Ecological Services Sub Office, 3325 Green Jay Road, Alamo, Texas 78516.

The enclosed species list identifies federally threatened, endangered, and proposed to be listed species; designated critical habitat; and candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project.

New information from updated surveys, changes in the abundance and distribution of species, changes in habitat conditions, or other factors could change the list. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the ECOS-IPaC website http://ecos.fws.gov/ipac/ at regular intervals during project planning and implementation for updates to species list and information. An updated list may be

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Section 7

Section 7 of the Act requires that all Federal agencies consult with the Service to ensure that actions authorized, funded or carried out by such agencies do not jeopardize the continued existence of any listed threatened or endangered species or adversely modify or destroy critical habitat of such species. It is the responsibility of the Federal action agency to determine if the proposed project may affect threatened or endangered species. If a "may affect" determination is made, the Federal agency shall initiate the section 7 consultation process by writing to the office that has responsibility for the area in which your project occurs.

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We request that you provide us with the final location and specifications of your proposed towers, as well as the recommendations implemented. A Tower Site Evaluation Form is also available via the above website; we recommend you complete this form and keep it in your files. If meteorological towers are to be constructed, please forward this completed form to our office.

More information concerning sections 7 and 10 of the Act, migratory birds, candidate species, and landowner tools can be found on our website at: http://www.fws.gov/southwest/es/TexasCoastal/ProjectReviews.html.

Wetlands and Wildlife Habitat

Wetlands and riparian zones provide valuable fish and wildlife habitat as well as contribute to flood control, water quality enhancement, and groundwater recharge. Wetland and riparian vegetation provides food and cover for wildlife, stabilizes banks and decreases soil erosion. These areas are inherently dynamic and very sensitive to changes caused by such activities as overgrazing, logging, major construction, or earth disturbance. Executive Order 11990 asserts that each agency shall provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial value of wetlands in carrying out the agency's responsibilities. Construction activities near riparian zones should be carefully designed to minimize impacts. If vegetation clearing is needed in these riparian areas, they should be re-vegetated with native wetland and riparian vegetation to prevent erosion or loss of habitat. We recommend minimizing the area of soil scarification and initiating incremental re-establishment of herbaceous vegetation at the proposed work sites. Denuded and/or disturbed areas should be re-vegetated with a mixture of native legumes and grasses. Species commonly used for soil stabilization are listed in the Texas Department of Agriculture's (TDA) Native Tree and Plant Directory, available from TDA at P.O. Box 12847, Austin, Texas 78711. The Service also urges taking precautions to ensure sediment loading does not occur to any receiving streams in the proposed project area. To prevent and/or minimize soil erosion and compaction associated with construction activities, avoid any unnecessary clearing of vegetation, and follow established rights-of-way whenever possible. All machinery and petroleum products should be stored outside the floodplain and/or wetland area during construction to prevent possible contamination of water and soils.

Wetlands and riparian areas are high priority fish and wildlife habitat, serving as important sources of food, cover, and shelter for numerous species of resident and migratory wildlife. Waterfowl and other migratory birds use wetlands and riparian corridors as stopover, feeding, and nesting areas. We strongly recommend that the selected project site not impact wetlands and riparian areas, and be located as far as practical from these areas. Migratory birds tend to concentrate in or near wetlands and riparian areas and use these areas as migratory flyways or corridors. After every effort has been made to avoid impacting wetlands, you anticipate unavoidable wetland impacts will occur; you should contact the appropriate U.S. Army Corps of Engineers office to determine if a permit is necessary prior to commencement of construction activities.

If your project will involve filling, dredging, or trenching of a wetland or riparian area it may require a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (COE). For permitting requirements please contact the U.S. Corps of Engineers, District Engineer, P.O. Box 1229, Galveston, Texas 77553-1229, (409) 766-3002.

Beneficial Landscaping

In accordance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping (42 C.F.R. 26961), where possible, any landscaping associated with project plans should be limited to seeding and replanting with native species. A mixture of grasses and forbs appropriate to address potential erosion problems and long-term cover should be planted when seed is reasonably available. Although Bermuda grass is listed in seed mixtures, this species and other introduced species should be avoided as much as possible. The Service also recommends the use of native trees, shrubs, and herbaceous species that are adaptable, drought tolerant and conserve water.

State Listed Species

The State of Texas protects certain species. Please contact the Texas Parks and Wildlife Department (Endangered Resources Branch), 4200 Smith School Road, Austin, Texas 78744 (telephone 512/389-8021) for information concerning fish, wildlife, and plants of State concern or visit their website at: http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/listed_species/.

If we can be of further assistance, or if you have any questions about these comments, please contact 281/286-8282 if your project is in southeast Texas, or 361/994-9005, ext. 246, if your project is in southern Texas. Please refer to the Service consultation number listed above in any future correspondence regarding this project.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
(281) 286-8282

Project Summary

Consultation Code: 02ETTX00-2020-SLI-0613

Event Code: 02ETTX00-2020-E-01247

Project Name: Coastal Texas Protection and Restoration Study - Ecosystem Restoration - SP1

Project Type: LAND - RESTORATION / ENHANCEMENT

Project Description: The plan includes using breakwaters and/or living shorelines, BU material, and oyster reef balls to restore, create, and/or enhance the island complex of Dagger, Ransom, and Stedman islands in Redfish Bay (Measure SP-1). The plan would include creating 392 acres of island habitat in the complex and would require 6.7 million cy of fill material. Also, along the unprotected GIWW shorelines, along the backside of Redfish Bay and the bayside of the restored islands the plan would place 7.4 miles of breakwaters around the system. In the interior of the system 7,392 linear feet of oyster reef would be created to enhance SAV growth.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/27.82776343737588N97.18184891839235W

Counties: Nueces, TX

Endangered Species Act Species

There is a total of 15 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 1 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Gulf Coast Jaguarundi *Herpailurus (=Felis) yagouaroundi cacomitli* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3945	Endangered
Ocelot *Leopardus (=Felis) pardalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4474	Endangered
West Indian Manatee *Trichechus manatus* There is **final** critical habitat for this species. Your location is outside the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4469	Threatened

Birds

NAME	STATUS
Least Tern *Sterna antillarum*	Endangered
Northern Aplomado Falcon *Falco femoralis septentrionalis*	Endangered
Piping Plover *Charadrius melodus*	Threatened
Red Knot *Calidris canutus rufa*	Threatened
Whooping Crane *Grus americana*	Endangered

Least Tern *Sterna antillarum*

Population: interior pop.

No critical habitat has been designated for this species.

This species only needs to be considered under the following conditions:

- Wind Related Projects Within Migratory Route

Species profile: https://ecos.fws.gov/ecp/species/8505

Northern Aplomado Falcon *Falco femoralis septentrionalis*

Population: Wherever found, except where listed as an experimental population

No critical habitat has been designated for this species.

Species profile: https://ecos.fws.gov/ecp/species/1923

Piping Plover *Charadrius melodus*

Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered.

There is **final** critical habitat for this species. Your location is outside the critical habitat.

Species profile: https://ecos.fws.gov/ecp/species/6039

Red Knot *Calidris canutus rufa*

No critical habitat has been designated for this species.

Species profile: https://ecos.fws.gov/ecp/species/1864

Whooping Crane *Grus americana*

Population: Wherever found, except where listed as an experimental population

There is **final** critical habitat for this species. Your location is outside the critical habitat.

Species profile: https://ecos.fws.gov/ecp/species/758

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Flowering Plants

NAME	STATUS
Slender Rush-pea *Hoffmannseggia tenella* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5298	Endangered
South Texas Ambrosia *Ambrosia cheiranthifolia* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3331	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
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http://www.fws.gov/southwest/es/TexasCoastal/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

In Reply Refer To: December 30, 2019
Consultation Code: 02ETTX00-2020-SLI-0614
Event Code: 02ETTX00-2020-E-01249
Project Name: Coastal Texas Protection and Restoration Study - Ecosystem Restoration - W3

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

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More information concerning sections 7 and 10 of the Act, migratory birds, candidate species, and landowner tools can be found on our website at: http://www.fws.gov/southwest/es/TexasCoastal/ProjectReviews.html.

Wetlands and Wildlife Habitat

Wetlands and riparian zones provide valuable fish and wildlife habitat as well as contribute to flood control, water quality enhancement, and groundwater recharge. Wetland and riparian vegetation provides food and cover for wildlife, stabilizes banks and decreases soil erosion. These areas are inherently dynamic and very sensitive to changes caused by such activities as overgrazing, logging, major construction, or earth disturbance. Executive Order 11990 asserts that each agency shall provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial value of wetlands in carrying out the agency's responsibilities. Construction activities near riparian zones should be carefully designed to minimize impacts. If vegetation clearing is needed in these riparian areas, they should be re-vegetated with native wetland and riparian vegetation to prevent erosion or loss of habitat. We recommend minimizing the area of soil scarification and initiating incremental re-establishment of herbaceous vegetation at the proposed work sites. Denuded and/or disturbed areas should be re-vegetated with a mixture of native legumes and grasses. Species commonly used for soil stabilization are listed in the Texas Department of Agriculture's (TDA) Native Tree and Plant Directory, available from TDA at P.O. Box 12847, Austin, Texas 78711. The Service also urges taking precautions to ensure sediment loading does not occur to any receiving streams in the proposed project area. To prevent and/or minimize soil erosion and compaction associated with construction activities, avoid any unnecessary clearing of vegetation, and follow established rights-of-way whenever possible. All machinery and petroleum products should be stored outside the floodplain and/or wetland area during construction to prevent possible contamination of water and soils.

Wetlands and riparian areas are high priority fish and wildlife habitat, serving as important sources of food, cover, and shelter for numerous species of resident and migratory wildlife. Waterfowl and other migratory birds use wetlands and riparian corridors as stopover, feeding, and nesting areas. We strongly recommend that the selected project site not impact wetlands and riparian areas, and be located as far as practical from these areas. Migratory birds tend to concentrate in or near wetlands and riparian areas and use these areas as migratory flyways or corridors. After every effort has been made to avoid impacting wetlands, you anticipate unavoidable wetland impacts will occur; you should contact the appropriate U.S. Army Corps of Engineers office to determine if a permit is necessary prior to commencement of construction activities.

If your project will involve filling, dredging, or trenching of a wetland or riparian area it may require a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (COE). For permitting requirements please contact the U.S. Corps of Engineers, District Engineer, P.O. Box 1229, Galveston, Texas 77553-1229, (409) 766-3002.

Beneficial Landscaping

In accordance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping (42 C.F.R. 26961), where possible, any landscaping associated with project plans should be limited to seeding and replanting with native species. A mixture of grasses and forbs appropriate to address potential erosion problems and long-term cover should be planted when seed is reasonably available. Although Bermuda grass is listed in seed mixtures, this species and other introduced species should be avoided as much as possible. The Service also recommends the use of native trees, shrubs, and herbaceous species that are adaptable, drought tolerant and conserve water.

State Listed Species

The State of Texas protects certain species. Please contact the Texas Parks and Wildlife Department (Endangered Resources Branch), 4200 Smith School Road, Austin, Texas 78744 (telephone 512/389-8021) for information concerning fish, wildlife, and plants of State concern or visit their website at: http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/listed_species/.

If we can be of further assistance, or if you have any questions about these comments, please contact 281/286-8282 if your project is in southeast Texas, or 361/994-9005, ext. 246, if your project is in southern Texas. Please refer to the Service consultation number listed above in any future correspondence regarding this project.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
(281) 286-8282

Project Summary

Consultation Code: 02ETTX00-2020-SLI-0614

Event Code: 02ETTX00-2020-E-01249

Project Name: Coastal Texas Protection and Restoration Study - Ecosystem Restoration - W3

Project Type: LAND - RESTORATION / ENHANCEMENT

Project Description: In order to maintain the geomorphic function of the Gulf shoreline north of the Port Mansfield Channel and restore and maintain the hydrologic connection between the Laguna Madre and the Gulf, the plan would dredge 6.9 miles of the Port Mansfield Ship Channel (Measure W-3). The plan would also include a bird island restoration using the dredge material to restore 27.8 acres of an existing island. A 0.7-mile breakwater would also be placed on the island to maintain the system. The action of restoring and maintain the hydrologic connection between the Laguna Madre and the Gulf would hydrologically restore over 112,800 acres in the Lower Laguna Madre.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/26.630564338534256N97.30143192684072W

Counties: Kenedy, TX | Willacy, TX

Endangered Species Act Species

There is a total of 14 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 1 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Gulf Coast Jaguarundi *Herpailurus (=Felis) yagouaroundi cacomitli* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3945	Endangered
Ocelot *Leopardus (=Felis) pardalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4474	Endangered
West Indian Manatee *Trichechus manatus* There is **final** critical habitat for this species. Your location is outside the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4469	Threatened

Birds

NAME	STATUS
Least Tern *Sterna antillarum*	Endangered
Northern Aplomado Falcon *Falco femoralis septentrionalis*	Endangered
Piping Plover *Charadrius melodus*	Threatened
Red Knot *Calidris canutus rufa*	Threatened
Whooping Crane *Grus americana*	Endangered

Least Tern *Sterna antillarum*
Population: interior pop.
No critical habitat has been designated for this species.
This species only needs to be considered under the following conditions:
- Wind Related Projects Within Migratory Route

Species profile: https://ecos.fws.gov/ecp/species/8505

Northern Aplomado Falcon *Falco femoralis septentrionalis*
Population: Wherever found, except where listed as an experimental population
No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/1923

Piping Plover *Charadrius melodus*
Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered.
There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/6039

Red Knot *Calidris canutus rufa*
No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/1864

Whooping Crane *Grus americana*
Population: Wherever found, except where listed as an experimental population
There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/758

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Flowering Plants

NAME	STATUS
Texas Ayenia *Ayenia limitaris* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4942	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
Phone: (281) 286-8282 Fax: (281) 488-5882
http://www.fws.gov/southwest/es/TexasCoastal/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

In Reply Refer To: January 02, 2020
Consultation Code: 02ETTX00-2020-SLI-0664
Event Code: 02ETTX00-2020-E-01353
Project Name: Coastal Texas Protection and Restoration Study - CSRM - Bolivar Roads Surge Gate

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The U.S. Fish and Wildlife Service (Service) field offices in Clear Lake, Tx, and Corpus Christi, Tx, have combined administratively to form the Texas Coastal Ecological Services Field Office. A map of the Texas Coastal Ecological Services Field Office area of responsibility can be found at: http://www.fws.gov/southwest/es/TexasCoastal/Map.html. All project related correspondence should be sent to the field office responsible for the area in which your project occurs. For projects located in southeast Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; 17629 El Camino Real Ste. 211; Houston, Texas 77058. For projects located in southern Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; P.O. Box 81468; Corpus Christi, Texas 78468-1468. For projects located in six counties in southern Texas (Cameron, Hidalgo, Starr, Webb, Willacy, and Zapata) please write: Santa Ana NWR, ATTN: Ecological Services Sub Office, 3325 Green Jay Road, Alamo, Texas 78516.

The enclosed species list identifies federally threatened, endangered, and proposed to be listed species; designated critical habitat; and candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project.

New information from updated surveys, changes in the abundance and distribution of species, changes in habitat conditions, or other factors could change the list. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the ECOS-IPaC website http://ecos.fws.gov/ipac/ at regular intervals during project planning and implementation for updates to species list and information. An updated list may be

requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

Candidate species have no protection under the Act but are included for consideration because they could be listed prior to the completion of your project. The other species information should help you determine if suitable habitat for these listed species exists in any of the proposed project areas or if project activities may affect species on-site, off-site, and/or result in "take" of a federally listed species.

"Take" is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. In addition to the direct take of an individual animal, habitat destruction or modification can be considered take, regardless of whether it has been formally designated as critical habitat, if the activity results in the death or injury of wildlife by removing essential habitat components or significantly alters essential behavior patterns, including breeding, feeding, or sheltering.

Section 7

Section 7 of the Act requires that all Federal agencies consult with the Service to ensure that actions authorized, funded or carried out by such agencies do not jeopardize the continued existence of any listed threatened or endangered species or adversely modify or destroy critical habitat of such species. It is the responsibility of the Federal action agency to determine if the proposed project may affect threatened or endangered species. If a "may affect" determination is made, the Federal agency shall initiate the section 7 consultation process by writing to the office that has responsibility for the area in which your project occurs.

Is not likely to adversely affect - the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effects. The Federal agency or the designated non-Federal representative should seek written concurrence from the Service that adverse effects have been eliminated. Be sure to include all of the information and documentation used to reach your decision with your request for concurrence. The Service must have this documentation before issuing a concurrence.

Is likely to adversely affect - adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. If the overall effect of the proposed action is beneficial to the listed species but also is likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species. An "is likely to adversely affect" determination requires the Federal action agency to initiate formal section 7 consultation with this office.

No effect - the proposed action will not affect federally listed species or critical habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area). No further coordination or contact with the Service is necessary. However, if the

project changes or additional information on the distribution of listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered.

Regardless of your determination, the Service recommends that you maintain a complete record of the evaluation, including steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related articles.

Please be advised that while a Federal agency may designate a non-Federal representative to conduct informal consultations with the Service, assess project effects, or prepare a biological assessment, the Federal agency must notify the Service in writing of such a designation. The Federal agency shall also independently review and evaluate the scope and contents of a biological assessment prepared by their designated non-Federal representative before that document is submitted to the Service.

The Service's Consultation Handbook is available online to assist you with further information on definitions, process, and fulfilling Act requirements for your projects at: http://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf

Section 10

If there is no federal involvement and the proposed project is being funded or carried out by private interests and/or non-federal government agencies, and the project as proposed may affect listed species, a section 10(a)(1)(B) permit is recommended. The Habitat Conservation Planning Handbook is available at: http://www.fws.gov/endangered/esa-library/pdf/HCP_Handbook.pdf

Service Response

Please note that the Service strives to respond to requests for project review within 30 days of receipt, however, this time period is not mandated by regulation. Responses may be delayed due to workload and lack of staff. Failure to meet the 30-day timeframe does not constitute a concurrence from the Service that the proposed project will not have impacts to threatened and endangered species.

Proposed Species and/or Proposed Critical Habitat

While consultations are required when the proposed action may affect listed species, section 7(a)(4) was added to the ESA to provide a mechanism for identifying and resolving potential conflicts between a proposed action and proposed species or proposed critical habitat at an early planning stage. The action agency should seek conference from the Service to assist the action agency in determining effects and to advise the agency on ways to avoid or minimize adverse effect to proposed species or proposed critical habitat.

Candidate Species

Candidate species are species that are being considered for possible addition to the threatened and endangered species list. They currently have no legal protection under the ESA. If you find you have potential project impacts to these species the Service would like to provide technical

assistance to help avoid or minimize adverse effects. Addressing potential impacts to these species at this stage could better provide for overall ecosystem healh in the local area and ay avert potential future listing.

Several species of freshwater mussels occur in Texas and four are candidates for listing under the ESA. The Service is also reviewing the status of six other species for potential listing under the ESA. One of the main contributors to mussel die offs is sedimentation, which smothers and suffocates mussels. To reduce sedimentation within rivers, streams, and tributaries crossed by a project, the Service recommends that that you implement the best management practices found at: http://www.fws.gov/southwest/es/TexasCoastal/FreshwaterMussels.html.

Candidate Conservation Agreements (CCAs) or Candidate Conservation Agreements with Assurances (CCAAs) are voluntary agreements between the Service and public or private entities to implement conservation measures to address threats to candidate species. Implementing conservation efforts before species are listed increases the likelihood that simpler, flexible, and more cost-effective conservation options are available. A CCAA can provide participants with assurances that if they engage in conservation actions, they will not be required to implement additional conservation measures beyond those in the agreement. For additional information on CCAs/CCAAs please visit the Service's website at http://www.fws.gov/endangered/what-we-do/cca.html.

Migratory Birds

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions for the protection of migratory birds. Under the MBTA, taking, killing, or possessing migratory birds is unlawful. Many may nest in trees, brush areas or other suitable habitat. The Service recommends activities requiring vegetation removal or disturbance avoid the peak nesting period of March through August to avoid destruction of individuals or eggs. If project activities must be conducted during this time, we recommend surveying for active nests prior to commencing work. A list of migratory birds may be viewed at http://www.fws.gov/migratorybirds/regulationspolicies/mbta/mbtandx.html.

The bald eagle (*Haliaeetus leucocephalus*) was delisted under the Act on August 9, 2007. Both the bald eagle and the goden eagle (*Aquila chrysaetos*) are still protected under the MBTA and BGEPA. The BGEPA affords both eagles protection in addition to that provided by the MBTA, in particular, by making it unlawful to "disturb" eagles. Under the BGEPA, the Service may issue limited permits to incidentally "take" eagles (e.g., injury, interfering with normal breeding, feeding, or sheltering behavior nest abandonment). For more information on bald and golden eagle management guidlines, we recommend you review information provided at http://www.fws.gov/midwest/eagle/pdf/NationalBaldEagleManagementGuidelines.pdf.

The construction of overhead power lines creates threats of avian collision and electrocution. The Service recommends the installation of underground rather than overhead power lines whenever possible. For new overhead lines or retrofitting of old lines, we recommend that project

developers implement, to the maximum extent practicable, the Avian Power Line Interaction Committee guidelines found at http://www.aplic.org/.

Meteorological and communication towers are estimated to kill millions of birds per year. We recommend following the guidance set forth in the Service Interim Guidelines for Recommendations on Communications Tower Siting, Constructions, Operation and Decommissioning, found online at: http://www.fws.gov/habitatconservation/communicationtowers.html, to minimize the threat of avian mortality at these towers. Monitoring at these towers would provide insight into the effectiveness of the minimization measures. We request the results of any wildlife mortality monitoring at towers associated with this project.

We request that you provide us with the final location and specifications of your proposed towers, as well as the recommendations implemented. A Tower Site Evaluation Form is also available via the above website; we recommend you complete this form and keep it in your files. If meteorological towers are to be constructed, please forward this completed form to our office.

More information concerning sections 7 and 10 of the Act, migratory birds, candidate species, and landowner tools can be found on our website at: http://www.fws.gov/southwest/es/TexasCoastal/ProjectReviews.html.

Wetlands and Wildlife Habitat

Wetlands and riparian zones provide valuable fish and wildlife habitat as well as contribute to flood control, water quality enhancement, and groundwater recharge. Wetland and riparian vegetation provides food and cover for wildlife, stabilizes banks and decreases soil erosion. These areas are inherently dynamic and very sensitive to changes caused by such activities as overgrazing, logging, major construction, or earth disturbance. Executive Order 11990 asserts that each agency shall provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial value of wetlands in carrying out the agency's responsibilities. Construction activities near riparian zones should be carefully designed to minimize impacts. If vegetation clearing is needed in these riparian areas, they should be re-vegetated with native wetland and riparian vegetation to prevent erosion or loss of habitat. We recommend minimizing the area of soil scarification and initiating incremental re-establishment of herbaceous vegetation at the proposed work sites. Denuded and/or disturbed areas should be re-vegetated with a mixture of native legumes and grasses. Species commonly used for soil stabilization are listed in the Texas Department of Agriculture's (TDA) Native Tree and Plant Directory, available from TDA at P.O. Box 12847, Austin, Texas 78711. The Service also urges taking precautions to ensure sediment loading does not occur to any receiving streams in the proposed project area. To prevent and/or minimize soil erosion and compaction associated with construction activities, avoid any unnecessary clearing of vegetation, and follow established rights-of-way whenever possible. All machinery and petroleum products should be stored outside the floodplain and/or wetland area during construction to prevent possible contamination of water and soils.

Wetlands and riparian areas are high priority fish and wildlife habitat, serving as important sources of food, cover, and shelter for numerous species of resident and migratory wildlife. Waterfowl and other migratory birds use wetlands and riparian corridors as stopover, feeding, and nesting areas. We strongly recommend that the selected project site not impact wetlands and riparian areas, and be located as far as practical from these areas. Migratory birds tend to concentrate in or near wetlands and riparian areas and use these areas as migratory flyways or corridors. After every effort has been made to avoid impacting wetlands, you anticipate unavoidable wetland impacts will occur; you should contact the appropriate U.S. Army Corps of Engineers office to determine if a permit is necessary prior to commencement of construction activities.

If your project will involve filling, dredging, or trenching of a wetland or riparian area it may require a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (COE). For permitting requirements please contact the U.S. Corps of Engineers, District Engineer, P.O. Box 1229, Galveston, Texas 77553-1229, (409) 766-3002.

Beneficial Landscaping

In accordance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping (42 C.F.R. 26961), where possible, any landscaping associated with project plans should be limited to seeding and replanting with native species. A mixture of grasses and forbs appropriate to address potential erosion problems and long-term cover should be planted when seed is reasonably available. Although Bermuda grass is listed in seed mixtures, this species and other introduced species should be avoided as much as possible. The Service also recommends the use of native trees, shrubs, and herbaceous species that are adaptable, drought tolerant and conserve water.

State Listed Species

The State of Texas protects certain species. Please contact the Texas Parks and Wildlife Department (Endangered Resources Branch), 4200 Smith School Road, Austin, Texas 78744 (telephone 512/389-8021) for information concerning fish, wildlife, and plants of State concern or visit their website at: http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/listed_species/.

If we can be of further assistance, or if you have any questions about these comments, please contact 281/286-8282 if your project is in southeast Texas, or 361/994-9005, ext. 246, if your project is in southern Texas. Please refer to the Service consultation number listed above in any future correspondence regarding this project.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
(281) 286-8282

Project Summary

Consultation Code: 02ETTX00-2020-SLI-0664

Event Code: 02ETTX00-2020-E-01353

Project Name: Coastal Texas Protection and Restoration Study - CSRM - Bolivar Roads Surge Gate

Project Type: LAND - FLOODING

Project Description: From the Bolivar side to the Galveston side, the gate structure would be comprised of 16 shallow water environmental gates that have a cross sectional opening of 16- by 16-feet and a sill depth of -5-foot NAVD88; five vertical lift gates with a 300-foot-wide opening and a sill elevation of -20-foot NAVD88; three vertical lift gates with a 300-foot-wide opening and a sill elevation of -40-foot NAVD88; one small navigation sector gate with a 125-foot wide opening and a -40-foot NAVD88 sill elevation; two navigation sector gates for the Houston Ship Channel, each with a 650-foot-wide opening and a sill elevation of -60-foot NAVD88; one small navigation sector gate with a 125-foot wide opening and a -40-foot NAVD88 sill elevation; two vertical lift gates with a 300-foot-wide opening and a sill elevation of -40-foot NAVD88; and three vertical lift gates with a 300-foot-wide opening and a sill elevation of -20-foot NAVD88. A combi/floodwall would be constructed on Bolivar and would tie into the beach/dune feature. On the Galveston side there would be a control station and access road constructed on the Galveston side of the project area.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/29.36749688999474N94.75360196846925W

Counties: Galveston, TX

Endangered Species Act Species

There is a total of 9 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
West Indian Manatee *Trichechus manatus* There is **final** critical habitat for this species. Your location is outside the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4469	Threatened

Birds

NAME	STATUS
Attwater's Greater Prairie-chicken *Tympanuchus cupido attwateri* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7259	Endangered
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Critical habitats

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Piping Plover *Charadrius melodus* https://ecos.fws.gov/ecp/species/6039#crithab	Final

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Texas Coastal Ecological Services Field Office
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Houston, TX 77058
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http://www.fws.gov/southwest/es/TexasCoastal/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

In Reply Refer To: December 30, 2019
Consultation Code: 02ETTX00-2020-SLI-0615
Event Code: 02ETTX00-2020-E-01251
Project Name: Coastal Texas Protection and Restoration Study - CSRM - Bolivar Peninsula/ Galveston Beach/Dune

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

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The enclosed species list identifies federally threatened, endangered, and proposed to be listed species; designated critical habitat; and candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project.

New information from updated surveys, changes in the abundance and distribution of species, changes in habitat conditions, or other factors could change the list. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the ECOS-IPaC website http://ecos.fws.gov/ipac/ at regular intervals during project planning and implementation for updates to species list and information. An updated list may be

requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

Candidate species have no protection under the Act but are included for consideration because they could be listed prior to the completion of your project. The other species information should help you determine if suitable habitat for these listed species exists in any of the proposed project areas or if project activities may affect species on-site, off-site, and/or result in "take" of a federally listed species.

"Take" is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. In addition to the direct take of an individual animal, habitat destruction or modification can be considered take, regardless of whether it has been formally designated as critical habitat, if the activity results in the death or injury of wildlife by removing essential habitat components or significantly alters essential behavior patterns, including breeding, feeding, or sheltering.

Section 7

Section 7 of the Act requires that all Federal agencies consult with the Service to ensure that actions authorized, funded or carried out by such agencies do not jeopardize the continued existence of any listed threatened or endangered species or adversely modify or destroy critical habitat of such species. It is the responsibility of the Federal action agency to determine if the proposed project may affect threatened or endangered species. If a "may affect" determination is made, the Federal agency shall initiate the section 7 consultation process by writing to the office that has responsibility for the area in which your project occurs.

Is not likely to adversely affect - the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effects. The Federal agency or the designated non-Federal representative should seek written concurrence from the Service that adverse effects have been eliminated. Be sure to include all of the information and documentation used to reach your decision with your request for concurrence. The Service must have this documentation before issuing a concurrence.

Is likely to adversely affect - adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. If the overall effect of the proposed action is beneficial to the listed species but also is likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species. An "is likely to adversely affect" determination requires the Federal action agency to initiate formal section 7 consultation with this office.

No effect - the proposed action will not affect federally listed species or critical habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area). No further coordination or contact with the Service is necessary. However, if the

project changes or additional information on the distribution of listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered.

Regardless of your determination, the Service recommends that you maintain a complete record of the evaluation, including steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related articles.

Please be advised that while a Federal agency may designate a non-Federal representative to conduct informal consultations with the Service, assess project effects, or prepare a biological assessment, the Federal agency must notify the Service in writing of such a designation. The Federal agency shall also independently review and evaluate the scope and contents of a biological assessment prepared by their designated non-Federal representative before that document is submitted to the Service.

The Service's Consultation Handbook is available online to assist you with further information on definitions, process, and fulfilling Act requirements for your projects at: http://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf

Section 10

If there is no federal involvement and the proposed project is being funded or carried out by private interests and/or non-federal government agencies, and the project as proposed may affect listed species, a section 10(a)(1)(B) permit is recommended. The Habitat Conservation Planning Handbook is available at: http://www.fws.gov/endangered/esa-library/pdf/HCP_Handbook.pdf

Service Response

Please note that the Service strives to respond to requests for project review within 30 days of receipt, however, this time period is not mandated by regulation. Responses may be delayed due to workload and lack of staff. Failure to meet the 30-day timeframe does not constitute a concurrence from the Service that the proposed project will not have impacts to threatened and endangered species.

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Candidate species are species that are being considered for possible addition to the threatened and endangered species list. They currently have no legal protection under the ESA. If you find you have potential project impacts to these species the Service would like to provide technical

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Migratory Birds

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions for the protection of migratory birds. Under the MBTA, taking, killing, or possessing migratory birds is unlawful. Many may nest in trees, brush areas or other suitable habitat. The Service recommends activities requiring vegetation removal or disturbance avoid the peak nesting period of March through August to avoid destruction of individuals or eggs. If project activities must be conducted during this time, we recommend surveying for active nests prior to commencing work. A list of migratory birds may be viewed at http://www.fws.gov/migratorybirds/regulationspolicies/mbta/mbtandx.html.

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developers implement, to the maximum extent practicable, the Avian Power Line Interaction Committee guidelines found at http://www.aplic.org/.

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We request that you provide us with the final location and specifications of your proposed towers, as well as the recommendations implemented. A Tower Site Evaluation Form is also available via the above website; we recommend you complete this form and keep it in your files. If meteorological towers are to be constructed, please forward this completed form to our office.

More information concerning sections 7 and 10 of the Act, migratory birds, candidate species, and landowner tools can be found on our website at: http://www.fws.gov/southwest/es/TexasCoastal/ProjectReviews.html.

Wetlands and Wildlife Habitat

Wetlands and riparian zones provide valuable fish and wildlife habitat as well as contribute to flood control, water quality enhancement, and groundwater recharge. Wetland and riparian vegetation provides food and cover for wildlife, stabilizes banks and decreases soil erosion. These areas are inherently dynamic and very sensitive to changes caused by such activities as overgrazing, logging, major construction, or earth disturbance. Executive Order 11990 asserts that each agency shall provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial value of wetlands in carrying out the agency's responsibilities. Construction activities near riparian zones should be carefully designed to minimize impacts. If vegetation clearing is needed in these riparian areas, they should be re-vegetated with native wetland and riparian vegetation to prevent erosion or loss of habitat. We recommend minimizing the area of soil scarification and initiating incremental re-establishment of herbaceous vegetation at the proposed work sites. Denuded and/or disturbed areas should be re-vegetated with a mixture of native legumes and grasses. Species commonly used for soil stabilization are listed in the Texas Department of Agriculture's (TDA) Native Tree and Plant Directory, available from TDA at P.O. Box 12847, Austin, Texas 78711. The Service also urges taking precautions to ensure sediment loading does not occur to any receiving streams in the proposed project area. To prevent and/or minimize soil erosion and compaction associated with construction activities, avoid any unnecessary clearing of vegetation, and follow established rights-of-way whenever possible. All machinery and petroleum products should be stored outside the floodplain and/or wetland area during construction to prevent possible contamination of water and soils.

Wetlands and riparian areas are high priority fish and wildlife habitat, serving as important sources of food, cover, and shelter for numerous species of resident and migratory wildlife. Waterfowl and other migratory birds use wetlands and riparian corridors as stopover, feeding, and nesting areas. We strongly recommend that the selected project site not impact wetlands and riparian areas, and be located as far as practical from these areas. Migratory birds tend to concentrate in or near wetlands and riparian areas and use these areas as migratory flyways or corridors. After every effort has been made to avoid impacting wetlands, you anticipate unavoidable wetland impacts will occur; you should contact the appropriate U.S. Army Corps of Engineers office to determine if a permit is necessary prior to commencement of construction activities.

If your project will involve filling, dredging, or trenching of a wetland or riparian area it may require a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (COE). For permitting requirements please contact the U.S. Corps of Engineers, District Engineer, P.O. Box 1229, Galveston, Texas 77553-1229, (409) 766-3002.

Beneficial Landscaping

In accordance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping (42 C.F.R. 26961), where possible, any landscaping associated with project plans should be limited to seeding and replanting with native species. A mixture of grasses and forbs appropriate to address potential erosion problems and long-term cover should be planted when seed is reasonably available. Although Bermuda grass is listed in seed mixtures, this species and other introduced species should be avoided as much as possible. The Service also recommends the use of native trees, shrubs, and herbaceous species that are adaptable, drought tolerant and conserve water.

State Listed Species

The State of Texas protects certain species. Please contact the Texas Parks and Wildlife Department (Endangered Resources Branch), 4200 Smith School Road, Austin, Texas 78744 (telephone 512/389-8021) for information concerning fish, wildlife, and plants of State concern or visit their website at: http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/listed_species/.

If we can be of further assistance, or if you have any questions about these comments, please contact 281/286-8282 if your project is in southeast Texas, or 361/994-9005, ext. 246, if your project is in southern Texas. Please refer to the Service consultation number listed above in any future correspondence regarding this project.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
(281) 286-8282

Project Summary

Consultation Code: 02ETTX00-2020-SLI-0615

Event Code: 02ETTX00-2020-E-01251

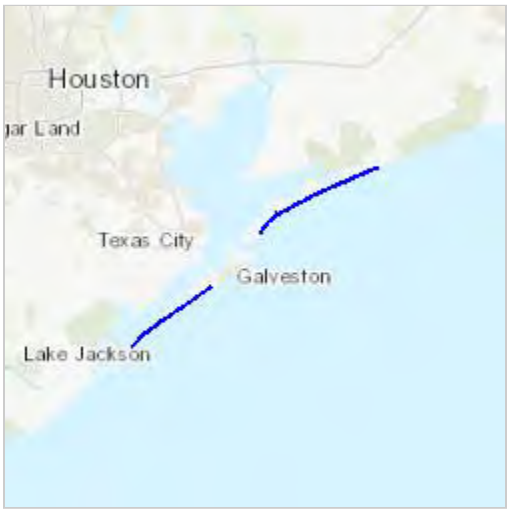
Project Name: Coastal Texas Protection and Restoration Study - CSRM - Bolivar Peninsula/ Galveston Beach/Dune

Project Type: LAND - FLOODING

Project Description: Restore approximately 26.6 miles of Gulf shoreline from High Island on Bolivar Peninsula to the Galveston East Jetty and 18.6 miles of Galveston Island shoreline west of the Galveston seawall. An initial 33 to 66 million cy of beach and dune fill for environmental restoration purposes would be placed over the area. A total of 5,057 acres would be restored, created, protected, and/or enhanced.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/29.438889350358114N94.67009833895631W



Counties: Chambers, TX | Galveston, TX

Endangered Species Act Species

There is a total of 9 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
West Indian Manatee *Trichechus manatus* There is **final** critical habitat for this species. Your location is outside the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4469	Threatened

Birds

NAME	STATUS
Attwater's Greater Prairie-chicken *Tympanuchus cupido attwateri* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7259	Endangered
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Critical habitats

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Piping Plover *Charadrius melodus* https://ecos.fws.gov/ecp/species/6039#crithab	Final

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
Phone: (281) 286-8282 Fax: (281) 488-5882
http://www.fws.gov/southwest/es/TexasCoastal/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

In Reply Refer To: January 02, 2020
Consultation Code: 02ETTX00-2020-SLI-0658
Event Code: 02ETTX00-2020-E-01338
Project Name: Coastal Texas Protection and Restoration Study-CSRM-Clear Creek, Dickinson Bayou gates, nonstructure

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

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Wetlands and riparian areas are high priority fish and wildlife habitat, serving as important sources of food, cover, and shelter for numerous species of resident and migratory wildlife. Waterfowl and other migratory birds use wetlands and riparian corridors as stopover, feeding, and nesting areas. We strongly recommend that the selected project site not impact wetlands and riparian areas, and be located as far as practical from these areas. Migratory birds tend to concentrate in or near wetlands and riparian areas and use these areas as migratory flyways or corridors. After every effort has been made to avoid impacting wetlands, you anticipate unavoidable wetland impacts will occur; you should contact the appropriate U.S. Army Corps of Engineers office to determine if a permit is necessary prior to commencement of construction activities.

If your project will involve filling, dredging, or trenching of a wetland or riparian area it may require a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (COE). For permitting requirements please contact the U.S. Corps of Engineers, District Engineer, P.O. Box 1229, Galveston, Texas 77553-1229, (409) 766-3002.

Beneficial Landscaping

In accordance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping (42 C.F.R. 26961), where possible, any landscaping associated with project plans should be limited to seeding and replanting with native species. A mixture of grasses and forbs appropriate to address potential erosion problems and long-term cover should be planted when seed is reasonably available. Although Bermuda grass is listed in seed mixtures, this species and other introduced species should be avoided as much as possible. The Service also recommends the use of native trees, shrubs, and herbaceous species that are adaptable, drought tolerant and conserve water.

State Listed Species

The State of Texas protects certain species. Please contact the Texas Parks and Wildlife Department (Endangered Resources Branch), 4200 Smith School Road, Austin, Texas 78744 (telephone 512/389-8021) for information concerning fish, wildlife, and plants of State concern or visit their website at: http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/listed_species/.

If we can be of further assistance, or if you have any questions about these comments, please contact 281/286-8282 if your project is in southeast Texas, or 361/994-9005, ext. 246, if your project is in southern Texas. Please refer to the Service consultation number listed above in any future correspondence regarding this project.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
(281) 286-8282

Project Summary

Consultation Code: 02ETTX00-2020-SLI-0658

Event Code: 02ETTX00-2020-E-01338

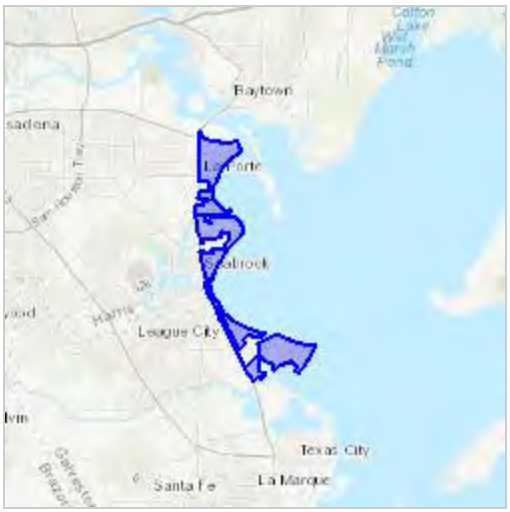
Project Name: Coastal Texas Protection and Restoration Study-CSRM-Clear Creek, Dickinson Bayou gates, nonstructure

Project Type: LAND - FLOODING

Project Description: The system would include closures at Clear Creek Channel and Dickinson Bayou to address wind-driven
surges in the bay. The features at both areas consist of sector gates across the channel, associated barrier walls,
and pump stations. For planning purposes, the elevation of the walls and gates were set at an elevation of 17.0
feet. The plan would also include nonstructural measures along the west side of Galveston Bay to address residual
damages from wind-driven bay surges. As discussed above, elevation is a common approach already being
undertaken by residents and businesses in the study area. Due to the general uncertainty associated with structures'
first-floor elevations and locations in the floodplain, additional structure inventory investigations would be
undertaken to evaluate which structures are at risk if this alternative moves forward. The focus would be on the
approximately 10,000 structures between SH 146 and the bay rim.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/29.488211727000053N94.94032993993434W



Counties: Chambers, TX | Galveston, TX | Harris, TX

Endangered Species Act Species

There is a total of 11 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 1 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
West Indian Manatee *Trichechus manatus*	Threatened

There is **final** critical habitat for this species. Your location is outside the critical habitat.
This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.
Species profile: https://ecos.fws.gov/ecp/species/4469

Birds

NAME	STATUS
Attwater's Greater Prairie-chicken *Tympanuchus cupido attwateri* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7259	Endangered
Least Tern *Sterna antillarum* Population: interior pop. No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: ▪ Wind related projects within migratory route. Species profile: https://ecos.fws.gov/ecp/species/8505	Endangered
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Flowering Plants

NAME	STATUS
Texas Prairie Dawn-flower *Hymenoxys texana*	Endangered

No critical habitat has been designated for this species.

Species profile: https://ecos.fws.gov/ecp/species/6471

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
Phone: (281) 286-8282 Fax: (281) 488-5882
http://www.fws.gov/southwest/es/TexasCoastal/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

In Reply Refer To: January 02, 2020
Consultation Code: 02ETTX00-2020-SLI-0662
Event Code: 02ETTX00-2020-E-01349
Project Name: Coastal Texas Protection and Restoration Study - CSRM - Galveston Ring Levee

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The U.S. Fish and Wildlife Service (Service) field offices in Clear Lake, Tx, and Corpus Christi, Tx, have combined administratively to form the Texas Coastal Ecological Services Field Office. A map of the Texas Coastal Ecological Services Field Office area of responsibility can be found at: http://www.fws.gov/southwest/es/TexasCoastal/Map.html. All project related correspondence should be sent to the field office responsible for the area in which your project occurs. For projects located in southeast Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; 17629 El Camino Real Ste. 211; Houston, Texas 77058. For projects located in southern Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; P.O. Box 81468; Corpus Christi, Texas 78468-1468. For projects located in six counties in southern Texas (Cameron, Hidalgo, Starr, Webb, Willacy, and Zapata) please write: Santa Ana NWR, ATTN: Ecological Services Sub Office, 3325 Green Jay Road, Alamo, Texas 78516.

The enclosed species list identifies federally threatened, endangered, and proposed to be listed species; designated critical habitat; and candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project.

New information from updated surveys, changes in the abundance and distribution of species, changes in habitat conditions, or other factors could change the list. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the ECOS-IPaC website http://ecos.fws.gov/ipac/ at regular intervals during project planning and implementation for updates to species list and information. An updated list may be

requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

Candidate species have no protection under the Act but are included for consideration because they could be listed prior to the completion of your project. The other species information should help you determine if suitable habitat for these listed species exists in any of the proposed project areas or if project activities may affect species on-site, off-site, and/or result in "take" of a federally listed species.

"Take" is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. In addition to the direct take of an individual animal, habitat destruction or modification can be considered take, regardless of whether it has been formally designated as critical habitat, if the activity results in the death or injury of wildlife by removing essential habitat components or significantly alters essential behavior patterns, including breeding, feeding, or sheltering.

Section 7

Section 7 of the Act requires that all Federal agencies consult with the Service to ensure that actions authorized, funded or carried out by such agencies do not jeopardize the continued existence of any listed threatened or endangered species or adversely modify or destroy critical habitat of such species. It is the responsibility of the Federal action agency to determine if the proposed project may affect threatened or endangered species. If a "may affect" determination is made, the Federal agency shall initiate the section 7 consultation process by writing to the office that has responsibility for the area in which your project occurs.

Is not likely to adversely affect - the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effects. The Federal agency or the designated non-Federal representative should seek written concurrence from the Service that adverse effects have been eliminated. Be sure to include all of the information and documentation used to reach your decision with your request for concurrence. The Service must have this documentation before issuing a concurrence.

Is likely to adversely affect - adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. If the overall effect of the proposed action is beneficial to the listed species but also is likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species. An "is likely to adversely affect" determination requires the Federal action agency to initiate formal section 7 consultation with this office.

No effect - the proposed action will not affect federally listed species or critical habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area). No further coordination or contact with the Service is necessary. However, if the

project changes or additional information on the distribution of listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered.

Regardless of your determination, the Service recommends that you maintain a complete record of the evaluation, including steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related articles.

Please be advised that while a Federal agency may designate a non-Federal representative to conduct informal consultations with the Service, assess project effects, or prepare a biological assessment, the Federal agency must notify the Service in writing of such a designation. The Federal agency shall also independently review and evaluate the scope and contents of a biological assessment prepared by their designated non-Federal representative before that document is submitted to the Service.

The Service's Consultation Handbook is available online to assist you with further information on definitions, process, and fulfilling Act requirements for your projects at: http://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf

Section 10

If there is no federal involvement and the proposed project is being funded or carried out by private interests and/or non-federal government agencies, and the project as proposed may affect listed species, a section 10(a)(1)(B) permit is recommended. The Habitat Conservation Planning Handbook is available at: http://www.fws.gov/endangered/esa-library/pdf/HCP_Handbook.pdf

Service Response

Please note that the Service strives to respond to requests for project review within 30 days of receipt, however, this time period is not mandated by regulation. Responses may be delayed due to workload and lack of staff. Failure to meet the 30-day timeframe does not constitute a concurrence from the Service that the proposed project will not have impacts to threatened and endangered species.

Proposed Species and/or Proposed Critical Habitat

While consultations are required when the proposed action may affect listed species, section 7(a)(4) was added to the ESA to provide a mechanism for identifying and resolving potential conflicts between a proposed action and proposed species or proposed critical habitat at an early planning stage. The action agency should seek conference from the Service to assist the action agency in determining effects and to advise the agency on ways to avoid or minimize adverse effect to proposed species or proposed critical habitat.

Candidate Species

Candidate species are species that are being considered for possible addition to the threatened and endangered species list. They currently have no legal protection under the ESA. If you find you have potential project impacts to these species the Service would like to provide technical

assistance to help avoid or minimize adverse effects. Addressing potential impacts to these species at this stage could better provide for overall ecosystem healh in the local area and ay avert potential future listing.

Several species of freshwater mussels occur in Texas and four are candidates for listing under the ESA. The Service is also reviewing the status of six other species for potential listing under the ESA. One of the main contributors to mussel die offs is sedimentation, which smothers and suffocates mussels. To reduce sedimentation within rivers, streams, and tributaries crossed by a project, the Service recommends that that you implement the best management practices found at: http://www.fws.gov/southwest/es/TexasCoastal/FreshwaterMussels.html.

Candidate Conservation Agreements (CCAs) or Candidate Conservation Agreements with Assurances (CCAAs) are voluntary agreements between the Service and public or private entities to implement conservation measures to address threats to candidate species. Implementing conservation efforts before species are listed increases the likelihood that simpler, flexible, and more cost-effective conservation options are available. A CCAA can provide participants with assurances that if they engage in conservation actions, they will not be required to implement additional conservation measures beyond those in the agreement. For additional information on CCAs/CCAAs please visit the Service's website at http://www.fws.gov/endangered/what-we-do/cca.html.

Migratory Birds

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions for the protection of migratory birds. Under the MBTA, taking, killing, or possessing migratory birds is unlawful. Many may nest in trees, brush areas or other suitable habitat. The Service recommends activities requiring vegetation removal or disturbance avoid the peak nesting period of March through August to avoid destruction of individuals or eggs. If project activities must be conducted during this time, we recommend surveying for active nests prior to commencing work. A list of migratory birds may be viewed at http://www.fws.gov/migratorybirds/regulationspolicies/mbta/mbtandx.html.

The bald eagle (*Haliaeetus leucocephalus*) was delisted under the Act on August 9, 2007. Both the bald eagle and the goden eagle (*Aquila chrysaetos*) are still protected under the MBTA and BGEPA. The BGEPA affords both eagles protection in addition to that provided by the MBTA, in particular, by making it unlawful to "disturb" eagles. Under the BGEPA, the Service may issue limited permits to incidentally "take" eagles (e.g., injury, interfering with normal breeding, feeding, or sheltering behavior nest abandonment). For more information on bald and golden eagle management guidlines, we recommend you review information provided at http://www.fws.gov/midwest/eagle/pdf/NationalBaldEagleManagementGuidelines.pdf.

The construction of overhead power lines creates threats of avian collision and electrocution. The Service recommends the installation of underground rather than overhead power lines whenever possible. For new overhead lines or retrofitting of old lines, we recommend that project

developers implement, to the maximum extent practicable, the Avian Power Line Interaction Committee guidelines found at http://www.aplic.org/.

Meteorological and communication towers are estimated to kill millions of birds per year. We recommend following the guidance set forth in the Service Interim Guidelines for Recommendations on Communications Tower Siting, Constructions, Operation and Decommissioning, found online at: http://www.fws.gov/habitatconservation/communicationtowers.html, to minimize the threat of avian mortality at these towers. Monitoring at these towers would provide insight into the effectiveness of the minimization measures. We request the results of any wildlife mortality monitoring at towers associated with this project.

We request that you provide us with the final location and specifications of your proposed towers, as well as the recommendations implemented. A Tower Site Evaluation Form is also available via the above website; we recommend you complete this form and keep it in your files. If meteorological towers are to be constructed, please forward this completed form to our office.

More information concerning sections 7 and 10 of the Act, migratory birds, candidate species, and landowner tools can be found on our website at: http://www.fws.gov/southwest/es/TexasCoastal/ProjectReviews.html.

Wetlands and Wildlife Habitat

Wetlands and riparian zones provide valuable fish and wildlife habitat as well as contribute to flood control, water quality enhancement, and groundwater recharge. Wetland and riparian vegetation provides food and cover for wildlife, stabilizes banks and decreases soil erosion. These areas are inherently dynamic and very sensitive to changes caused by such activities as overgrazing, logging, major construction, or earth disturbance. Executive Order 11990 asserts that each agency shall provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial value of wetlands in carrying out the agency's responsibilities. Construction activities near riparian zones should be carefully designed to minimize impacts. If vegetation clearing is needed in these riparian areas, they should be re-vegetated with native wetland and riparian vegetation to prevent erosion or loss of habitat. We recommend minimizing the area of soil scarification and initiating incremental re-establishment of herbaceous vegetation at the proposed work sites. Denuded and/or disturbed areas should be re-vegetated with a mixture of native legumes and grasses. Species commonly used for soil stabilization are listed in the Texas Department of Agriculture's (TDA) Native Tree and Plant Directory, available from TDA at P.O. Box 12847, Austin, Texas 78711. The Service also urges taking precautions to ensure sediment loading does not occur to any receiving streams in the proposed project area. To prevent and/or minimize soil erosion and compaction associated with construction activities, avoid any unnecessary clearing of vegetation, and follow established rights-of-way whenever possible. All machinery and petroleum products should be stored outside the floodplain and/or wetland area during construction to prevent possible contamination of water and soils.

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If your project will involve filling, dredging, or trenching of a wetland or riparian area it may require a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (COE). For permitting requirements please contact the U.S. Corps of Engineers, District Engineer, P.O. Box 1229, Galveston, Texas 77553-1229, (409) 766-3002.

Beneficial Landscaping

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If we can be of further assistance, or if you have any questions about these comments, please contact 281/286-8282 if your project is in southeast Texas, or 361/994-9005, ext. 246, if your project is in southern Texas. Please refer to the Service consultation number listed above in any future correspondence regarding this project.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
(281) 286-8282

Project Summary

Consultation Code: 02ETTX00-2020-SLI-0662

Event Code: 02ETTX00-2020-E-01349

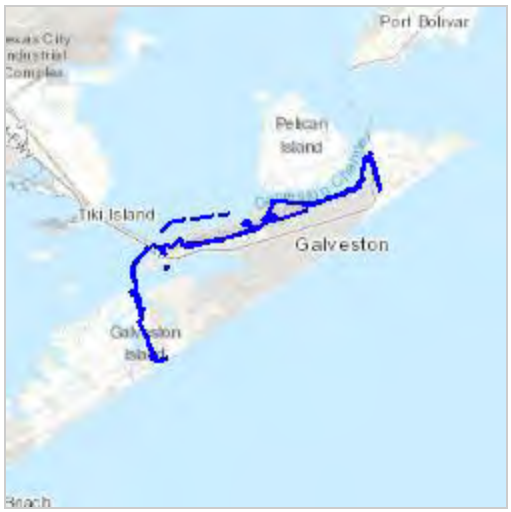
Project Name: Coastal Texas Protection and Restoration Study - CSRM - Galveston Ring Levee

Project Type: LAND - FLOODING

Project Description: This measure is referred to as the Galveston Ring Levee and is being evaluated as part of the Coastal Texas Protection and Restoration Study. It would include the construction of a flood wall that would tie into the existing seawall and would protect a large portion of Galveston Island from storm surge coming from Galveston Bay. The components of the Galveston Ring Levee have a stickup height of +14-foot NAVD88, have a foundation that includes sub piling that extends approximately 45 feet below the bottom of the footing. The uploaded shape file includes both the permanent footprint and the temporary construction ROW. The floodwall would tie into high ground near the west end of the seawall and would extend northward to cross Offatts Bayou would then run across I-45, along the northside of Galveston and would tie back into the Seawall near the ferry landing. The Offatts bayou crossing would be comprised of a combi/floodwall and a surge barrier gate system. Specifically, navigation structures would be a sector gate with a sill depth of -15 and an opening of 130 ft. The overall footprint of the gate structure on the north and south sides of the channel will be 160ft by 140ft for an overall footprint of 160ft by 410ft. The vertical lift gate that will have a sill elevation of -10 and an opening 80ft wide. The gate will have a footprint of 80ft by 140ft and vertical clearance when open of 50ft. Circulation gates are sluice gates and will be in 2 sections. Section 1 is 544ft of gates that will have a sill elevation of -5 and a gate size of 15ft by 10ft for a total of 32 gates. Section 2 is 850ft of gates that will have a sill elevation of -5 and a gate size of 15ft by 10ft for a total of 50 gates.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/29.301904664977613N94.81672071673248W



Counties: Galveston, TX

Endangered Species Act Species

There is a total of 9 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
West Indian Manatee *Trichechus manatus* There is **final** critical habitat for this species. Your location is outside the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4469	Threatened

Birds

NAME	STATUS
Attwater's Greater Prairie-chicken *Tympanuchus cupido attwateri* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7259	Endangered
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Texas Coastal Ecological Services Field Office
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Houston, TX 77058
Phone: (281) 286-8282 Fax: (281) 488-5882
http://www.fws.gov/southwest/es/TexasCoastal/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

In Reply Refer To: January 02, 2020
Consultation Code: 02ETTX00-2020-SLI-0655
Event Code: 02ETTX00-2020-E-01332
Project Name: Coastal Texas Protection and Restoration Study - CSRM - South Padre Island

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The U.S. Fish and Wildlife Service (Service) field offices in Clear Lake, Tx, and Corpus Christi, Tx, have combined administratively to form the Texas Coastal Ecological Services Field Office. A map of the Texas Coastal Ecological Services Field Office area of responsibility can be found at: http://www.fws.gov/southwest/es/TexasCoastal/Map.html. All project related correspondence should be sent to the field office responsible for the area in which your project occurs. For projects located in southeast Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; 17629 El Camino Real Ste. 211; Houston, Texas 77058. For projects located in southern Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; P.O. Box 81468; Corpus Christi, Texas 78468-1468. For projects located in six counties in southern Texas (Cameron, Hidalgo, Starr, Webb, Willacy, and Zapata) please write: Santa Ana NWR, ATTN: Ecological Services Sub Office, 3325 Green Jay Road, Alamo, Texas 78516.

The enclosed species list identifies federally threatened, endangered, and proposed to be listed species; designated critical habitat; and candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project.

New information from updated surveys, changes in the abundance and distribution of species, changes in habitat conditions, or other factors could change the list. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the ECOS-IPaC website http://ecos.fws.gov/ipac/ at regular intervals during project planning and implementation for updates to species list and information. An updated list may be

requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

Candidate species have no protection under the Act but are included for consideration because they could be listed prior to the completion of your project. The other species information should help you determine if suitable habitat for these listed species exists in any of the proposed project areas or if project activities may affect species on-site, off-site, and/or result in "take" of a federally listed species.

"Take" is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. In addition to the direct take of an individual animal, habitat destruction or modification can be considered take, regardless of whether it has been formally designated as critical habitat, if the activity results in the death or injury of wildlife by removing essential habitat components or significantly alters essential behavior patterns, including breeding, feeding, or sheltering.

Section 7

Section 7 of the Act requires that all Federal agencies consult with the Service to ensure that actions authorized, funded or carried out by such agencies do not jeopardize the continued existence of any listed threatened or endangered species or adversely modify or destroy critical habitat of such species. It is the responsibility of the Federal action agency to determine if the proposed project may affect threatened or endangered species. If a "may affect" determination is made, the Federal agency shall initiate the section 7 consultation process by writing to the office that has responsibility for the area in which your project occurs.

Is not likely to adversely affect - the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effects. The Federal agency or the designated non-Federal representative should seek written concurrence from the Service that adverse effects have been eliminated. Be sure to include all of the information and documentation used to reach your decision with your request for concurrence. The Service must have this documentation before issuing a concurrence.

Is likely to adversely affect - adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. If the overall effect of the proposed action is beneficial to the listed species but also is likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species. An "is likely to adversely affect" determination requires the Federal action agency to initiate formal section 7 consultation with this office.

No effect - the proposed action will not affect federally listed species or critical habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area). No further coordination or contact with the Service is necessary. However, if the

project changes or additional information on the distribution of listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered.

Regardless of your determination, the Service recommends that you maintain a complete record of the evaluation, including steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related articles.

Please be advised that while a Federal agency may designate a non-Federal representative to conduct informal consultations with the Service, assess project effects, or prepare a biological assessment, the Federal agency must notify the Service in writing of such a designation. The Federal agency shall also independently review and evaluate the scope and contents of a biological assessment prepared by their designated non-Federal representative before that document is submitted to the Service.

The Service's Consultation Handbook is available online to assist you with further information on definitions, process, and fulfilling Act requirements for your projects at: http://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf

Section 10

If there is no federal involvement and the proposed project is being funded or carried out by private interests and/or non-federal government agencies, and the project as proposed may affect listed species, a section 10(a)(1)(B) permit is recommended. The Habitat Conservation Planning Handbook is available at: http://www.fws.gov/endangered/esa-library/pdf/HCP_Handbook.pdf

Service Response

Please note that the Service strives to respond to requests for project review within 30 days of receipt, however, this time period is not mandated by regulation. Responses may be delayed due to workload and lack of staff. Failure to meet the 30-day timeframe does not constitute a concurrence from the Service that the proposed project will not have impacts to threatened and endangered species.

Proposed Species and/or Proposed Critical Habitat

While consultations are required when the proposed action may affect listed species, section 7(a)(4) was added to the ESA to provide a mechanism for identifying and resolving potential conflicts between a proposed action and proposed species or proposed critical habitat at an early planning stage. The action agency should seek conference from the Service to assist the action agency in determining effects and to advise the agency on ways to avoid or minimize adverse effect to proposed species or proposed critical habitat.

Candidate Species

Candidate species are species that are being considered for possible addition to the threatened and endangered species list. They currently have no legal protection under the ESA. If you find you have potential project impacts to these species the Service would like to provide technical

assistance to help avoid or minimize adverse effects. Addressing potential impacts to these species at this stage could better provide for overall ecosystem healh in the local area and ay avert potential future listing.

Several species of freshwater mussels occur in Texas and four are candidates for listing under the ESA. The Service is also reviewing the status of six other species for potential listing under the ESA. One of the main contributors to mussel die offs is sedimentation, which smothers and suffocates mussels. To reduce sedimentation within rivers, streams, and tributaries crossed by a project, the Service recommends that that you implement the best management practices found at: http://www.fws.gov/southwest/es/TexasCoastal/FreshwaterMussels.html.

Candidate Conservation Agreements (CCAs) or Candidate Conservation Agreements with Assurances (CCAAs) are voluntary agreements between the Service and public or private entities to implement conservation measures to address threats to candidate species. Implementing conservation efforts before species are listed increases the likelihood that simpler, flexible, and more cost-effective conservation options are available. A CCAA can provide participants with assurances that if they engage in conservation actions, they will not be required to implement additional conservation measures beyond those in the agreement. For additional information on CCAs/CCAAs please visit the Service's website at http://www.fws.gov/endangered/what-we-do/cca.html.

Migratory Birds

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions for the protection of migratory birds. Under the MBTA, taking, killing, or possessing migratory birds is unlawful. Many may nest in trees, brush areas or other suitable habitat. The Service recommends activities requiring vegetation removal or disturbance avoid the peak nesting period of March through August to avoid destruction of individuals or eggs. If project activities must be conducted during this time, we recommend surveying for active nests prior to commencing work. A list of migratory birds may be viewed at http://www.fws.gov/migratorybirds/regulationspolicies/mbta/mbtandx.html.

The bald eagle (*Haliaeetus leucocephalus*) was delisted under the Act on August 9, 2007. Both the bald eagle and the goden eagle (*Aquila chrysaetos*) are still protected under the MBTA and BGEPA. The BGEPA affords both eagles protection in addition to that provided by the MBTA, in particular, by making it unlawful to "disturb" eagles. Under the BGEPA, the Service may issue limited permits to incidentally "take" eagles (e.g., injury, interfering with normal breeding, feeding, or sheltering behavior nest abandonment). For more information on bald and golden eagle management guidlines, we recommend you review information provided at http://www.fws.gov/midwest/eagle/pdf/NationalBaldEagleManagementGuidelines.pdf.

The construction of overhead power lines creates threats of avian collision and electrocution. The Service recommends the installation of underground rather than overhead power lines whenever possible. For new overhead lines or retrofitting of old lines, we recommend that project

developers implement, to the maximum extent practicable, the Avian Power Line Interaction Committee guidelines found at http://www.aplic.org/.

Meteorological and communication towers are estimated to kill millions of birds per year. We recommend following the guidance set forth in the Service Interim Guidelines for Recommendations on Communications Tower Siting, Constructions, Operation and Decommissioning, found online at: http://www.fws.gov/habitatconservation/communicationtowers.html, to minimize the threat of avian mortality at these towers. Monitoring at these towers would provide insight into the effectiveness of the minimization measures. We request the results of any wildlife mortality monitoring at towers associated with this project.

We request that you provide us with the final location and specifications of your proposed towers, as well as the recommendations implemented. A Tower Site Evaluation Form is also available via the above website; we recommend you complete this form and keep it in your files. If meteorological towers are to be constructed, please forward this completed form to our office.

More information concerning sections 7 and 10 of the Act, migratory birds, candidate species, and landowner tools can be found on our website at: http://www.fws.gov/southwest/es/TexasCoastal/ProjectReviews.html.

Wetlands and Wildlife Habitat

Wetlands and riparian zones provide valuable fish and wildlife habitat as well as contribute to flood control, water quality enhancement, and groundwater recharge. Wetland and riparian vegetation provides food and cover for wildlife, stabilizes banks and decreases soil erosion. These areas are inherently dynamic and very sensitive to changes caused by such activities as overgrazing, logging, major construction, or earth disturbance. Executive Order 11990 asserts that each agency shall provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial value of wetlands in carrying out the agency's responsibilities. Construction activities near riparian zones should be carefully designed to minimize impacts. If vegetation clearing is needed in these riparian areas, they should be re-vegetated with native wetland and riparian vegetation to prevent erosion or loss of habitat. We recommend minimizing the area of soil scarification and initiating incremental re-establishment of herbaceous vegetation at the proposed work sites. Denuded and/or disturbed areas should be re-vegetated with a mixture of native legumes and grasses. Species commonly used for soil stabilization are listed in the Texas Department of Agriculture's (TDA) Native Tree and Plant Directory, available from TDA at P.O. Box 12847, Austin, Texas 78711. The Service also urges taking precautions to ensure sediment loading does not occur to any receiving streams in the proposed project area. To prevent and/or minimize soil erosion and compaction associated with construction activities, avoid any unnecessary clearing of vegetation, and follow established rights-of-way whenever possible. All machinery and petroleum products should be stored outside the floodplain and/or wetland area during construction to prevent possible contamination of water and soils.

Wetlands and riparian areas are high priority fish and wildlife habitat, serving as important sources of food, cover, and shelter for numerous species of resident and migratory wildlife. Waterfowl and other migratory birds use wetlands and riparian corridors as stopover, feeding, and nesting areas. We strongly recommend that the selected project site not impact wetlands and riparian areas, and be located as far as practical from these areas. Migratory birds tend to concentrate in or near wetlands and riparian areas and use these areas as migratory flyways or corridors. After every effort has been made to avoid impacting wetlands, you anticipate unavoidable wetland impacts will occur; you should contact the appropriate U.S. Army Corps of Engineers office to determine if a permit is necessary prior to commencement of construction activities.

If your project will involve filling, dredging, or trenching of a wetland or riparian area it may require a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (COE). For permitting requirements please contact the U.S. Corps of Engineers, District Engineer, P.O. Box 1229, Galveston, Texas 77553-1229, (409) 766-3002.

Beneficial Landscaping

In accordance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping (42 C.F.R. 26961), where possible, any landscaping associated with project plans should be limited to seeding and replanting with native species. A mixture of grasses and forbs appropriate to address potential erosion problems and long-term cover should be planted when seed is reasonably available. Although Bermuda grass is listed in seed mixtures, this species and other introduced species should be avoided as much as possible. The Service also recommends the use of native trees, shrubs, and herbaceous species that are adaptable, drought tolerant and conserve water.

State Listed Species

The State of Texas protects certain species. Please contact the Texas Parks and Wildlife Department (Endangered Resources Branch), 4200 Smith School Road, Austin, Texas 78744 (telephone 512/389-8021) for information concerning fish, wildlife, and plants of State concern or visit their website at: http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/listed_species/.

If we can be of further assistance, or if you have any questions about these comments, please contact 281/286-8282 if your project is in southeast Texas, or 361/994-9005, ext. 246, if your project is in southern Texas. Please refer to the Service consultation number listed above in any future correspondence regarding this project.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Texas Coastal Ecological Services Field Office
17629 El Camino Real #211
Houston, TX 77058
(281) 286-8282

Project Summary

Consultation Code: 02ETTX00-2020-SLI-0655

Event Code: 02ETTX00-2020-E-01332

Project Name: Coastal Texas Protection and Restoration Study - CSRM - South Padre Island

Project Type: LAND - FLOODING

Project Description: The selected plan for the South Padre Island CSRM feature consist of a beach fill template with an equilibrium dune height of 12.5 feet NAVD 88. The dune would have a width of 20 feet and berm width of 100 feet. The berm height would be 4-foot NAVD 88. It is assumed a re-nourishment for the template would be a 10-year interval. Initial construction would require an estimated 234,600 cy of sediment. Renourishment estimates are indicated in Table 6-10. A hopper dredge and gravity pipe will dredge and redirect the sediment from the Brownsville jetties to the shoreline. Once placed, the sediment will be shaped to the template utilizing earth moving equipment such as bulldozers and graders.

Table 6 10. Renourishment Estimates
Cycle Year Quantity (cy)
First Cycle 10 436,400
Second Cycle 20 801,200
Third Cycle 30 1,099,400
Fourth Cycle 40 1,240,400
Total 3,812,000

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/26.112204591500046N97.1636029759265W

Counties: Cameron, TX

Endangered Species Act Species

There is a total of 14 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 1 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Gulf Coast Jaguarundi *Herpailurus (=Felis) yagouaroundi cacomitli* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3945	Endangered
Ocelot *Leopardus (=Felis) pardalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4474	Endangered
West Indian Manatee *Trichechus manatus* There is **final** critical habitat for this species. Your location is outside the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4469	Threatened

Birds

NAME	STATUS
Least Tern *Sterna antillarum*	Endangered
Northern Aplomado Falcon *Falco femoralis septentrionalis*	Endangered
Piping Plover *Charadrius melodus*	Threatened
Red Knot *Calidris canutus rufa*	Threatened

Least Tern *Sterna antillarum* — Endangered

Population: interior pop.

No critical habitat has been designated for this species.

This species only needs to be considered under the following conditions:

- Wind Related Projects Within Migratory Route

Species profile: https://ecos.fws.gov/ecp/species/8505

Northern Aplomado Falcon *Falco femoralis septentrionalis* — Endangered

Population: Wherever found, except where listed as an experimental population

No critical habitat has been designated for this species.

Species profile: https://ecos.fws.gov/ecp/species/1923

Piping Plover *Charadrius melodus* — Threatened

Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered.

There is **final** critical habitat for this species. Your location overlaps the critical habitat.

Species profile: https://ecos.fws.gov/ecp/species/6039

Red Knot *Calidris canutus rufa* — Threatened

No critical habitat has been designated for this species.

Species profile: https://ecos.fws.gov/ecp/species/1864

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Flowering Plants

NAME	STATUS
South Texas Ambrosia *Ambrosia cheiranthifolia* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3331	Endangered
Texas Ayenia *Ayenia limitaris* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4942	Endangered

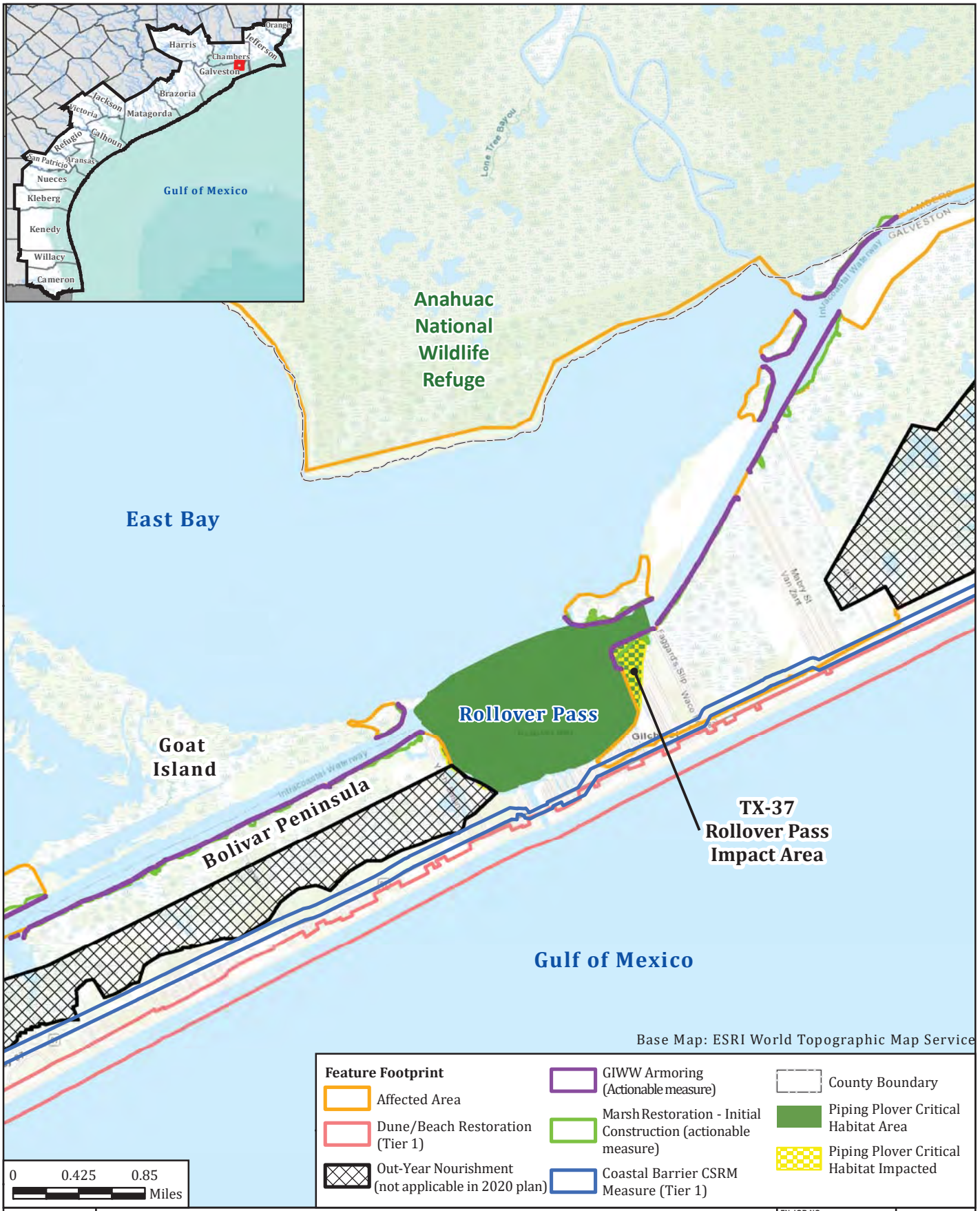
Critical habitats

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Piping Plover *Charadrius melodus* https://ecos.fws.gov/ecp/species/6039#crithab	Final

Attachment C

Piping Plover Critical Habitat in the Action Area

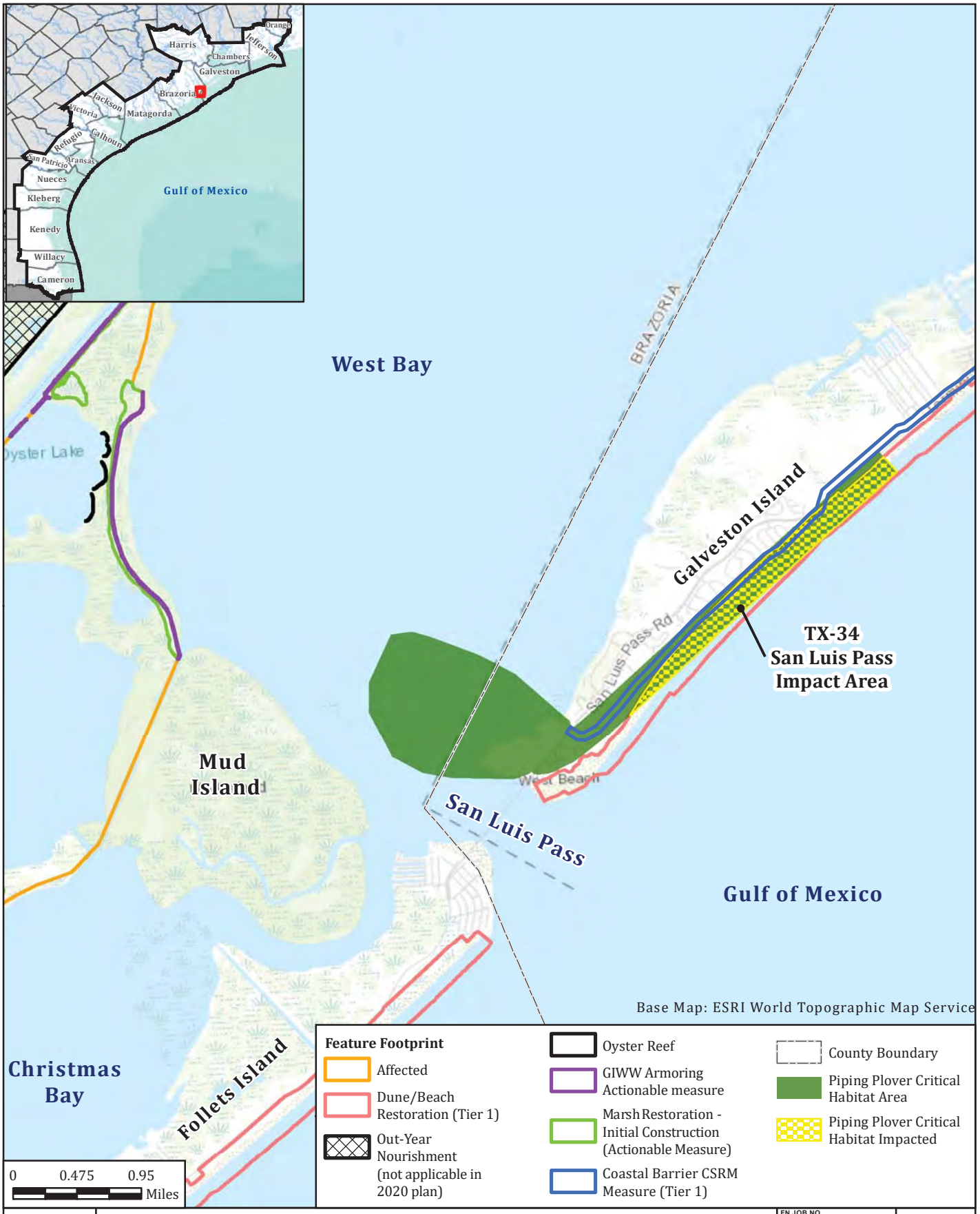


USACE COASTAL TEXAS PROTECTION AND RESTORATION STUDY

Federally Designated Critical Habitat
Piping Plover

FN JOB NO	TGL18185
FILE NAME	Figure2a_Critical_Habitat.mxd
DATE	7/10/2018
SCALE	
DESIGNED	KLC
DRAFTED	02588

NAD 1983 StatePlane Texas Central FIPS 4203 Feet

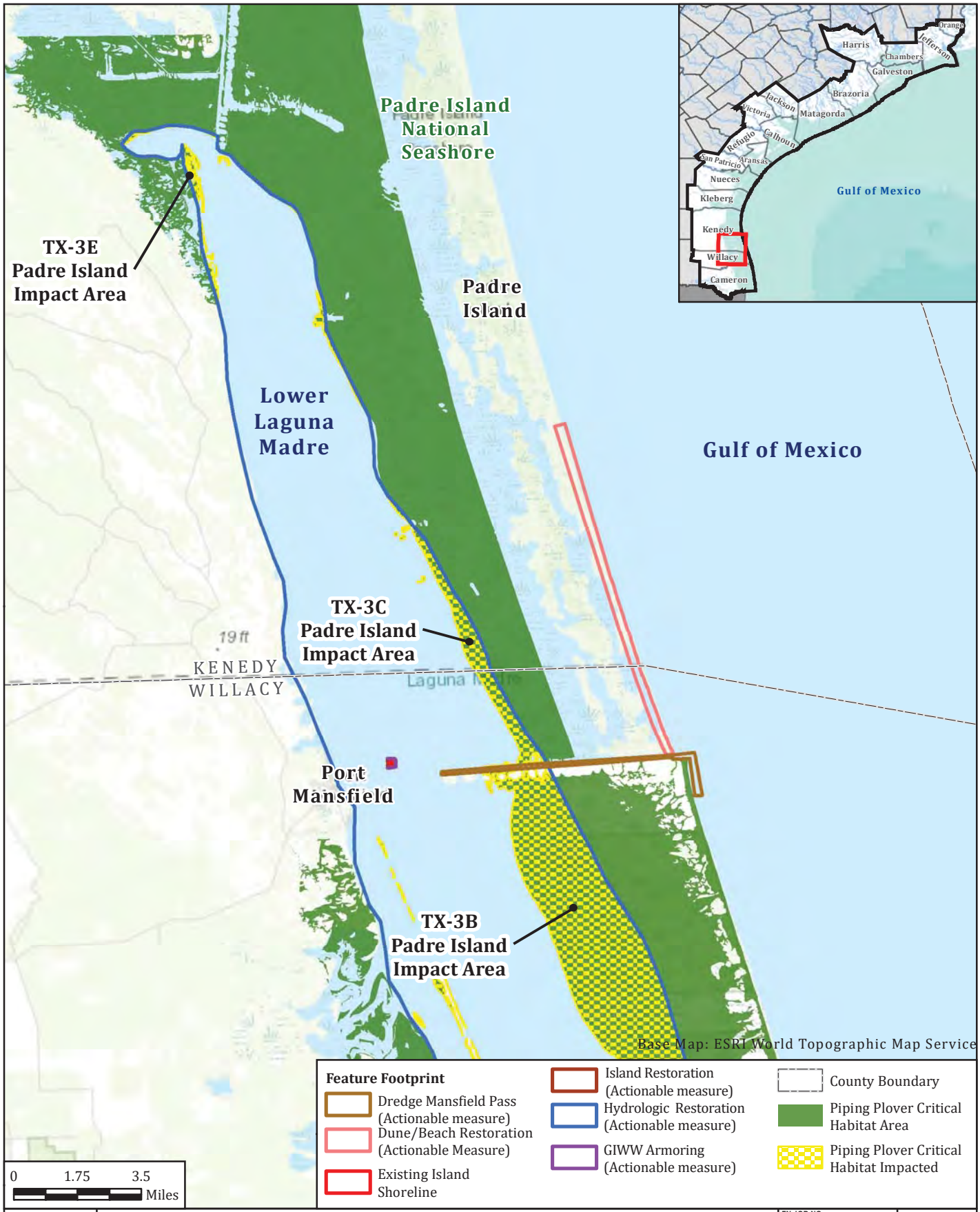


USACE COASTAL TEXAS PROTECTION AND RESTORATION STUDY

Federally Designated Critical Habitat
Piping Plover

FN JOB NO	TGL18185
FILE NAME	Figure2c_Critical_Habitat.mxd
DATE	7/10/2018
SCALE	
DESIGNED	KLC
DRAFTED	02588

NAD 1983 StatePlane Texas Central FIPS 4203 Feet

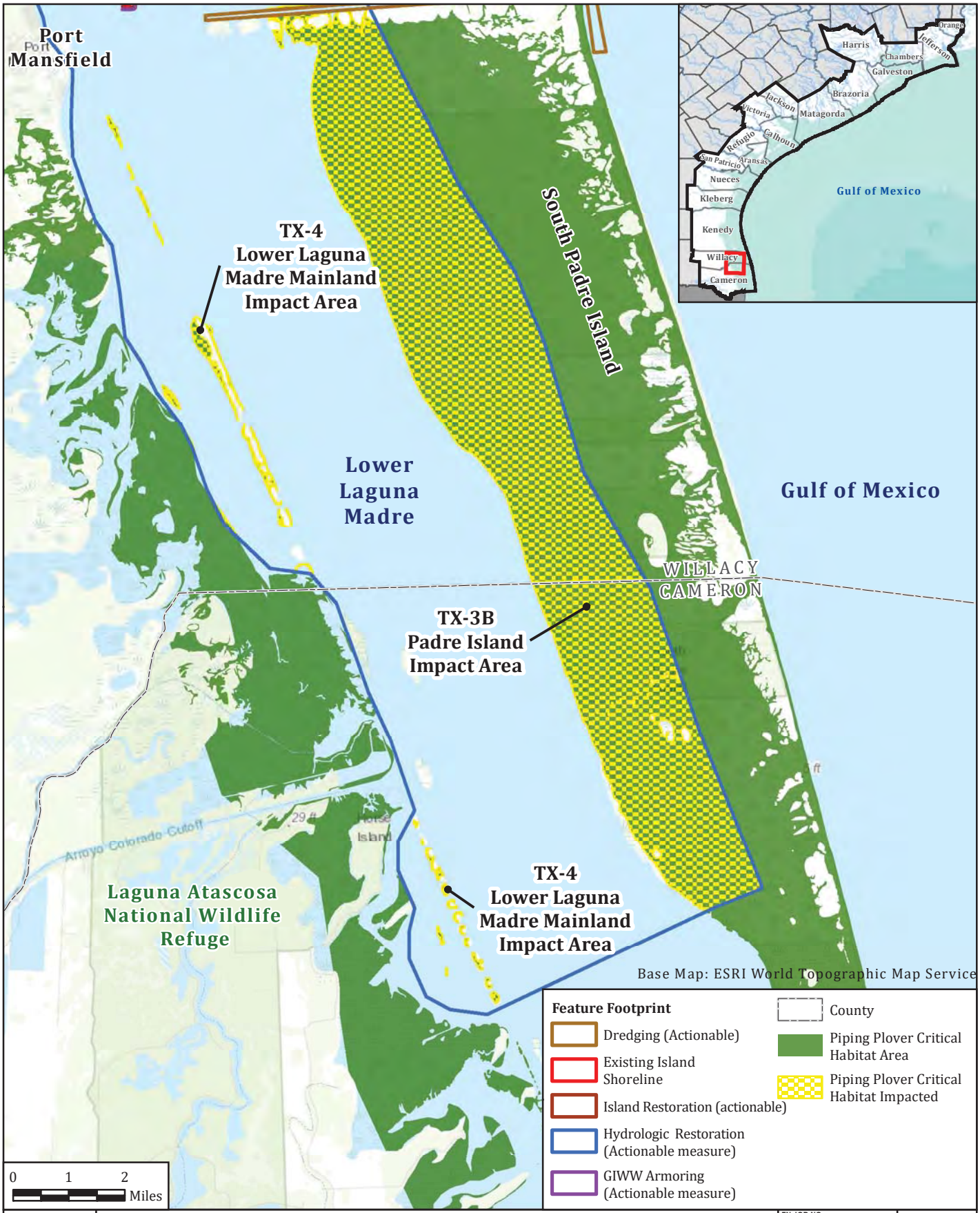


USACE COASTAL TEXAS PROTECTION AND RESTORATION STUDY

Federally Designated Critical Habitat Piping Plover

FN JOB NO	TGL18185
FILE NAME	Figure2d_Critical_Habitat.mxd
DATE	7/9/2018
SCALE	
DESIGNED	KLC
DRAFTED	02588

NAD 1983 StatePlane Texas Central FIPS 4203 Feet



USACE COASTAL TEXAS PROTECTION AND RESTORATION STUDY

Federally Designated Critical Habitat
Piping Plover

FN JOB NO	TGL18185
FILE NAME	Figure2e_Critical_Habitat.mxd
DATE	7/9/2018
SCALE	
DESIGNED	KLC
DRAFTED	02588

NAD 1983 StatePlane Texas Central FIPS 4203 Feet