DETAILED PROJECT REPORT AND ENVIRONMENTAL ASSESSMENT

Continuing Authorities Program Section 204

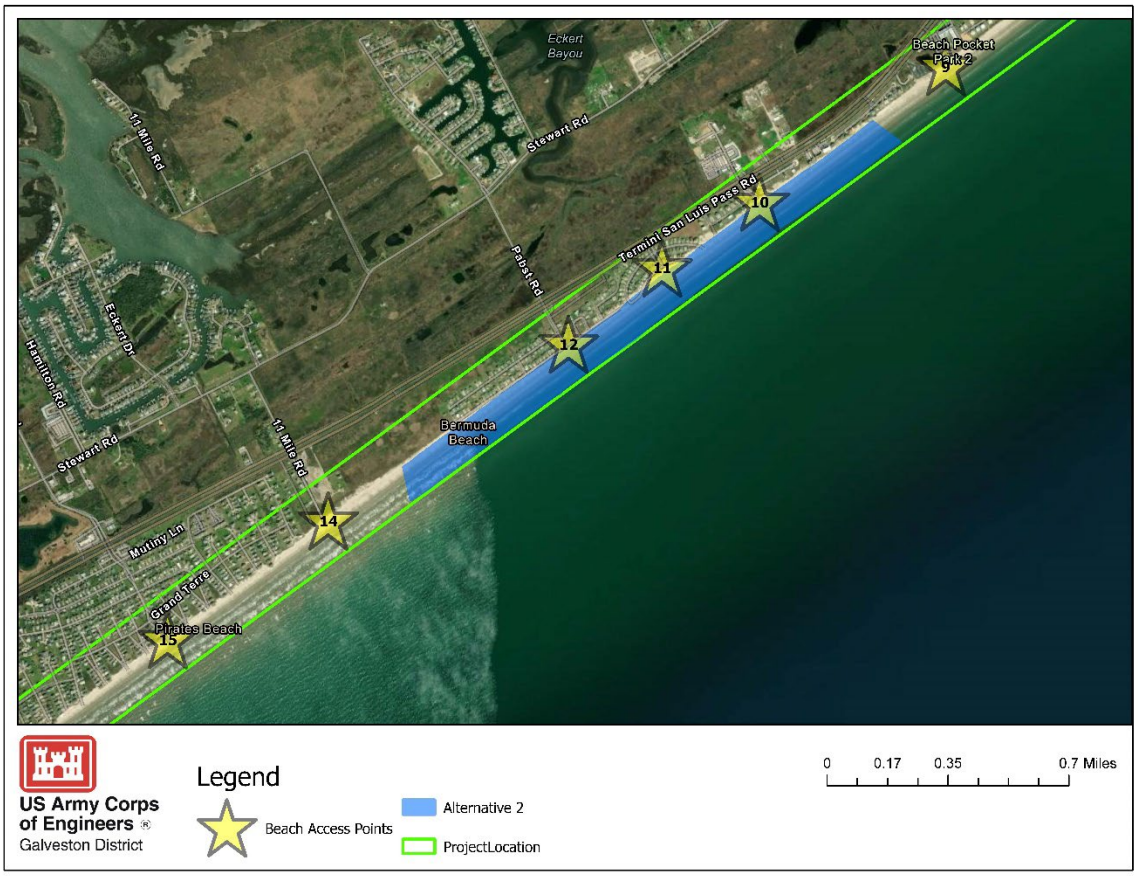
Regional Sediment Management (Beneficial Use of Dredged Material)

For

Galveston Island Coastal Erosion,

City of Galveston, Galveston County, Texas

February 2023



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US Army Corps of Engineers®
Galveston District

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GALVESTON ISLAND COASTAL EROSION
CITY OF GALVESTON, GALVESTON COUNTY, TEXAS
Detailed Project Report and Environment Assessment
Continuing Authorities Program
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FINAL

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1 Study Information

This final Detailed Project Report and Environmental Assessment (DPR/EA) contains information relevant for both a Planning and Design Analysis used as a planning document by the U.S. Army Corps of Engineers (USACE) and an EA to satisfy the National Environmental Policy Act (NEPA).

The City of Galveston Park Board of Trustees is the Non-Federal Sponsor for the feasibility study.

1.1 Study Purpose and Authority

November 23, 2020, the Galveston Island Park Board of Trustees, sent a letter to the Galveston District Engineer requesting a study under Section 204 of the Water Resources Development Act of 1992. Sec 204 provides the authority to plan, design, and build projects in connection with dredging of authorized Federal navigation projects. The costs of the Section 204 project are those costs in excess of the costs necessary to carry out the dredging for construction, operation, or maintenance of an authorized Federal water resources project in the most cost-effective way, consistent with economic, engineering, and environmental criteria. The study is conducted at Federal expense. The sponsor understands and agrees with the study and project requirements, including cost sharing. See Attachments 1 and 2.

As the project's incremental federal costs of beach nourishment exceed $300,000 of the cost of dredging Galveston Entrance Channel Reach (a portion of the FNP), the project's incremental costs must be justified by demonstrating that the project benefits are greater than its incremental costs with a benefit-to-cost ratio of 1.0 or greater. The benefits achieved are those that would normally be considered in a coastal storm risk reduction project. All the necessary conditions for federal participation, consistent with its project purpose, are to be met. Federal and state resource agencies must support the selected disposal method. The disposal method is subject to appropriate National Environmental Policy Act requirements.

1.2 Federal Interest

The Federal Interest Determination (FID) approved by the Southwestern Division Commander on January 19, 2021, indicating federal interest for the beneficial use of dredged materials from the Galveston Entrance Channel Reach project on Galveston Island. The material placement study area extends from 8 Mile Road approximately five miles WSW along the Gulf coast to 13 Mile Road. The Federal interest in the project is indicated as the benefits of preventing future coastal storm damages to structures and infrastructure on this section of developed coastline on West Galveston Island would be greater than the incremental cost of placing sand dredged from the Galveston Entrance Channel Reach onto the public beach without adverse environmental impacts.

1.3 Purpose and Need for the Project

The project purpose is to address coastal erosion for the protection of life and property on Galveston Island. Beach erosion between 8 Mile Road and 13 Mile Road risks

homes and public infrastructure including roads, utilities, and communication networks. As such, this project would reduce coastal erosion damages and improve human life and safety. The study purpose is to determine whether beneficial use of dredged material is a cost-effective solution.

1.4 Study Scope

The study scope is for placement of dredged material based on the sand quantity from the required operations and maintenance dredging of the Galveston Navigation Channel. The length of beach to be nourished is dependent on the quantity of dredged beach quality sand and the amount of sand required based on the existing and with plan beach profiles. Sand placement is to ameliorate the coastal erosion damages for a segment of the island's developed area adjacent to the public beaches.

1.5 Study Location and Project Area

Galveston Island is a barrier island between the Gulf of Mexico to the east and the Texas mainland on West Bay 51 miles southeast of Houston. The Galveston Island study area is on the Gulf of Mexico seaward of Texas Highway 3005 from the end of the 10-mile-long Galveston Seawall extending for approximately five miles to 13 Mile Road. The following is a map of the location and the project area. See Figure 1.

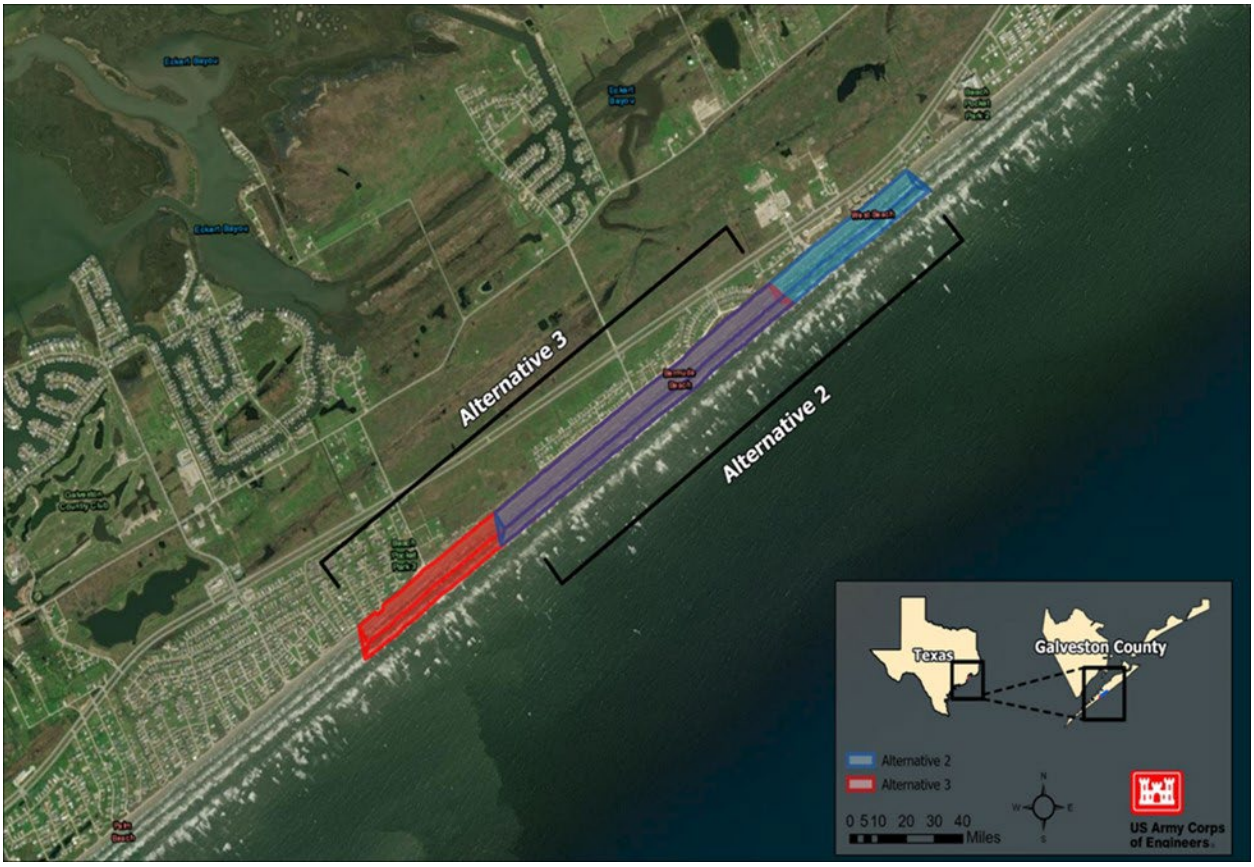

Figure 1 - Study Location

Two alternative project areas are shown in the previous figure. Alternative 2 extends from Sunbather Lane for 1.7 miles west. Alternative 3 extends from Hershey Beach Drive for 1.7 miles west to Ghost Crab Lane.

1.5.1 Congressional Representation

- Senators John Cornyn and Ted Cruz
- Representative Randy Weber (District 14)

1.6 Federal Navigation Project

1.6.1 Existing Navigation

The Galveston Harbor and Channel, the Federal Navigation Project, is maintained by the Federal government for navigation purposes. Federal maintenance dredging of the navigation channel is carried out periodically and generally in odd years using a hopper dredge. There is an estimated 530,000 cubic yards of beach quality sand that could be made available for beach nourishment. The sandy dredge material is to be placed by hopper dredge. Some sand placement has previously been done for beach nourishment on Galveston Island further east (Figure 2).

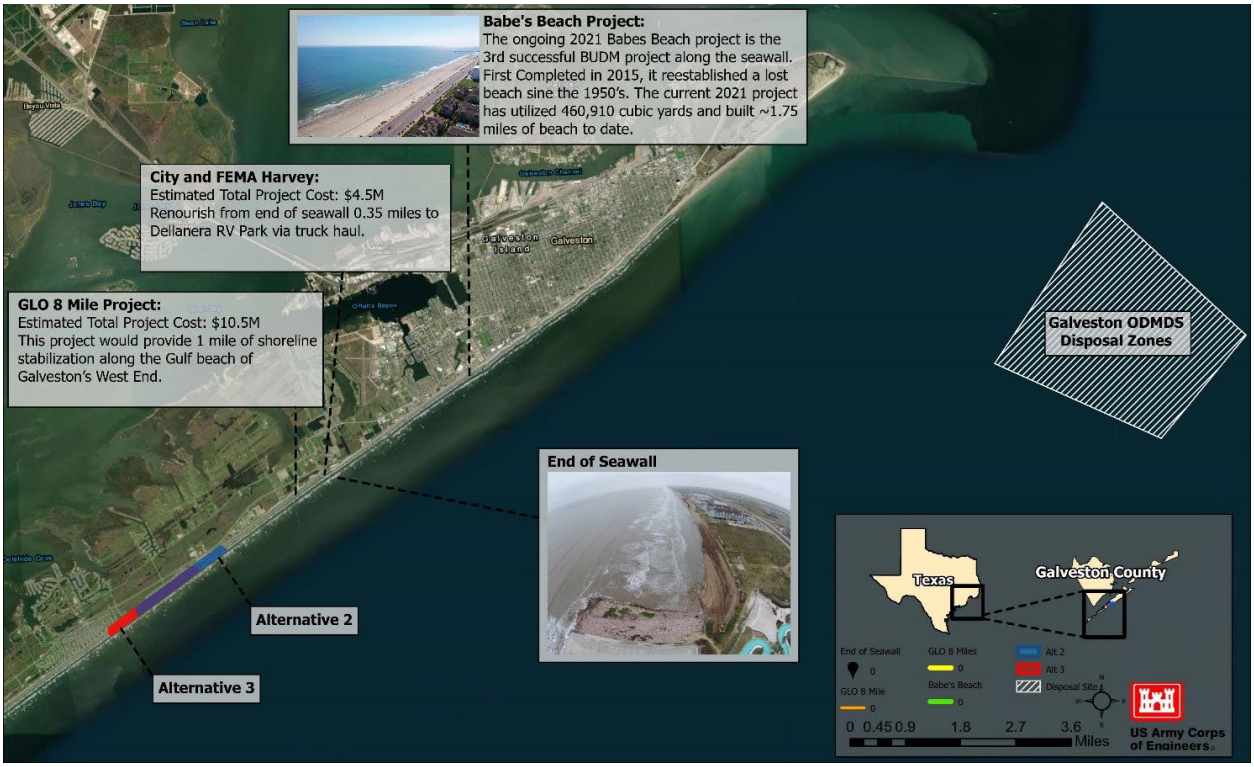

Figure 2 - Existing Projects

1.6.2 Prior Reports and Existing Water Projects

The municipal Port of Galveston was established by Mexico in 1825. It is on the eastern end of Galveston Island 9.3 miles from the open Gulf. It consists of the Galveston Harbor and Channel, the south side of Pelican Island, the north side of Galveston Island

on the Intercoastal Waterway, and the entrance to Galveston Bay. The Houston Ship Channel goes through Galveston Bay with the world's largest number of vessel transits. The Ocean Disposal Material Disposal Site (ODMDS) is shown in Figure 2. Galveston Seawall was constructed in 1902.

The Coastal Texas Protection and Restoration Feasibility Study recommended plan includes a beach and dune system to reduce storm surge impacts (Figure 3). However, construction of the Coastal Texas project isn't expected to start until after 2032 with a completion date estimated by 2043. Construction of this Section 204 is expected to start in 2025 with a design life of eight to ten years, or until 2033 or 2035.

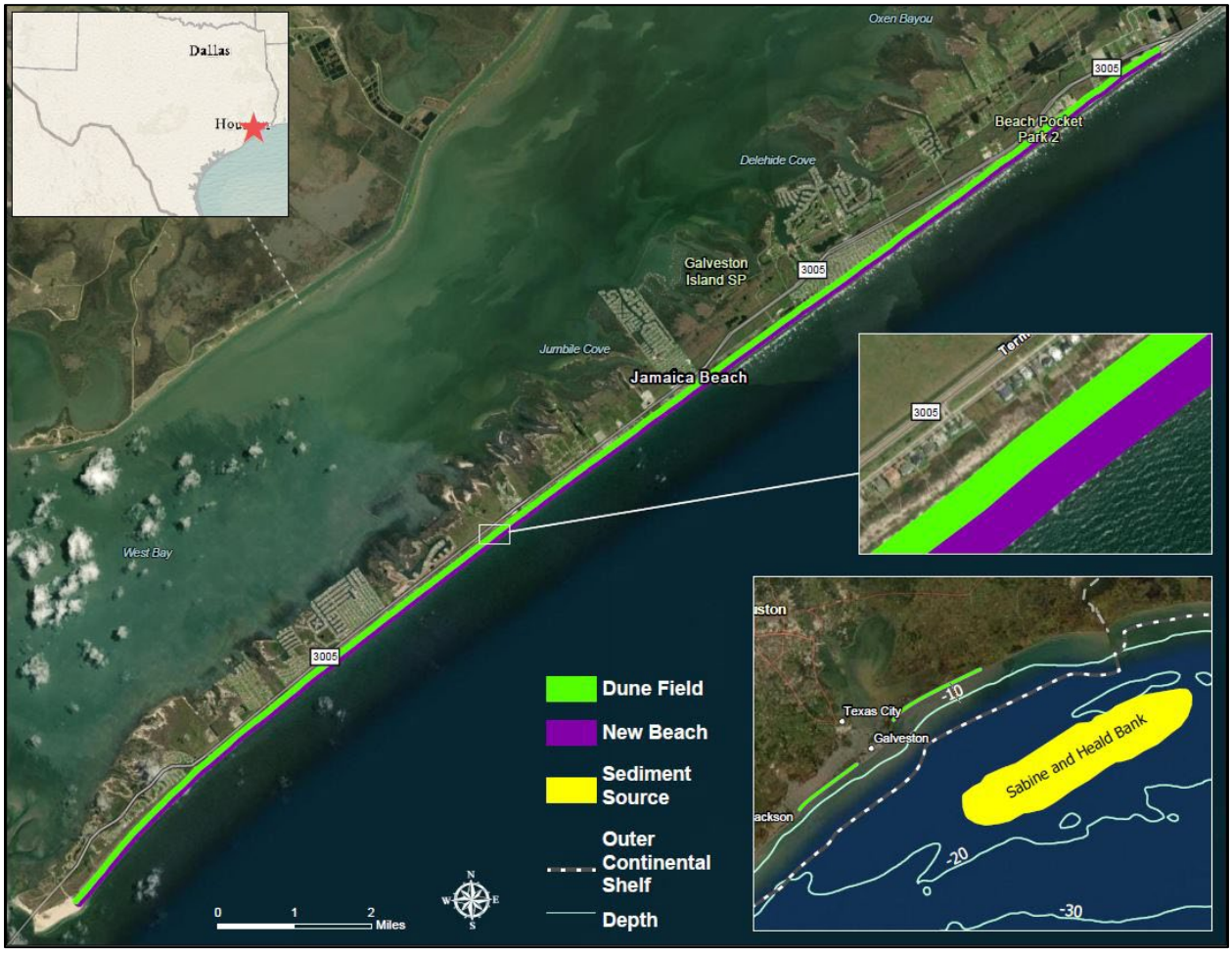

Figure 3 – Coastal Texas Galveston Beach and Dune

The City of Galveston has a Sediment Management Plan for which implementation of this study/project is included. The Section 204 project has the potential to delay erosion towards Highway 3005, an essential evacuation route, and homes prior to the construction of the Coastal Texas project.

1.6.3 Current Projects

Babe's Beach sand nourishment project (Figure 2) provides data to refine project design. Galveston Entrance Channel Reach Operation and Maintenance (O&M)

dredging occurred in 2018 under the Harvey Supplemental Program that provided base plan indications of cost; incremental cost for work done in 2019 was $8M for BUDM placement. The Entrance Channel O&M dredging in 2021 continued into March 2022; the next award, February 2023 includes placement option for Babes Beach. Galveston Park Board and FEMA have a beach restoration project in planning that will renourish the first 0.35 miles of beach from end of the seawall via truck haul. A GLO project is renourishing one mile of shoreline from the end of the seawall approximately down to 8 Mile Road. The Port of Galveston will have a deepened portion of the Galveston Harbor and Channel to accommodate larger vessels throughout the port that increases capacity, while enabling improved operational safety for a nearly $11M cost funded in 2022. City of Galveston has requested a permit to construct bulkheads at the Three Towers condos footprint for protection of the foundations. Also, at Bermuda Beach, they are installing Bumper Blades, an anti-submersion system to resist and reduce the destructive impact of submersion waves. The Coastal Texas Protection and Restoration Feasibility Study (USACE, 2021) proposes a large-scale nourishment project requiring large volumes of sand pumped from offshore sources at a higher cost relative to BU of Galveston Entrance Channel Reach material. Current construction completion is scheduled for year 2043 and proposes an engineered double dune system to provide storm surge protection to reduce flood risk damages to structures. Coastal Texas would not receive benefits from this Section 204 as there would be no overlap of either construction or design life.

1.7 Problems and Opportunities

A problem is an undesirable condition in need of a solution. An opportunity is set of circumstances that makes it possible to address a problem.

Coastal erosion and storm events have caused major damage to Galveston's infrastructure, tax base and economy. Beach erosion between 8 Mile Road and 13 Mile Road poses risks to homes and public infrastructure including roads, utilities, communications, and networks. The opportunity exists to provide beach nourishment to a segment of the public access beaches to alleviate erosion damages to homes and infrastructure of Galveston Island's developed area.

Similar BU nourishment was applied to the nearby Babe's Beach, successfully restoring the once nonexistent beach and preventing costly damage to the Seawall, as seen in the Google Earth aerial imagery below. The imagery shows the beach erosion over time (2006), reaching to the seawall and Texas Highway 3005 (2014) before sand placement in 2016 restored the beach protecting the seawall and highway with resumption of beach erosion in shown in 2018. See Figure 4. Babe's Beach BU Nourishment "Proof of Concept" of the four images taken in 2006, 2014, 2016 and 2018.

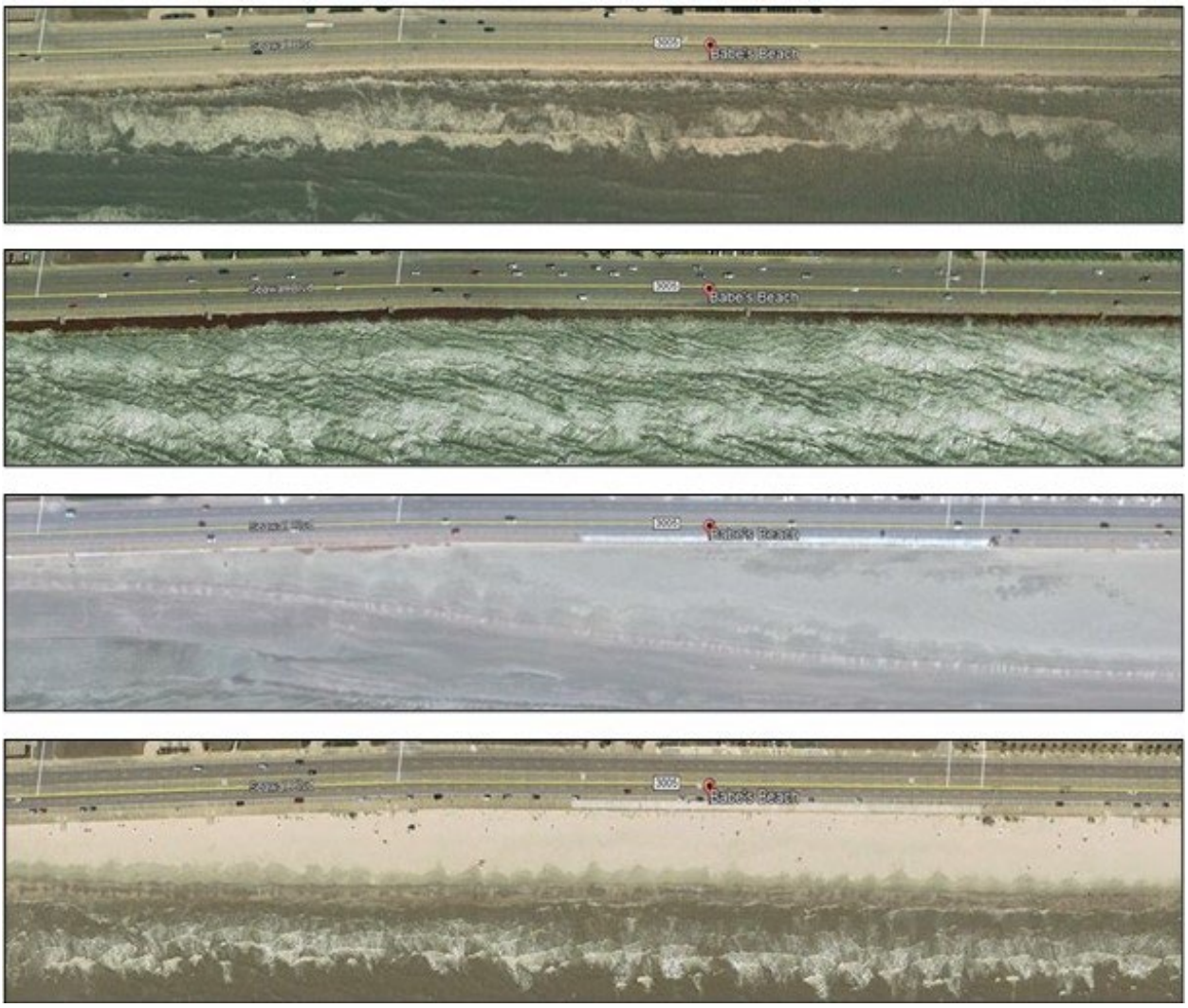

Figure 4 - Babe's Beach BU Nourishment "Proof of Concept"

1.8 Planning Goals and Objectives

1.8.1 Federal Goal

The Federal objective of water and related land resources projects is to contribute to the National Economic Development consistent with protecting the Nation’s environment. Congress authorized the US Army Corps of Engineers (USACE) to study and implement projects that restore and protect the shores of the US. Shore projects are designed to reduce damages caused by wind- and tide-generated waves and currents. Federal assistance for periodic nourishment is also an authorized objective of USACE.

1.8.2 Specific Planning Objectives

An objective is a statement of the intended purposes of the project. These are statements of what the recommended plan will try to achieve:

- Reduce the risk of coastal erosion damage to personal property and public infrastructure along Galveston Island between 8 Mile Road and 13 Mile Road.
- Reduce the risk to human life and safety by protecting Highway 3005, which functions as an essential evacuation route.

The Non-Federal Sponsor reconfirmed by email their support for BUDM in the study area on February 17, 2022.

1.9 Planning Constraints

1.9.1 Universal Planning Constraints

These constraints are the legal and policy constraints that need to be included into every USACE planning study but vary by study type.

- The Federal limit of participation in the design and construction is $10,000,000.
- The project must adhere to all relevant federal, state and local laws and regulations. For instance, no alternatives may intentionally adversely affect threatened or endangered species.

1.9.2 Specific Planning Constraints

These constraints are those things unique to this feasibility study that alternatives should avoid or that may limit plan formulation, selection or construction.

- An estimated 530,000 cubic yards of available dredged sand limits the extent of beach nourishment.
- This Sec 204 project cannot increase costs or schedule to existing Federal Navigation Project's O&M dredging contracts; the Base Plan. Scheduled target for the Base Plan is a production rate of 0.63 days per 10,000 cubic yards.

1.10 Planning Uncertainties and Their Risks

- Proposed project area increases roundtrip sail distance from the ODMDS ~ 30 miles.
- Proposed project area increase the total sail above the current BUDM site (Babe's Beach) by 10 miles.
    - Risk – Medium. Existing dredging contracts schedules cannot be lengthened.
        - Mitigation – USACE interviewed dredging contractors and asked them if they thought that they could implement alternatives within current contract perimeters.

        - Mitigation – During Design and Implementation, dredging contractors will again be queried prior to project implementation
- Estimated 530,000 cubic yards of available dredged sand
    - Risk – Low. Limits the amounts of dredged material appropriate for beaches.
        - Mitigation – Alternatives analyzed based upon the estimated amount of appropriate dredged materials.

2 Existing Environmental Conditions

2.1 Air Quality

The Clean Air Act (CAA), as amended in 1990, authorizes the Environmental Protection Agency (EPA) to designate areas as nonattainment, attainment, or unclassifiable and to further classify nonattainment areas according to the degree of severity. Classification, in turn, triggers a set of control requirements designed to bring areas into attainment by their specified date.

According to the Texas Commission for Environmental Quality (TCEQ), Galveston County is in the Houston-Galveston-Brazoria (HGB) Air Quality Control Region (AQCR). In 2015, the EPA revised its primary and secondary national ambient air quality standards for ozone to 0.070 ppm (80 FR 65292). In 2020, the EPA retained the 2015 standards without revision (85 FR 87256), thus Galveston County remains classified as a marginal nonattainment area for the eight-hour standard for ozone with an attainment deadline of August 3, 2021, (80 FR 65292). CAA section 107(d)(1)(A)(i) defines a nonattainment area as, “any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant”. The threshold for major source emissions in a marginal nonattainment area is 100 tons per year (tpy). For all other pollutants (i.e., lead, carbon monoxide, nitrogen dioxide, particulate matter, and sulfur dioxide), the HGB is classified as unclassifiable/attainment. CAA section 107(d)(1)(A)(ii) defines an attainment area as, “any area (other than an area identified in clause i) that meets the national primary or secondary ambient air quality standard for the pollutant”, while an unclassifiable designation is defined in CAA section 107(d)(1)(A)(iii) as “any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant”.

2.2 Climate

The climate of the study area is humid subtropical with warm to hot summers and mild winters. The average annual high temperature is about 76 degrees Fahrenheit (°F), with an average summer high of about 91 °F for the months of June, July, and August, and an average annual winter low temperature of 41 °F. Periods of freezing temperatures are infrequent and rainfall averages about 44 inches annually (National Weather Service 2021). Severe weather occurs periodically in the form of thunderstorms, tornadoes, tropical storms and hurricanes. Additional discussion on historic significant storm events is available in the Engineering Appendix (Appendix A).

2.3 Physical Oceanography

2.3.1 Tides, Currents and Circulation

Mean tidal range is 1.17’ (or ~1.2’) and great diurnal range is 1.67’ (MHHW – MLLW), with larger variations dependent upon the wind. During winter, weather fronts out of the northwest are usually accompanied by strong winds that may depress the water surface as much as 4 feet below mean sea level. At other times of the year, predominantly southerly winds, when coupled with higher-than-normal tides (i.e., spring tides), may occasionally and temporarily raise surface water elevations. Large fluctuations in water surface elevation may also occur during tropical storms and hurricanes (USACE 1975).

The predominant wave direction is from the southeast, with the shore-normal direction for waves approaching Galveston Island at approximately 147 degrees azimuth, which is roughly midway between the two most frequent direction. As a result, there is a fairly even split in the directional frequency of wave driven longshore currents. However, seasonal variations in wave magnitude and direction ultimately yield a net longshore transport direction to the southwest. Elevation +4.0 feet (NAVD88) coincides with the approximate (landward) limit of wave runup during typical conditions according to observation of aerial imagery.

Currents are affected by many different factors including wind, waves, thermohalines, tides, and the Coriolis effect. The National Oceanic and Atmospheric Administration’s (NOAA) Atlantic Oceanographic and Meteorological Laboratory records daily geostrophic current fields for the Gulf of Mexico. During non-summer months the current along Galveston moves in the same direction as the net longshore current (southwest) at higher magnitudes than in summer months when it shifts to the opposite direction (Johnson, 2008).

2.3.2 Depth of Closure

The depth of closure (DOC) is intended to define the seaward limit of the active profile, which is the theoretical cross-shore extent of sediment movement, beyond which elevation changes are thought to be negligible. Guidance and wave data from the Coastal Inlets Research program (CIRPA) were utilized to calculate the depth of closure in the project area. DOC values were calculated using Hallermeier’s equations which yielded an inner DOC at 16 feet and outer DOC at 41 feet. The respective depths define the seaward limits of the littoral zone, and the less dynamic shoal zone.

2.3.3 Relative Sea Level Change

The change in ocean height relative to coastal lands, called relative sea level rise, is a combination of three factors: eustatic sea level rise, local variations in sea level rise, and relative land motion. Eustatic sea level rise is the change in global mean ocean height (global mean sea level [GMSL]) and is primarily the result of increasing temperatures that cause thermal expansion and melting glaciers and ice sheets. Scientific research indicates that GMSL has risen by about 7-8 inches (16-21 cm) since 1900 and could rise between 3.6-7.2 inches (9-18 cm) by 2030 and 15-51.6 inches (30-130 cm) by 2100 (Sweet et al. 2017). Local variations are produced by changes in wind patterns and ocean currents and are minor for the Gulf of Mexico (Nielsen-Gammon et

al. 2020). Relative land motion in coastal Texas is dominated by coastal subsidence, or the gradual lowering of land-surface elevation, and is the result of the extraction of groundwater, oil, or gas or increasing sediment loading or infrastructure construction.

The USACE Sea Level Change Curve Calculator (Version 2021.12) is used to project three local relative sea level change (RSLC) scenarios in accordance with ER 1100-2-8162 (USACE, 2019). The historic RSLC rate utilized (0.02106 ft/yr) reflects NOAA's regional rate at the Galveston, TX Pier 21 gauge (8771450). RSLC is projected out to year 2038, which is consistent with the FWOP analysis duration of 24-years (2023 to 2046). Projections are summarized for three scenarios (low, medium and high) with station datums (on NAVD88) projected with intermediate RSLC in Figure 5. The mid-epoch analysis year (1992) is used as the starting year of RLSC projections according to the station's tidal datum analysis period.

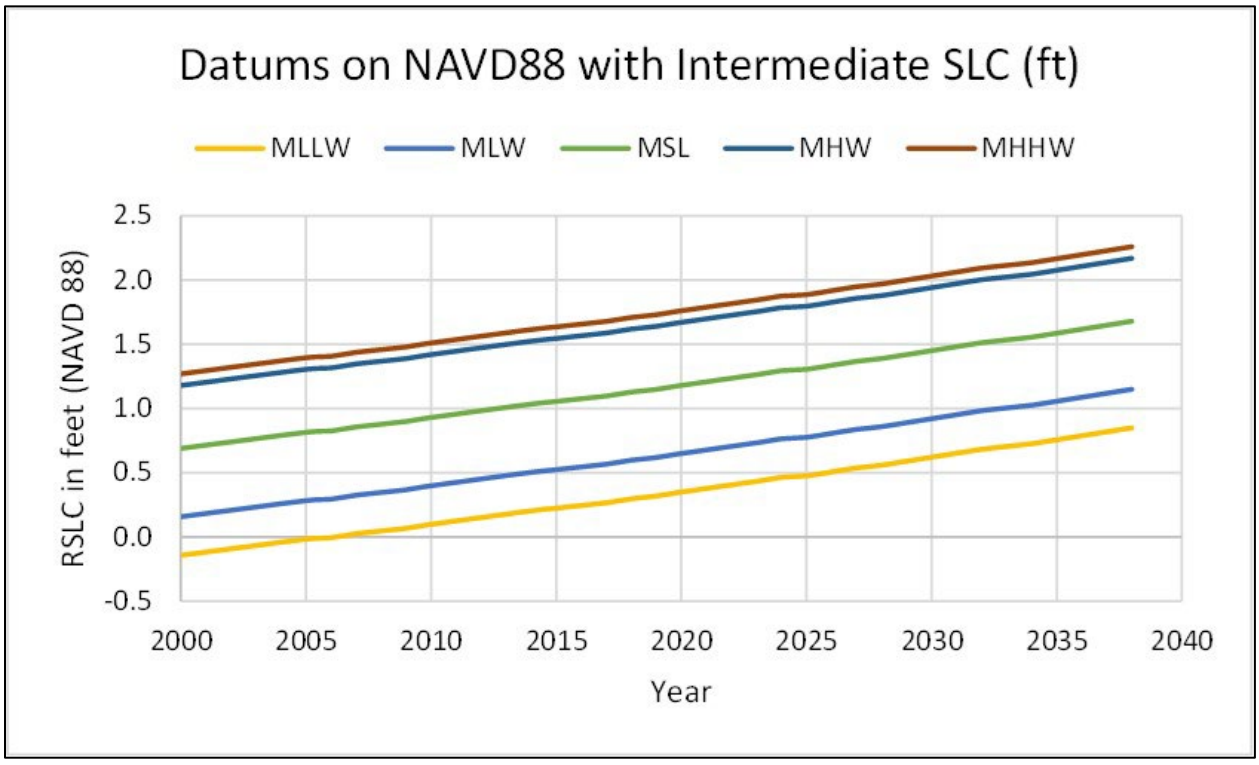

Figure 5 - Pier 21 Datums Adjusted for Intermediate RSLC for MLLW, MLW, MSL, MHW & MHHW.

2.3.4 Flooding

The 1-year AEP total WSE (still water elevation + intermediate sea level rise + 2 percent wave runup) is calculated at +4.6 feet NAVD88 and includes all project areas. Structures located proximal to this elevation contour have historically been subjected to "buy-backs." This is likely because such structures are at immediate risk of exposure to surge and waves during high frequency storms (1 to 5-year AEP storms).

2.3.5 Geomorphology

Galveston Island is in the Quaternary Texas Gulf Coast Plain which formed about 5,500 years ago. After formation, the island advanced seaward by the addition of sand transported from offshore. About 2,600 years ago, the eastern portion of the island became high and wide enough that it ceased to be frequently breached by storms; however, the lower, narrower western portion continued to be periodically over washed. Galveston Island stopped growing about 1,200 years ago. Since then, the island has been diminishing, with relative sea level rise, wash over, erosion from waves, and lack of sand sources contributing to overall erosion and landward migration. The beaches along Galveston Island are extremely dynamic and constantly changing due to daily exposure from wind, waves, and tides. In addition, anthropogenic events such as construction of the Galveston Harbor and Channel and jetties, groin field, and seawall have altered local sediment transportation patterns along the Galveston shoreline. The beaches adjacent to Seawall Boulevard have experienced a net loss of sediments over time. As a result, highest local shoreline retreat (erosion) rates are observed along the beaches immediately adjacent to, and west of, Seawall Boulevard over the historical record. Conversely, net shoreline advance (accretion) is observed on the eastern and western extremities of the island, which is largely a result of local impacts from the Galveston Entrance Channel and San Luis Pass, respectively.

2.3.6 Sediment

Sediment samples from the Texas Coastal Sediment Geodatabase (TxSed), compiled by the Texas Government Land Office (TXGLO), were analyzed to review spatial variation, and estimate median grain size (D50) of native sediment. A total of 42 samples with grain size distribution data from sieve analysis were identified along West Galveston (Figure 10), including 18 beach samples collected by HDR in 2003 and 22 nearshore samples collected by TAMUG in 2005, between depths of 14 and 26 feet (datum unverified) (HDR, 2003; TAMUG, 2005). The calculated average D50 is 0.156 mm for samples collected along the beach, while nearshore samples collected by TAMUG yield an average D50 at 0.094 mm.

According to beach equilibrium profile theory, discussed further in Appendix A - Section 3.4.3, the shape of existing cross-shore (depth of closure) profiles in the project area indicate a theoretical equivalent D50 range of 0.07 - 0.1 mm, in good agreement with TAMUG samples. It should be noted that many past studies have used a coarser D50, consistent with samples collected on the beach, to represent the effective native fill. However, the portion of the active profile that consists of coarser material is relatively small. To represent the entire active profile and to maintain consistency with equilibrium profile concepts, the native beach is assigned an effective D50 = 0.09 mm.

Beach quality sand that meets USACE criteria would be obtained from the Galveston Entrance Channel, an authorized Federal project, during routine maintenance dredging operations.

2.3.7 Shoreline Erosion

The University of Texas BEG (Bureau of Economic Geology) reports shoreline change rates along Galveston Island that range from -16.7 to +81.7 feet per year[1] and a net rate of +3.2 feet per year between 2000 and 2012 (Paine 2020). Long-term historic retreat rates in the project area range from approximately -4.5 to -8.0 feet per year, with erosion rates decreasing from east to west the further from the erosional hotspot located at the end of the seawall (Figure 2). BEG reports a significant reduction to the rate of retreat over the last 19 years in the project area, with local rates being closer to -4.0 to -5.0 feet per year (Figure 4). The rates dropped notably upon the most recent update that accounted for the period between 2012 and 2019, which can be attributed largely to recent nourishments that have effectively reduced the rate of local erosion. It is anticipated that local nourishments will continue biannually into the near future. Historical shoreline change rate estimates account for impacts related to both, nourishment events and storm events.

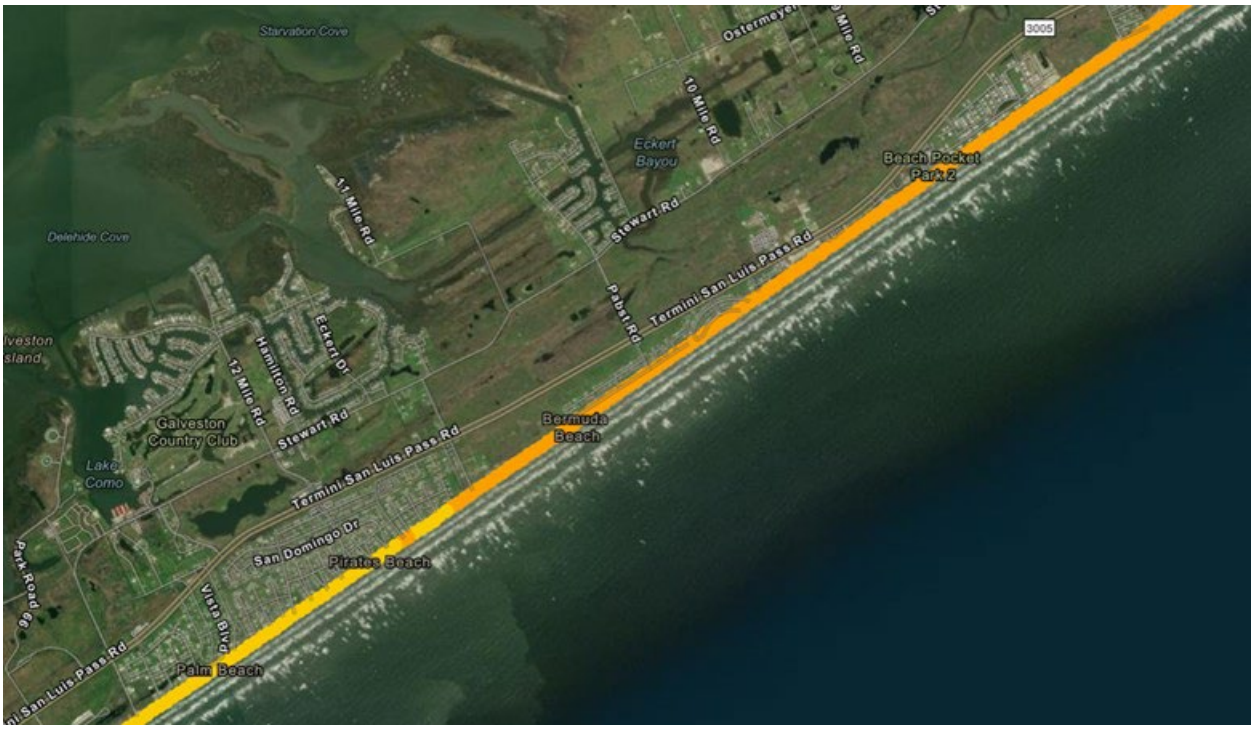

Figure 6 – Shoreline Change in the Project Area from 1930s-2019 (feet/year)

[1] Negative values indicate erosion/loss of shoreline and positive values indicate accretion/gain in shoreline area

Figure 7 – Shoreline Change in the Project Area from 2000-2019 (feet/year)

2.4 Water Quality

Section 305(b) of the Clean Water Act (CWA) requires states to assess surface and ground water quality and prepare comprehensive reports documenting water quality, which states submit to the US EPA biannually. In addition, Section 303(d) of the CWA requires states to prepare a list of impaired waters based on Total Maximum Daily Loads of pollutants and specify corrective actions. TCEQ enforces state water quality standards and prepares the state's comprehensive report for submittal to US EPA.

Based on the TCEQ's 303(d) list, segment 2501_03, which includes Gulf of Mexico waters from the Gulf shoreline to the limit of Texas jurisdiction between Bolivar Point to San Luis Pass is designated as exceptional for Aquatic Life Use (ALU); however, this segment is impaired for mercury in edible tissue. Segments 2501GW_01 (Spanish Grant/Bermuda Beach [Beach ID TX 163187]) and 2501GW_04 (Pirates Beach [Beach ID TX 751320]) both have a High ALU designation and have no listed impairments. However, this area is regularly monitored for exceedances in state standards for enterococcus (fecal) bacteria, which occur a couple of times per year.

2.5 Biological Communities

The project area lies seaward of the line of vegetation and extends out to the depth of closure in the Gulf of Mexico. This area contains beach habitat that extends to the depth of closure and includes the backshore (berm/dry beach/supratidal), foreshore (extends from the mean low water line to the highest elevation reached by waves at normal high

tide/intertidal) and nearshore (area always underwater/subtidal). Beaches are the transition from land to sea.

Aquatic organisms thrive in foreshore and nearshore zones of the beach where sediments are frequently inundated by water, providing important nursery, and feeding habitat for many fish species. Daily flooding by saltwater and moderate- to high- energy waves prohibit plant growth aside from inconspicuous algae in these zones. Backshore areas, those at or just above the high tide zone, are exposed to harsh conditions including fluctuations in temperature and salinity, which preclude habitation by few animals and no plants. The wrack zone, transition between dry beach and surf zone, provides a reservoir of water and food for cryptic nocturnal feeders or species that feed during high tide (e.g., crabs, spiders, beetles), and is characterized by an abundance of arthropods and worms. The wrack zone is also a prime foraging habitat for shorebirds.

2.5.1 Threatened and Endangered Species

Section (7)(a)(2) of the Endangered Species Act (ESA), 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. The NFS was issued a biological opinion (BO) dated June 17, 2019 (Consultation No. 02ETTX00-2018-F-2491) that addressed effects of beach nourishment to U.S. Fish and Wildlife Services (USFWS) listed species along Galveston Island. This study's project area falls within the area addressed in the 2019 BO, as such, the USACE requested the USFWS to grant this proposed action ESA compliance with the guarantee the USACE would adhere to the conservation measures and conditions written in the Parks Board BO and accompanying permit.

There are eleven ESA-listed, candidate, or proposed for listing species identified in the USFWS Official Species List dated August 2, 2022 (Project code: 2022-0070276), and four NMFS protected species (Table 1). Critical habitat (CH) has been proposed for Rufa red knot (*Calidris canutus rufa*) and is expected to occur in the action area if official designation is made (79 FR 73706.

Table 1 - ESA-listed species identified by USFWS and NMFS as potentially occurring in the action area

Common Name	Species Name	Jurisdiction	Status
Birds			
Piping plover	*Charadrius melodus*	USFWS	T
Rufa red knot	*Calidris canutus rufa*	USFWS	T
Whooping crane	*Grus americana*	USFWS	E
Eastern black rail	*Laterallus jamaicensis*	USFWS	T
Attwater's Greater Prairie Chicken	*Tympanuchus cupido attwateri*	USFWS	E
Mammals			
West Indian Manatee	*Trichechus manatus*	USFWS	T
Sperm whale	*Physeter macrocephalus*	NMFS	E
Rice's whale	*Balaenoptera ricei*	NMFS	E
Reptiles			
Green sea turtle	*Chelonia mydas*	USFWS/NMFS	T
Hawksbill sea turtle	*Eretmochelys imbricata*	USFWS/NMFS	E
Kemp's Ridley sea turtle	*Lepidochelys kempii*	USFWS/NMFS	E
Leatherback sea turtle	*Dermochelys coriacea*	USFWS/NMFS	E
Loggerhead sea turtle	*Caretta*	USFWS/NMFS	T
Fish			
Oceanic whitetip shark	*Carcharhinus longimanus*	NMFS	T
Giant manta ray	*Mobula birostris*	NMFS	T

Seven species have no potential to occur in any of the action areas because no suitable habitat exists and/or the action area is outside of their known range(s). These include the endangered whooping crane, Attwater's greater prairie chicken, sperm whale, Rice's whale, leatherback sea turtle; and threatened oceanic whitetip shark and giant manta ray.

Eight federally listed species are known to occur or potentially occur in the project area including the endangered Kemp's ridley sea turtle (*Lepidochelys kempii*) and hawksbill sea turtle (*Eretmochelys imbricata*); and the threatened West Indian manatee (*Trichechus manatus*), loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), piping plover (*Charadrius melodus*), Rufa red knot, and Eastern black rail (*Laterallus jamaicensis jamaicensis*).

Proposed CH for Rufa red knot encompasses the action area in Unit TX-2 (79 FR 73706). Unit TX-2 consists of approximately 590 ac (238 ha) of occupied habitat in

Galveston County, along the Gulf of Mexico, with boundaries from the mean low-low water (MLLW) up to the vegetation line, including emergent lands and intertidal area characterized as highly dynamic beach/seashore that is covered at high tide and uncovered at low tide. The northeastern boundary is the end of the Seawall Boulevard (end of the seawall), and the southwestern boundary is San Luis Pass. Specific habitat types within this unit include marine sandy coastline beach that is irregularly or regularly inundated by tides, depending upon the location.

For a more detailed discussion on the habitat requirements, historic and current occurrence, and threats to each species and CH, refer to the Galveston Parks Board BO (Appendix C).

2.5.2 Migratory Birds

The Texas Gulf coast is an important seasonal pathway for migratory birds and has plentiful habitat for migratory shorebirds and waterfowl. The Galveston beach area is not forested, and therefore is not an optimum habitat for passerine birds. Rather, it is more suited for wading birds, waterfowl, and shorebirds.

According to the eBird database managed by the Cornell Lab of Ornithology (ebird.org) the most abundant species observed at Bermuda Beach and Galveston Island State Park, the two birding hotspots in or near the project area include:

- Gulls: laughing (*Leucophaeus atricilla*), Bonaparte's (*Chroicocephalus philadelphia*), ring billed (*Larus delawarensis*), and herring (*L. argentatus*)
- Terns: Caspian (*Hydroprogne caspia*), sandwich (*Thalasseus sandvicensis*), royal (*T. maximus*), least (*Sterna antillarum*), Forster's (*S. forsteri*), and black (*Chlidonias niger*)
- Skimmers: black (*Rynchops niger*)
- Plovers: black-bellied (*Pluvialis squatarola*), snowy (*Charadrius alexandrines*), and Wilson's (*C. wilsonia*)
- Sandpipers (Waders): willet (*Tringa semipalmata*), western (*Calidris mauri*), sanderling (*C. alba*), and ruddy turnstone (*Arenaria interpres*)

Less common but significant species include the federally listed piping plover and red knot, de-listed brown pelican (*Pelecanus occidentalis*), and state listed white-faced ibis (*Plegadis chihi*).

2.5.3 Essential Fish Habitat

The project area is located in Ecoregion 4 nearshore habitat (60 feet or less in depth and not inside a barrier island or estuary) and includes EFH designated by the Gulf of Mexico Fishery Management Council (GMFMC) for all life stages of cobia (*Rachycentron canadum*) and red drum (*Sciaenops ocellatus*); larvae and juvenile lane snapper (*Lutjanus synagris*); juvenile and adult king mackerel (*Scomberomorus cavalla*); adult gray snapper (*Lutjanus griseus*); larval/pre-settlement post-larvae, late post-larvae/juvenile sub-adult, and adult white shrimp (*Litopenaeus setiferus*); and

larval/pre-settlement post-larvae and sub-adult brown shrimp (*Farfantepenaeus aztecus*).

The project area also includes EFH for highly migratory species managed by the National Marine Fisheries Service (NMFS) including scalloped hammerhead sharks (*Sphyrna lewini*), blacktip sharks (*Carcharhinus limbatus*), bull sharks (*Carcharhinus leucas*), lemon sharks (*Negaprion brevirostris*), spinner sharks (*Carcharhinus brevipinna*), bonnethead sharks (*Sphyrna tiburo*), Atlantic sharpnose sharks (*Rizoprionodon terraenovae*), and finetooth sharks (*Carcharhinus isodon*). EFH in the project vicinity includes sand and shell substrates and water column.

The Gulf of Mexico also supports commercial and recreational fisheries. Commercially landed finfish include black drum (*Pogonias cromis*), southern flounder (*Paralichthys lethostigma*), striped mullet (*Mugil cephalus*), and sheepshead (*Archosargus probatocephalus*). The main commercially harvested shellfish species around Galveston are brown and white shrimp, and blue crabs (*Callinectes sapidus*).

Other commercial and recreational species in the project vicinity may include Atlantic croaker (*Micropogonias undulatus*), spot croaker (*Leiostomus xanthurus*), sea trout (*Cynoscion nebulosus*), and sand trout (*Cynoscion arenerius*). These species are ubiquitous along the Texas coast with seasonal differences in abundance.

2.5.4 Marine Mammals

The common bottle nosed dolphin (*Tursiops truncatus*) is the most likely marine mammal occurring in the nearshore. Other species of dolphins and whales are primarily restricted to deeper offshore waters; therefore, it is unlikely that any of these species would occur in or near the project area.

2.6 Cultural Resources

Section 106 of the National Historic Preservation Act of 1966, as amended, requires federal agencies to consider the effects of their undertakings on historic properties. A preliminary assessment of the cultural resources within one kilometer of the project area was conducted using a desktop review of the databases maintained by the Texas Historical Commission and the Texas Archeological Research Laboratory for terrestrial and marine cultural resources as well as the shipwreck and obstruction databases of the National Oceanic and Atmospheric Administration and the Bureau of Ocean Energy Management. There are no recorded cultural resources and no previous cultural resources investigations within the project footprint. The nearest recorded terrestrial archeological site is 41GV71, which is located approximately 800 meters from the project area and will not be affected by the current undertaking. Site 41GV71 is the late 19th Century remains of the town of Nottingham, the Nottingham Lace Factory and the Galveston and Western Railway. Additionally, four possible shipwrecks (S.W. Perry, Sabine, Matagorda, and 41GV168) have been identified between 650 and 1,700 meters of the project area but are not directly offshore from the project area.

2.7 Socioeconomics

Socioeconomics is defined as the basic attributes and resources associated with the human environment, particularly population, demographics, economic status, and development. Demographics entail population characteristics and include data pertaining to race, gender, income, housing, poverty status, and education. Economic development or activity typically includes employment, wages, business patterns, an area's industrial base, and its economic growth.

Major industries that support Galveston Island's economic prosperity include education, healthcare, maritime, and tourism and hospitality. Three institutions contribute to the education and thousands of jobs in Galveston included Texas A&M University at Galveston (higher education), University of Texas Medical Branch (UTMB; higher education), and Galveston Independent School District. In addition to providing education, UTMB provides exceptional healthcare services including 24-hour emergency, specialty care, and is a Level-1 trauma center. The Port of Galveston is the fourth busiest port in the country, providing $2.3 billion economic impact for the State and $869.6 million in income in 2018 (Galveston Economy 2020). Direct spending from tourism had an impact of $913 million and generated a total economic impact of $1.2 billion in Galveston in 2021 (Tourism Economics 2022).

Median household income in Galveston is $51,280 (ACS 2020b), while median household income for Census block 1, tract 7260 in Galveston is $99,803 (ACS 2020a). There are no natural barriers to interchange between cities and other areas, and to some extent natural geographic features have benefited economic growth through access to Galveston Bay and the Galveston State Park.

The smallest census designation that contains the study area is census block 1, tract 7260 (Figure). Based on aerial imagery, the residential structures, and hence concentration of population, lies along the southeastern portion of the census block nearest the beachfront. Much of the census block is comprised of vegetated areas, beach, and Sweetwater Lake.

All data were obtained from the American Community Survey (ACS) 5-year report, generated using information gathered from the U.S. Census Bureau of Statistics.

2.7.1 Population, Housing, and Community

Galveston Island has an estimated population of 50,307 individuals, comprising less than 1% of the State's population. Approximately 50.1% of residents are male and 49.9% are female, the inverse of the State. Census block group 1, Tract 7260 has a population of 871 individuals across 3.7 square miles, forming a population density of 234.6 people per square mile. The distribution of men and women is nearly identical to the State (Table 2).

Table 2 - Population by sex. Data were gathered from ACS (2020 a-c)

Sex	Texas	Galveston Island	Census Block 1, Tract 7260
Total Population	28,635,442	50,307	871
Male	49.7%	50.1%	49.6%
Female	50.3%	49.9%	50.4%

The majority of people in Galveston are between 20-39 and 50-69 years of age, with the median age being 40 (ACS 2020b). This age demographic is older than most of the State where the greatest proportion of the population is less than 49 years of age, with the median age being 35 (ACS 2020c). Conversely, the majority of people residing in the census block are over the age of 40, with a median age of 54 (Table 3).

Table 3 - Population by age group. Data were gathered from ACS (2020 a-c)

Age Group (years)	Texas	Galveston Island	Census Block 1, Tract 7260
Total Population	28,635,442	50,307	871
0-9	14.0%	8.8%	7.7%
10-19	14.6%	10.4%	10.8%
20-29	14.4%	17.4%	6.0%
30-39	14.3%	13.5%	8.4%
40-49	13.0%	11.0%	14.0%
50-59	11.9%	13.8%	12.6%
60-69	9.6%	14.7%	24.9%
70-79	5.4%	6.8%	10.2%
80+	2.8%	3.5%	5.4%

In all instances, most of the population was comprised of white individuals followed by Hispanic or Latinos. For Galveston Island and the State, blacks/African Americans comprised the third largest percentage of residents, while two or more races ranked third for the census block. There were no Native Americans, Asians, or Pacific Islanders reported in the census block (Table 4).

Table 4 - Population by race. Data were gathered from ACS (2020 a-c)

Race	Texas	Galveston Island	Census Block 1, Tract 7260
Total Population	28,635,442	50,307	871
White alone	41.4%	49.4%	78.4%
Hispanic or Latino	39.4%	30.1%	18.7%
Black/African American	11.8%	15.9%	1.4%

Race	Texas	Galveston Island	Census Block 1, Tract 7260
American Indian/Alaska Native	0.2%	0.3%	0.0%
Asian	4.9%	2.8%	0.0%
Native Hawaiian/Pacific Islander	0.1%	0.0%	0.0%
Other	0.2%	0.1%	0.0%
Two or more races	2.0%	1.5%	1.5%

2.7.2 Environmental Justice

Executive Order 12898 directs federal agencies to identify and address any disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law. CEQ guidance states that minority populations should be identified where either: a) the minority population of the affected area exceeds 50% or b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

The EPA maintains an environmental justice mapping and screening tool (EJSCREEN) that provides users with a nationally consistent dataset and approach for combining environmental and demographic indicators. EJSCREEN can be used as a first-level screening tool to help determine the level of analysis needed. This analysis used two of the six demographic indicators available in the tool:

- Percent Low-Income: percent of individuals whose ratio of household income to poverty level in the past 12 months was less than 2.
- Percent Minority: percent minority as a fraction of population, where minority is defined as all but Non-Hispanic or White alone.

Additionally, the tool estimates a Demographic Index, based on the average of the two demographic indicators used for the analysis.

Census block group 1, Tract 7260, in Galveston, TX is the smallest geographical census boundary that included the study area and was used to evaluate environmental justice with EJSCREEN (Figure 8). The demographic index of the census block group relative to the U.S. is 18%, falling in the “less than 50th percentile” classification. Less than 50% indicates the concentration of minority and low-income populations were small compared to the region and would not be adversely impacted to a greater degree than the general population.

Minority percentiles show similar results, with 28% of the census group being minority as compared to the State at 58%. Data showed the census block is in the 19th percentile when compared to the State. For there to be environmental justice concerns, the census block would need to be in the 50th percentile or greater.

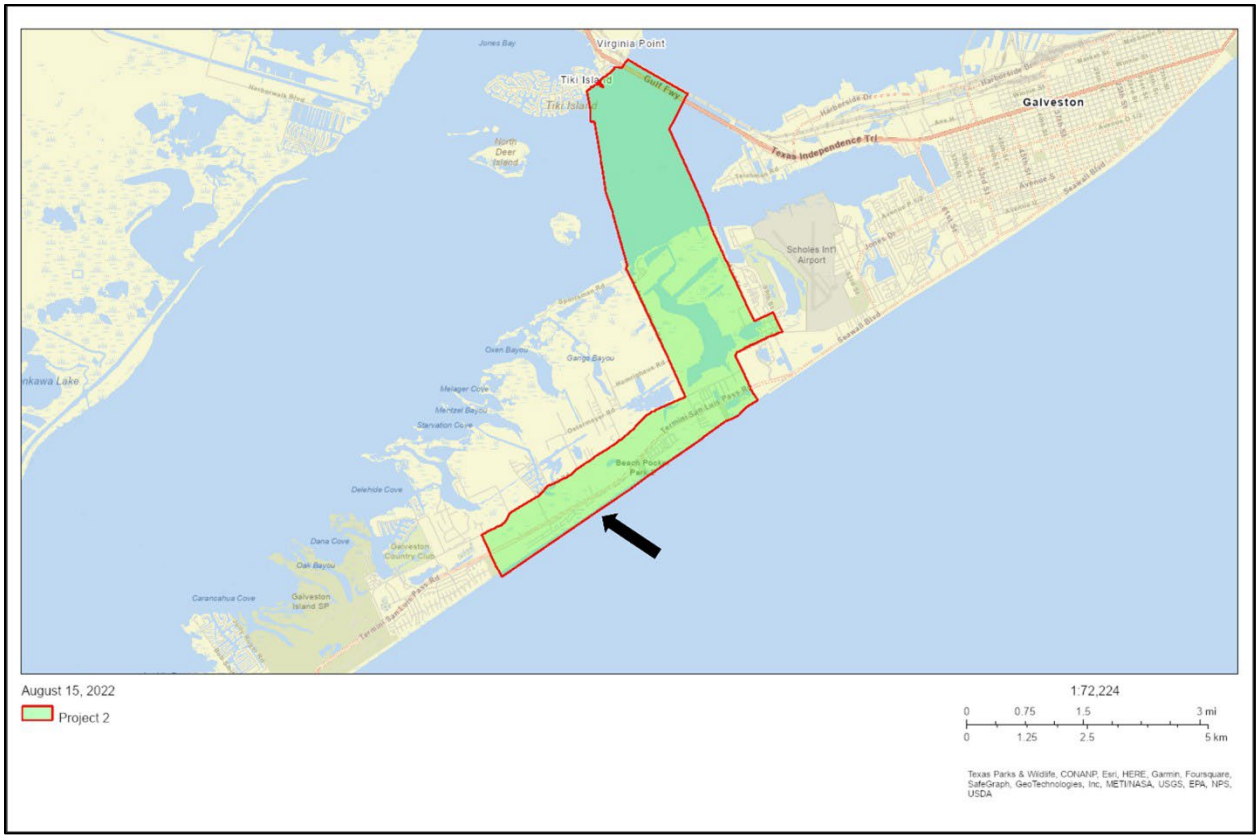

Figure 8 - Census block group from EJSCREEN used for the environmental justice analysis, including the location for proposed nourishment (black arrow)

2.8 Noise, Aesthetics and Recreation

The project area possesses generally good aesthetic values along much of the beachfront area. There is mostly residential development behind the narrow-vegetated dune, where it still exists. A couple of resorts and restaurants are also along the beach in the project area. Interspersed amongst existing development are large open oceanfront lots which improves aesthetics in those areas; however, many of the lots could be developed at any time.

The project area experiences local, state and national recreational use throughout most of the year on beaches locally known as Sunny Beach, West Beach, Bermuda Beach, and Pirates Beach. The back beach and nearshore waters are used by sunbathers, beachcombers, fisherman, swimmers, snorkelers, surfers, birders, and various types of boaters. Six public access points to the beach are available in the project area.

2.9 Hazardous, Toxic or Radioactive Waste

To complete a feasibility level Hazardous, Toxic and Radioactive Waste (HTRW) evaluation, a report was completed following the rules and guidance of ER 1165-2-132: HTRW Guidance for Civil Works Projects and ASTM E1527-13 Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process. The purpose of this search was to identify any sites with recognized environmental

conditions (RECs) where hazardous substances or petroleum products have been released or are likely to have been released to soil, groundwater, or surface water in the proposed project area.

A desktop records review was conducted using various sources to determine the presence of HTRW sites on or near the project footprint. This search was focused on active cleanup sites and sites with a reasonable risk of HTRW release. Several databases were searched manually to narrow down the search area. These databases included the Environmental Protection Agency (EPA) Cleanups in my Community database, the EPA Envirofacts database, the TCEQ web map of UST/AST's, TCEQ Central Registry, and the Texas Railroad Commission's (RRC) oil and gas well Public GIS Viewer. The information collected from this desktop records review was analyzed for recognized environmental conditions (RECs) that would affect the proposed project or need further investigation, given the proposed project measures. No Recognized Environmental Conditions were identified within one mile of the project area that could be reasonably expected to affect the project area.

Although not classified as HTRW under USACE regulations, several oil and gas infrastructure sites were identified within the surrounding area. As a result of these findings, pipelines and wells within the project vicinity and along potential site access routes should be precisely located during PED to ensure no unintended interaction occurs with the existing oil and gas facilities.

3 Future Without Project Condition

Future without Project Conditions forecast the conditions expected during the period of analysis if no beneficial use beach fill project is constructed. The future without project condition also provides the basis from which alternative plans are formulated and damages are assessed. This study will forecast the conditions expected at the Galveston Island Beach study area over the twenty four-year period of analysis, 2023 to 2046.

Future Without Project Plan (FWOP): Dredged material is deposited in open water (the base plan; has no Federal action for beach nourishment). Beach Erosion and damage to homes and infrastructures is unabated. FWOP plan does not provide BUDM. FWOP does not prevent or delay coastal erosion damages and/or risks to life and property at Galveston Island. The FWOP is compared to Future With Project Plans (FWPP) to determine if there is an economic justification of a FWPP. FWOP is shown below with the estimated annual shoreline retreat of the +4-foot (NAVD88) contour with yellow to red color progression from 2023 to 2046. The FWOP analysis utilizes historically derived shoreline change rates from 2014 – 2019 surveys (supplemented with limited survey from 2006) to estimate future shoreline change between 2023 and 2046. The local average rate of shoreline retreat ranges from 2.7 to 5.75 ft/yr. (landward) based on a comparative analysis of historic surveys. Details of these surveys and the resulting retreat calculations are provided in Appendix A – Engineering Appendix, Hydrology and Hydraulics. See the following Figure 9.

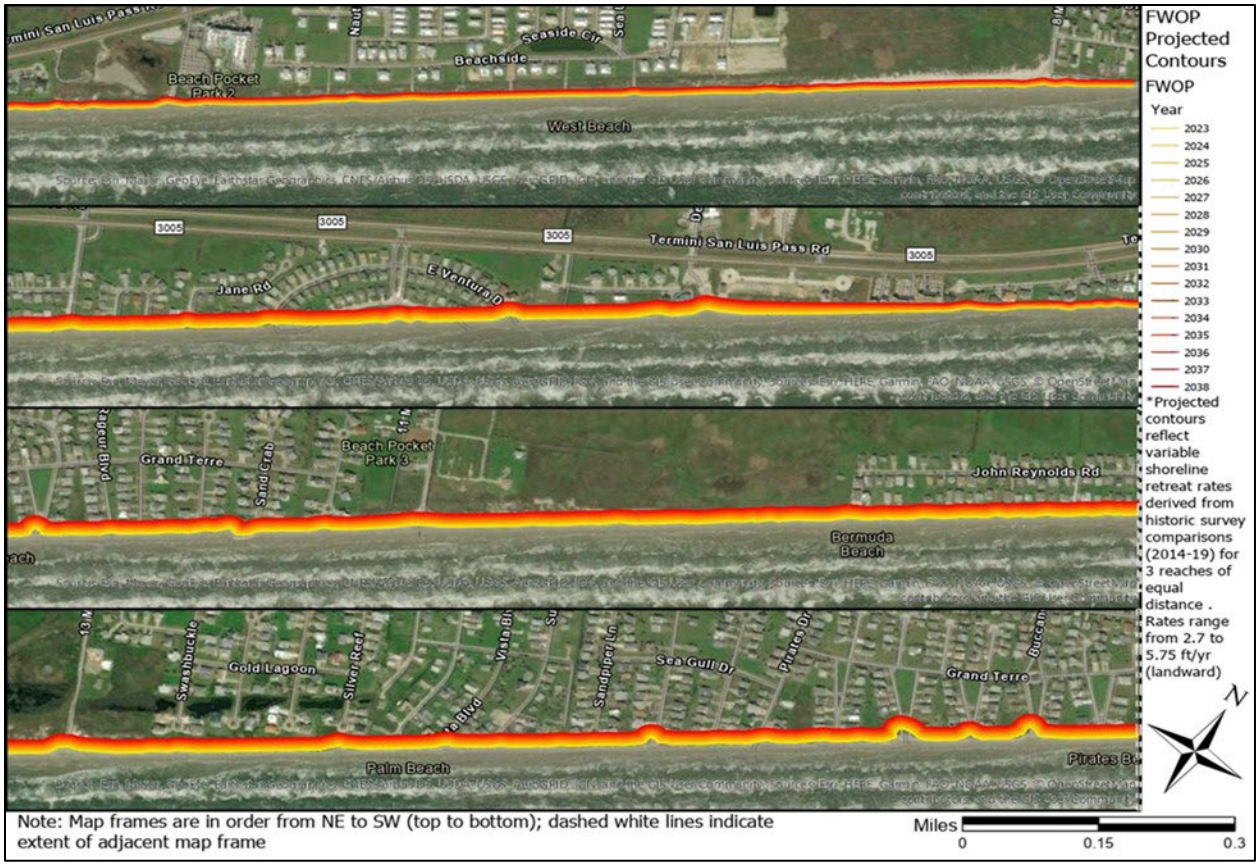

Figure 9 – FWOP

Shown above are four contiguous segments of the Galveston Island study area in order from east to west (top to bottom) with shoreline change projections superimposed. Yellow depicts the shoreline in 2023 and the estimated shoreline for 2038 is shown as the red line. Contrary to long-term trends, the eastern ~one-third of the study area has seen a reduction to shoreline retreat, which is largely attributed to recent and ongoing nourishment projects (Babe's Beach, Dellanera, etc.).

4 Alternative Plans Formulation

Management measures developed to alleviate coastal erosion in the study area were Beach Nourishment and Seawalls. The alternatives were developed to meet the goals, objectives, and avoid the constraints. Following is the array of alternatives with their descriptions. Screening resulted in two plans which were costed for comparison, Alternatives 2 and 3.

4.1 First Array of Alternative Plans

4.1.1 No Action / FWOP – Alternative 1

Dredged material is currently deposited in opened water (the base plan; has no Federal action for beach nourishment). Beach Erosion and damage to homes and infrastructures is unabated. FWOP plan does not provide BUDM. FWOP does not delay coastal erosion damages and risks to life and property at Galveston Island; thus, does not achieve erosion/storm damage reduction goals.

4.1.2 Beach Nourishment Alone – Alternatives 2 and 3

Alternatives 2 & 3 are differentiated only by their respective location, which amounts to a 3,000-foot shift (along the shore) of the construction template. These two alternatives were developed following the consideration of the beach erosion between 8 Mile and Thirteen Mile Roads. This approximately 5-mile beach length was subdivided into four segments. The two segments with the most development were selected for further analysis. Based on the existing beach profile and estimated available beach quality sand, it was determined that 1.7 miles of beach could be nourished. Alternatives 2 & 3 were then sited to maximize erosion protection benefits for detailed analysis. The dimensions include a 300-foot added berm width, followed by a 1:20 slope to tie into the existing profile. A three-dimensional version (DEM) of this template is created in GIS, extending the entire length of the project area, which is used to determine total fill requirements by comparing the construction template DEM with the 2019 DEM, using GIS cut/fill operations. The calculations revealed that approximately 1/3 of the total project area length could be covered by 530K cubic yards of fill material, which is on the lower end of the range of anticipated borrow fill. There is risk that a dredging requirement could arise out of sequence with different quantity availability.

Shoreline change projections estimate movement of the +4-foot (NAVD88) contour, were projected annually from 2023 to 2046. The shoreline change curves account for cross-shore equilibration of the construction template profile, statistically derived background erosion, and longshore diffusion of each beach fill alternative. The one-line shoreline retreat results indicate losses inside the original placement area (construction template) at approximately 80 percent by year 5, and 100 percent loss between years 8 and 10, which varies alongshore based on relative proximity to the nourishment location and the background erosion rate.

The sand placement design goal is a contiguous, uniform shoreline to avoid end loses and induced rip currents to provide benefits to privately owned developed property. Thus, there is a limited placement of material in front of privately owned vacant land to provide project performance at the developed property and to alleviate safety concerns.

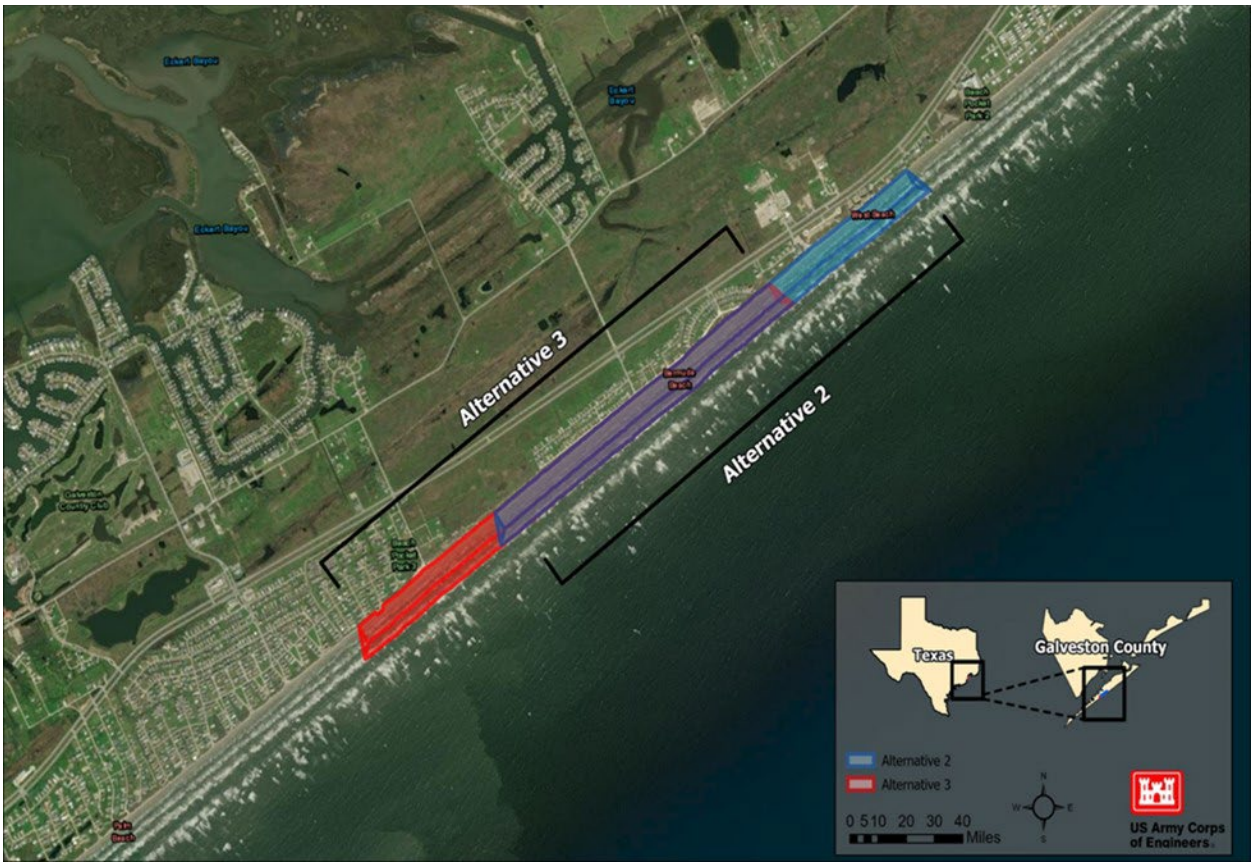

Figure 10 - Alternatives 2 and 3

4.1.3 Seawall Extension / FWP – Alternatives 4 and 5

Seawall extensions are not considered feasible for the purposes of this study due to economic and engineering concerns. A seawall extension would provide robust defense against storm surge and erosion but is costly and erosion would continue in the study area. The costs of a seawall, with- or without including beneficial use of dredged material would almost certainly have a benefit to cost ratio of less than 1.0 (Figure 11).

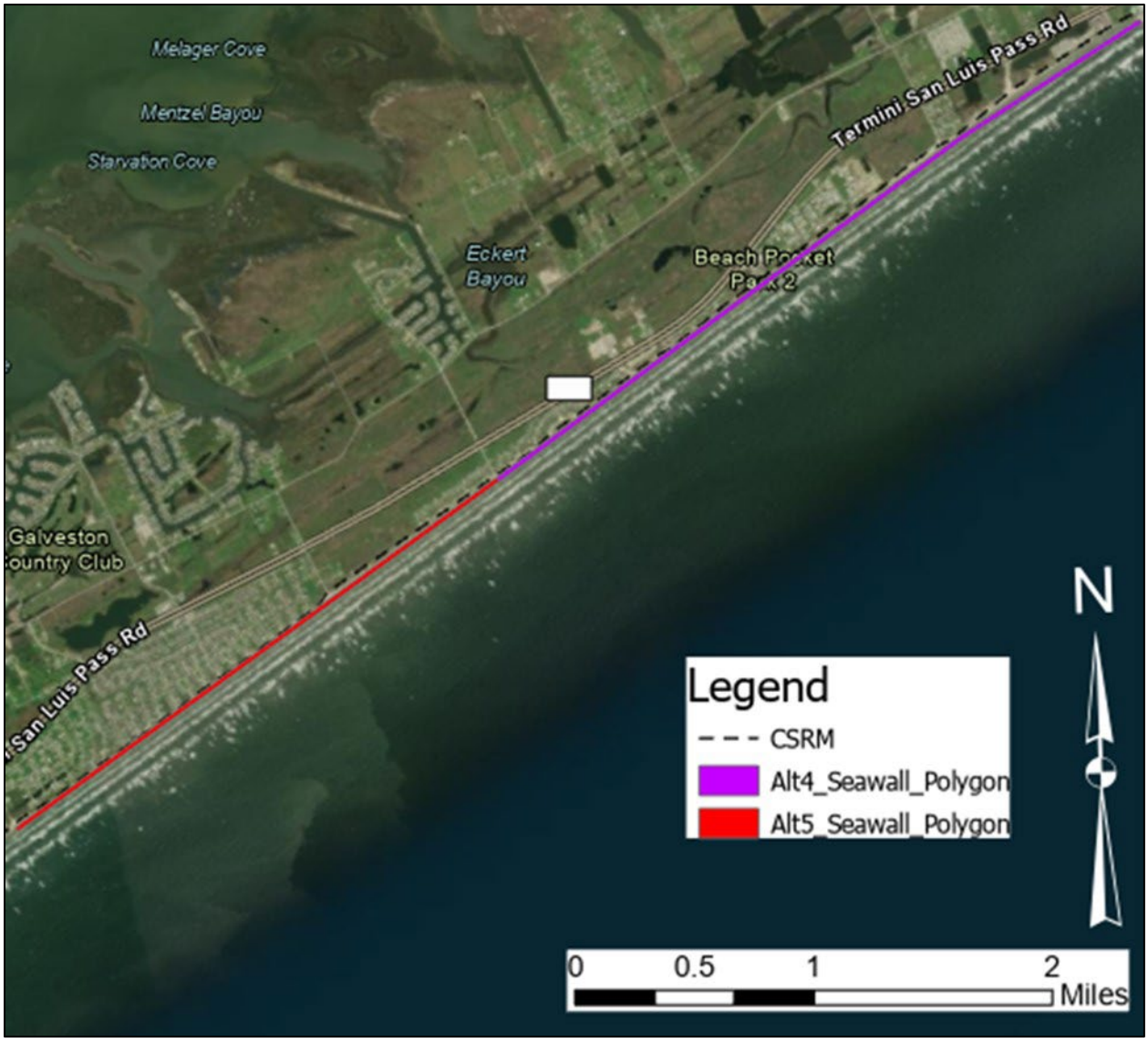

Figure 11 - FWP for Alternatives 4 & 5 - Seawall Extensions

4.1.4 Beach Nourishment West of Existing Seawall / FWP – Alternative 6

This alternative considered delaying erosion by way of westward littoral drift of sand placed seaward of the existing seawall's west end with a short placement duration to avoid/reduce dredging delays of the Galveston Navigation Channel. This alternative was screened out as analysis indicated that it would not reduce erosion for the most vulnerable developed properties in the study area (8-Mile to 13-Mile Roads) (Figure 12). The one mile of beachfront development from seawall end to 8 Mile Road that would most benefit by littoral drift from this alternative is already scheduled for direct sand placement. Thus, Alternative 6 would not generate positive net benefits for the Sec 204 project.

Figure 12 - Alternative 6

4.2 Evaluation and Comparison of Alternative Plans

The risks and uncertainties are similar among alternatives and include, but are not limited to, subsidence, erosion, impacts from climate change such as increased storm frequency and sea level rise, and availability of compatible sediment.

4.2.1 Alternative 2 – Beach Nourishment

Dredged material is brought to the west end of Galveston Beach by Hopper dredge and pipelined to beach for placement beginning at Sunbather Lane and extending approximately 1.7 miles west. Alternative 2 at its eastern end would have direct placement for the most vulnerable developed properties in the study area (Figure 13).

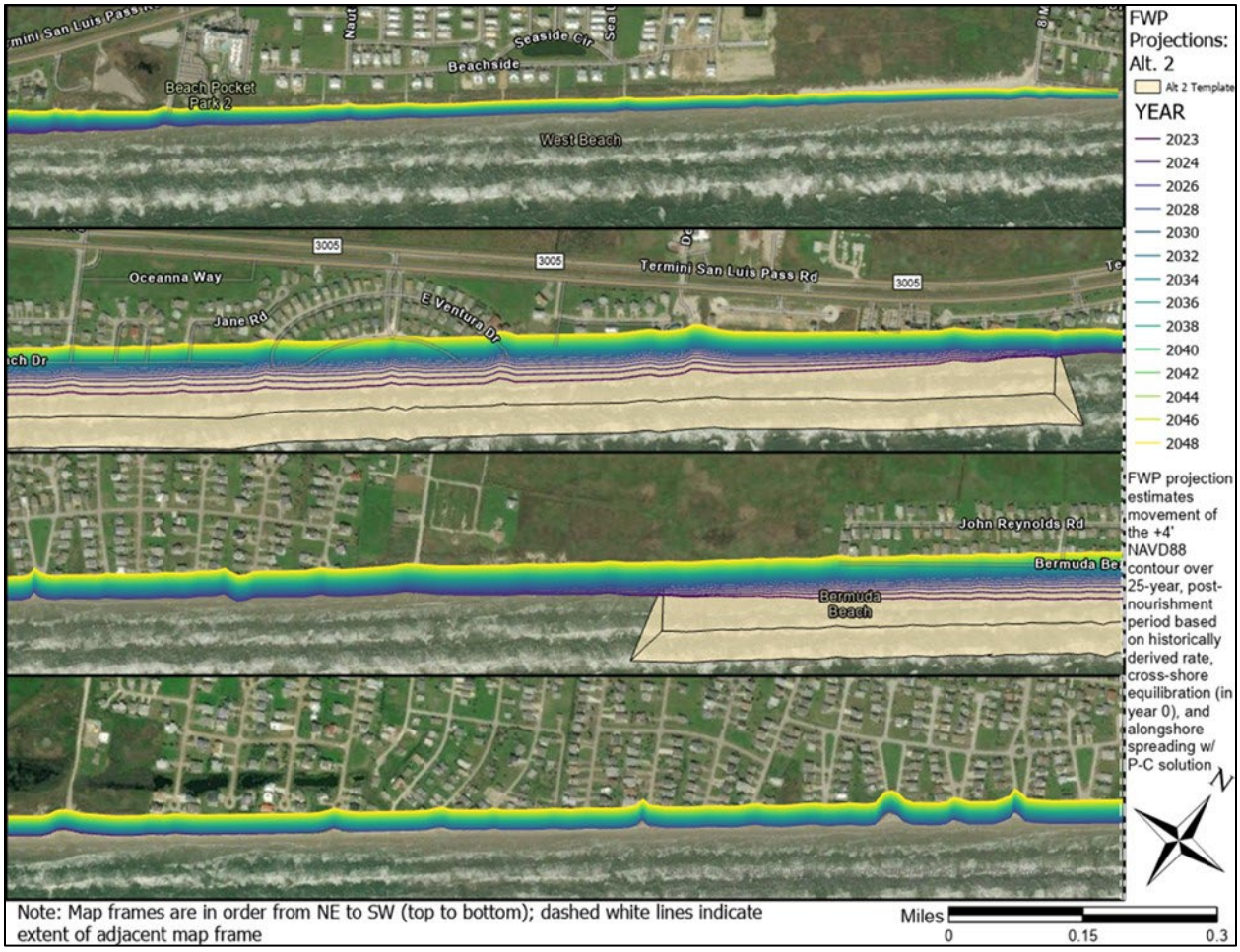

Figure 13 – FWP Alternative 2 Beach Nourishment

4.2.2 Alternative 3 – Beach Nourishment

Dredged material is brought to the west end of Galveston Beach by hopper dredge using a pipeline for beach placement beginning at Hershey Beach Drive and extending approximately 1.7 miles west to Ghost Crab Lane.

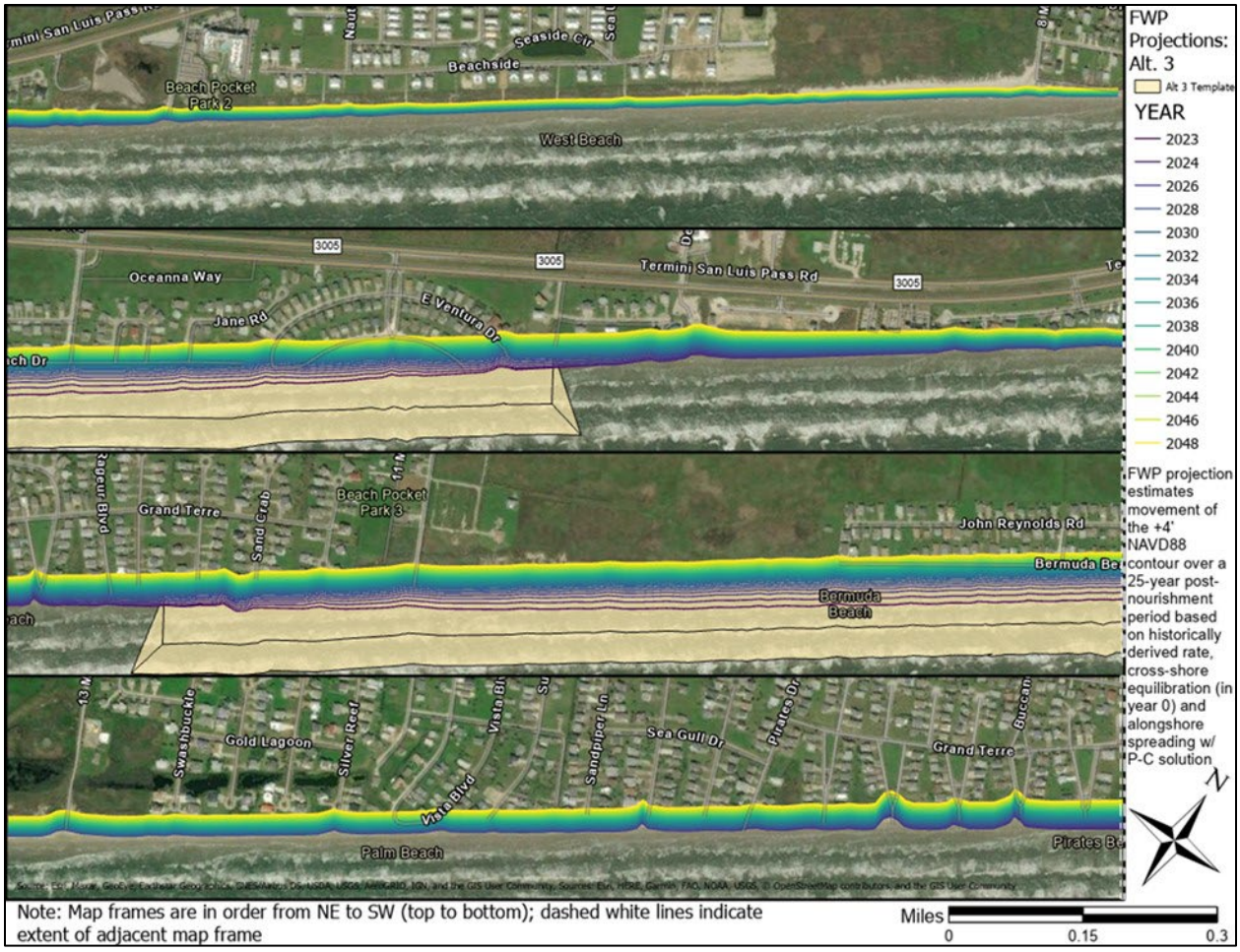

Figure 14 - FWP Alternative 3 Beach Nourishment

4.3 Costs and Benefits of Alternatives 2 and 3

Both the focused alternatives meet the criteria of only one placement on public access beaches, have BUDM benefits, and avoid impacts to sea turtles and shore birds to qualify for the final comparison of the National Economic Development Objective of benefits over cost. Both Alternatives 2 and 3 meet the criteria of economic justification, environmental factors, completeness, and effectiveness to be constructed under the authority of Section 204. As Alternative 2 has the greatest excess benefits over cost as well as providing direct erosion protection to the most vulnerable development within the study area including Highway 3005, an essential evacuation route, It is the most effective and acceptable plan. Alternative 2 is the NFS's preferred plan and also the Tentatively Selected Plan.

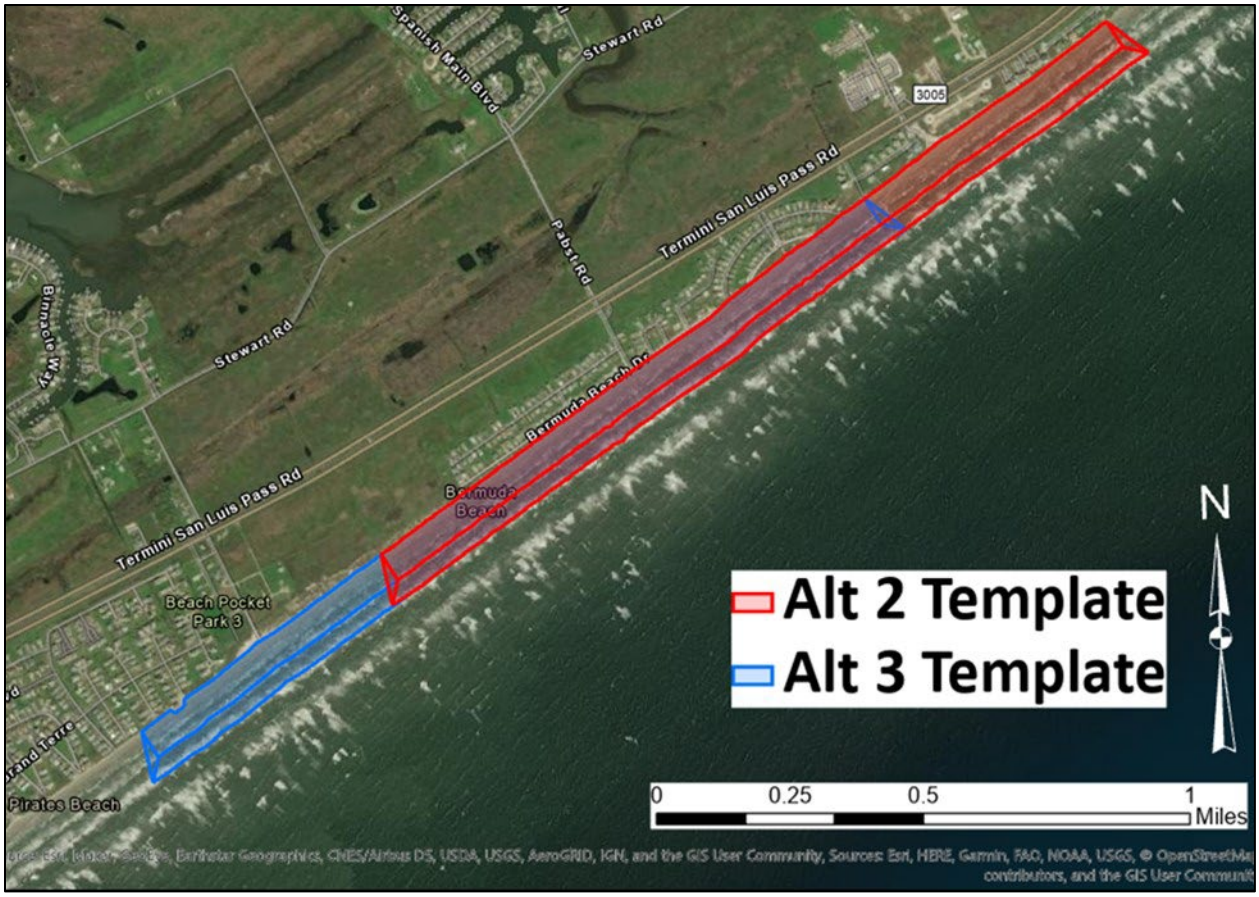

Figure 15 - Alternatives 2 and 3 Template

Alternative 2 is the TSP as it has the greatest CSRM benefits over cost making it the plan meeting the National Economic Development (NED) Objective. Life safety benefits would be similar for both Alternatives 2 and 3 as would Environmental Quality (EQ), Regional Economic Development (RED), Other Social Effects (OSE), monetary and non-monetary benefits, and primary versus incidental benefits. See Appendix E for economic benefits and additional economic information. OSE of the BUDM benefits delays erosion's life safety concerns (non-monetary) of undermining the evacuation route and homes, which also provides continued social interaction (non-monetary) as well as continued beach recreation that provides economic vitality to Galveston. Both alternatives have EQ of equal lengths of sand placement along and extending the beach seaward that temporary provides habitat such as for sea turtles, crabs and shore birds. Primary Federal Interest benefits are Coastal Storm Risk Management with incidental benefits for land losses and recreation.

Table 5 – First Costs for Alternative Plans (rounded)

Project First Costs	Alt 1 - FWOP	Alt 2 - BUDM	Alt 3 - BUDM
Construction Cost			
01 Real Estate		$77,000	$77,000
12 Navigation	$6,539,000	$18,912,000	19,553,000
30 Eng. & Design	$654,000	$1,888,000	$1,911,000
31 Const Mgmt.	$391,000	$1,134,000	$881,000
Project First Cost, rounded	$7,584,000	$22,011,000	$22,422,000
INCREASED PROJ COST		$14,427,000	$14,838,000

FY22 Price Levels, 25% Contingency (Appendix B – Cost)

Table 6 - Benefit-Cost Comparison Between Alternatives 2 and 3

	Alternative 2	Alternative 3
FY2022 Project First Cost	$14,427,000	$14,838,200
IDC - @ 2.50%	$29,700	$30,600
2022 Total Investment	**$14,446,800**	**$14,858,500**
Capital Recovery Factor **-** 24 years	0.0559	0.0559
FY2022 Annual Costs **for** 24-Year Period of Analysis	$808,300	$831,400
Annual Land Loss Avoided	$245,200	$245,200
Annual Recreation Benefits	$51,900	$51,900
Annual **Structure** Benefits	$875,600	$633,900
Total Annual Benefits **for 24-Year Period of Analysis**	$1,172,700	$931,000
Net Annual Benefits	$364,400	$99,600
Benefit-Cost Ratio	**1.45**	**1.12**

(Appendix E - Economics)

4.3.1 Planning Criteria

Criteria for comparing alternatives includes Costs, Benefits, Objectives, Constraints, Completeness, Effectiveness, Efficiency, Acceptability, and Environmental Impacts (Table 7).

Table 7 - Planning Criteria Alternative Evaluation

	No Action	Alternative 2	Alternative 3
Completeness – Does the alternative provide and account for all required investments to meet planning objectives?	NO	YES	YES
Effectiveness – Does the alternative contribute to meeting the planning objectives?	NO	YES	YES
Efficiency – Is the alternative the most effective way of meeting the planning objectives?	NO	YES	NO
Acceptability – Does the alternative meet all applicable laws, regulations and public policies?	NO	YES	YES

4.3.2 Qualitative Comprehensive Benefits Analysis

In January of 2021, USACE PDTs were directed to identify and analyze benefits in total and equally across a full array of benefit categories. Because this study was done under CAP, which relies heavily on best professional judgement and existing information, as opposed to the gathering of new information and models such as Cost Effective – Incremental Cost Analyses, this Comprehensive Benefits Analysis was performed qualitatively in order to keep costs down and to stay as close as possible to the statutory Federal participation limit.

Table 8 - Qualitative Comprehensive Benefits Analysis

Account	No Action	Alt 2	Alt 3
NED – Does the alternative increase the net value of the national output of goods and services, expressed in monetary units?	NO	YES – This alternative has positive net benefits of $364K.	YES – This alternative has positive net benefits of $100K.
RED – Does the alternative positively increase regional economic activities for income, employment, output or population?	NO	YES – This alternative would provide regional, temporary employment during construction and possibly for O&M.	YES – This alternative would provide regional, temporary employment during construction and possibly for O&M.
OSE – Does the alternative positively affect social aspects such as health and safety, displacement, energy conservation, etc.?	NO – This stretch of beach would continue to erode possibly putting the emergency evacuation route in danger of closing.	YES – Those who use beaches for exercise and recreation would be more likely to use this stretch of beach after construction.	YES – Those who use beaches for exercise and recreation would be more likely to use this stretch of beach after construction.
EQ – Does the alternative have positive effects on ecological and cultural resources?	NO – FWOP conditions will continue to be poor for aquatic species due to high sediment loads from bank sloughing.	YES – While not an objective of the study, animals who use beaches are more likely to use this stretch of beach after construction.	YES – While not an objective of the study, animals who use beaches are more likely to use this stretch of beach after construction.

5 Tentatively Selected Plan / Recommended Plan Description

Alternative 2**:** Dredged material is brought to the west end of the public use Galveston Beach by hopper dredge and pumped by a pipeline for beach placement beginning at Sunbather Lane and extending for 1.7 miles west. This is a measure for beach erosion control for the purpose of hurricane and storm damage reduction.

Costs for the Section 204 beneficial use project are measured as the increase in cost for direct beach placement of the dredged sand above the cost of the Federal Base Plan for ocean placement. The increased cost for construction of the beach nourishment plan is estimated at $15,115,000 fully funded. The 35 percent non-Federal share of the Section 204 project is estimated at $5,290,000. The 65 percent Federal share would be $9,825,000 for the purpose of coastal storm damage reduction. With the $450,000 Federal expenditure for the project study, the total Federal cost expenditure of $10,275,000 exceeds the $10,000,000 per project Federal expenditure limit. Sponsor must pay an additional $275,000 for a total share of $5,565,000.

Benefits for the increased beach fill include reducing the loss and damage to protected private developed properties of land loss, structural damages and recreation activities for the 24-year period of analysis without providing a specific level of service. The incremental construction first cost of beach nourishment for Alternative 2, the Recommended Plan is $14,427,000 or $808,300 (annualized). Net annual benefits amount to $364,400 yielding a Benefit-to-Cost Ratio of 1.45 to one. These benefits indicate a positive National Economic Development plan for beneficial use of dredged material to provide coastal storm damage risk reduction in the City of Galveston, Texas. See Figure 13 below of the graphic exhibiting existing, design, and post construction profiles based on beach equilibrium concepts.

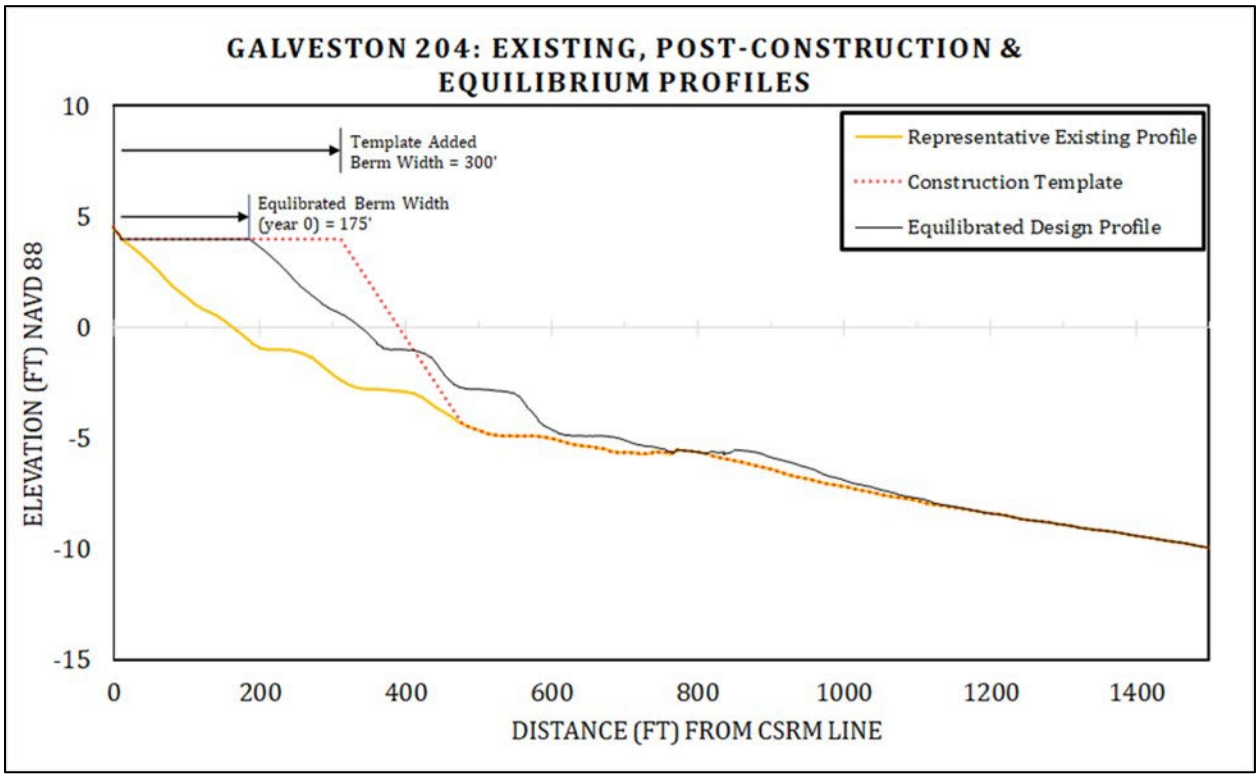

Figure 16 - CSRM - Coastal Storm Risk Management Line

The selected plan has been identified as the least environmentally damaging alternative, as such, the analysis indicates beach nourishment for Galveston Island is feasible, environmentally acceptable, and economically justified. This report concludes that there is Federal interest in proceeding with implementation of a project for the

beneficial use of dredged material from Galveston Navigation Channel under the authority of Section 204 of the Water Resources Development Act (WRDA) of 1992 (33 USC Sec. 2326), as amended. The tentatively selected plan is to bring dredged material to the west end of Galveston Beach transferred to a pipeline dredge for beach placement beginning at Sunbather Lane and extending 1.7 miles west.

6 Future With-Project Condition

Future with project conditions forecasts the most likely conditions expected during the periodof analysis if the selected beneficial-use project, direct placement of sand at Galveston Island is constructed. The future with project condition provides the basis from which benefits resulting from the construction project are calculated. The primary account used to calculate benefits from a storm damage reduction project is national economic development (NED).

This study forecasts the conditions expected through 2046 if the 530,000 cubic yards of available material is placed on the beach rather than in the ocean disposal area during the upcoming maintenance dredging of Galveston Entrance Channel Reach for 2025 or outyears. The analysis evaluated how the project would reduce coastal erosion damages to structures and infrastructure over the 24-year (2023-2046) period of analysis. The one-line shoreline retreat results compare well with volumetric loss projections, indicating losses inside the original placement area (construction template) at over half of the original beach fill in year one, approximately 80% by year 5, and 100% loss between years 8 and 10. While statistically derived background erosion rates mitigate some uncertainty inherent in the analytical solutions, analytical projections which form the basis of design here should not be considered representative of actual shoreline evolution (Figure 9 and Figure 17).

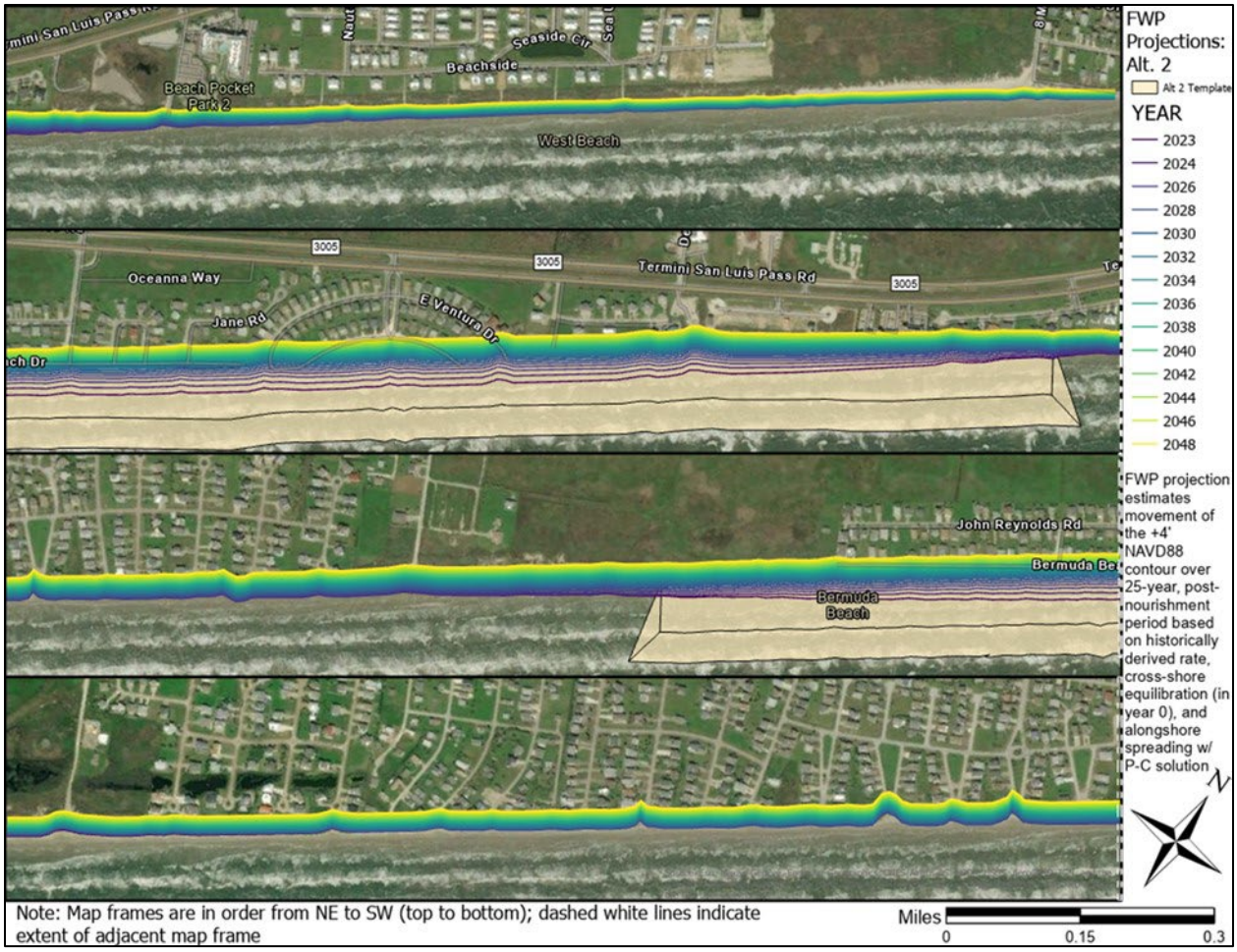

Figure 17 - Alternative 2 FWP

6.1 Environmental Consequences of Alternatives

Described are the probable effects or impacts of implementing the No Action/Future Without Project (FWOP) and the action alternative (i.e., the Future with Project condition or FWP). Effects can be either beneficial or adverse and are considered over a 24-year period of analysis (2023-2046).

The No Action Alternative is the most likely condition expected to occur over the 24-year planning horizon in the absence of the action alternative. In this case, the No Action Alternative means that dredged material would not be beneficially used to nourish the beach between Sunbather and Ghost Crab Lanes. Federal Operations and Maintenance dredging of the Galveston Entrance Channel Reach would occur according to the Federal Standard and placement of material following would be in an offshore disposal site. The ODMDS is shown in Figure 2.

The No Action Analysis includes a brief impact analysis of reasonably likely projects (e.g., projects funded for construction or for which a decision document is available but is awaiting funding) that are expected to modify the existing conditions of the project area. It is assumed that all other projects that are ongoing in the study area would

continue as planned but would not directly affect the project area and are therefore not discussed in the No Action analysis.

The Action Alternative is the TSP (Alternative 2), which involves beneficially using dredged material to nourish approximately 1.7 miles of beach. It is assumed all sediment needs for implementation of Alternative 2 would come from material dredged from the Galveston Entrance Channel Reach. The sediment needs would be met using existing operations and maintenance dredging and would not induce additional dredging beyond the Federal Standard.

Unless otherwise indicated, the impacts of dredging material are assumed to be identical under the No Action and Alternative 2 and will not be discussed herein. The impacts of O&M dredging and material have been accounted in its NEPA documentation and are incorporated by reference. This analysis will focus on the transportation and placement of dredged material to the Federal Standard location (No Action) or onto the beach (Alternative 2).

When considering impacts, it was assumed that, at a minimum, best management practices (BMPs) identified throughout this chapter would apply during project construction. Assumed BMPs are based primarily on widely accepted industry, state and federal standards for construction activities. Examples include but are not limited to:

- Use of silt fencing to limit soil migration and water quality degradation;
- Refueling and maintenance of vehicles and equipment in designated areas to prevent accidental spills and potential contamination of water sources and the surrounding soils;
- Limiting idling of vehicles and equipment to reduce emissions;
- Limiting ground disturbance necessary for staging areas, access routes, pipeline routes, etc. to the smallest area necessary to safely operate during construction and restoring staging area and access routes to result in no permanent loss;
- Minimizing project equipment and vehicles transiting between the staging area and restoration site to the greatest extent practicable, including but not limited to using designated routes, confining vehicle access to the immediate needs of the project, and coordinating and sequencing work to minimize the frequency and density of vehicular traffic.
- Minimizing use of construction lighting at night and when in use, directing lighting toward the construction activity area and shielding from view outside of the project area to the maximum extent practicable.

If, for some reason, the BMPs are not implemented, the impacts of any of the action alternatives would only minimally increase from those described in this chapter. The increase in impacts would not be substantial enough to cause an adverse insignificant impact to become significant.

6.1.1 Air Quality

No Action

Under the Federal Standard, transport of dredged material to the ODMDS would result in direct, short term adverse impacts to ambient air quality from construction activities associated with dredging, transport, and placement of material into the site. Dredged material would be transported by the dredge vessel approximately 5 miles. Dredging operations are not below *de minimus* and as a result have received a General Conformity Determination.

Alternative 2

The action would have direct, short term adverse impacts to ambient air quality from construction activities; however, no long-term adverse or beneficial impacts are expected because the project does not involve construction of permanent emission-emitting structures. Short-term air emissions would be mobile in nature, temporary, and localized to the nourishment area being worked at that time and any required booster pump locations and cease upon completion of construction actions. Operation of booster pumps, heavy equipment, support vehicles, vessels, and other motorized machinery for construction would result in combustion of fossil fuels and the release of volatile organic compounds (VOCs), nitrogen oxides (NOx), carbon monoxide (CO), ozone (O_3), sulfur dioxide (SO_2), and particulates (PM_{10} and $PM_{2.5}$).

In addition to BMPs already listed at the beginning of the chapter, the following BMPs would further reduce air quality impacts and should be incorporated when developing contract specifications: use non-road diesel-powered equipment which meets stringent Tier 3 and Tier 4 emissions standards; maintain and tune engines per manufacture's specifications to perform at EPA certification levels, prevent tampering, and conduct inspections to ensure these measures are followed; and consider alternative fuel and energy sources (e.g. natural gas, electricity, etc.) when and where appropriate. Using higher tiered equipment can reduce emissions and should be considered when possible; however, it is recognized that using this equipment may contribute to higher costs or limited availability of such equipment.

Existing beach nourishment actions along Galveston Island (DA Permit #SWG-2000-02888) were analyzed for conformity applicability pursuant to regulations implementing Section 176(c) of the Clean Air Act. For that project, it was determined that approximately 10.5 miles of beach nourishment and associated activities, including dredging in offshore and upland borrow locations, would not exceed *de minimis* levels of direct or indirect emissions of any criteria pollutant or its precursors. In comparison, Alternative 2 is significantly smaller in scope and does not involve any new dredging; therefore, it is also anticipated that direct and indirect emissions of the action would not exceed de minimis for any criteria pollutants or its precursors and is exempt from General Conformity Regulations.

Alternative 2 would result in higher emission rates than the FWOP/No Action due to longer transport vessel distances for the beach placement but would be within conformity regulations.

6.1.2 Climate

Climate impacts are analyzed from two perspectives: impact of implementing any of the action alternatives on climate and climate change and the impact of climate change on the performance of any of the action alternatives.

NEPA does not specify significance thresholds that may be used to evaluate the effects of a proposed action on global climate. The appropriate approach to evaluating a project's impact on global climate under NEPA is in a state of flux. Current guidance is to follow the Council on Environmental Quality (CEQ) guidance released in August 2016, which recommends 25,000 metric tons CO_2 equivalent ($MTCO_2e$) of direct emissions per year be used as a presumptive threshold for analysis and disclosure within NEPA documents. The guidance suggests that if a proposed action would result in direct emissions below this threshold, the emissions would not be relevant to and would not need to be discussed within a NEPA analysis.

At the state level, GHGs are a regulated pollutant under the PSD program when emissions exceed the thresholds set in 30 TAC 116.164(a)(1) or (a)(2). The threshold for new source emissions is the project emissions are above the major source threshold for a regulated pollutant that is not GHGs and will emit or have the potential to emit 75,000 tons per year (tpy) or more CO_2e. Emissions of GHGs are regulated and require authorization only when the project emission increases are above this threshold. None of the alternatives would exceed any non-GHG thresholds and would emit far fewer tpy CO_2e than the regulated amount.

No Action

Construction Activities

Under the No Action, no construction activities are anticipated in the project area, so there would be no emission of greenhouse gasses (GHGs).

Alternative 2

During construction, combustion of fossil fuels while operating on- and off-road mobile sources would result in the emission of GHGs. The primary GHGs generated during construction are CO_2, CH_4, and N_2O. The other GHGs such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride are typically associated with specific industrial sources and processes and would not be emitted during construction. After construction is complete, all GHG emissions would cease, and the area would return to baseline conditions. There are no apparent carbon sequestration impacts that would result from implementation; thus, the total direct and indirect impacts would be constrained to very small increases in GHG emissions to the atmosphere from operation of on- and off-road mobile sources. Performance under RSLC is discussed in Physical Oceanography, Relative Sea Level Change below for Alternative 2].

6.1.3 Physical Oceanography

6.1.3.1 Tides Currents and Circulation Patterns

No Action

Under the No Action, currents and circulation patterns would not be expected to change. As the beach narrows and shoreline loss occurs, the high tide line is expected to move further landward than where it is under the existing condition.

Alternative 2

Under Alternative 2, a wider beach will cause waves to break further from the shoreline, weakening their force before they reach the shoreline itself, thereby helping to protect the existing dune and properties from erosion, decreasing flooding potential and limiting how far ashore storm surge will go. Since CAP Section 204 limits Federal participation to $10 million, this is a one-time placement, the changes to wave breaking would be temporary and return to the existing condition at the end of the project life (about 10 years). Placing dredged material into the nearshore over a large area would not be expected to change the currents, circulation patterns, or tides due to the relatively minimal change in bathymetry (~2 percent slopes and less than a 5-foot max elevation increase).

Beach nourishment would not impact regional hydrology. The placement of sediments on the beach may have very localized effects on where rainfall runoff flows but would not block or interfere with any existing stream channels or other permanent inland waterbodies. No long-term or spatially extensive impacts to watershed hydrology are anticipated.

6.1.3.2 Relative Sea Level Rise

No Action

The impact of RSLC in the project area is discussed throughout the environmental consequences section of this DIFR-EA. In general, RSLC is anticipated to continue increasing at 0.02096 feet/year. At the end of the assumed maximum project benefit period, the water levels are projected to rise 0.82, 1.01 and 1.60 feet relative to NAVD88 for the low, intermediate, and high scenarios, respectively.

Alternative 2

Sea level rise is accounted for in the advance fill volume, which also includes contributions from background erosion, end loss and overfill. Because this action is a one-time nourishment in the near future and a relatively short project life, any beneficial impacts of nourishing the beach to combat sea level rise are unlikely to be realized.

6.1.3.3 Flooding

No Action

Storms represent the extremes in flooding risk and potential damage to the project area under the existing condition and into the future. As erosion continues to encroach on any dunes and degrade it, storm surge events are more likely to overtop dunes in more frequent events. At some point in the future, the narrow beach and degraded dune may not prevent tidal flooding during high-tide resulting in nuisance flooding occurring more frequently on a bi-monthly or even daily basis in lower-lying areas. As sea levels rise, the concern with more frequent flooding will only increase. It is reasonably likely that a hardened structure would be proposed to combat the problem at some point in the future.

Alternative 2

Executive Order 11988 requires evaluation the proposed project's potential effects on a floodplain. The project is located on a "developed" barrier island and it has not been designated as a protected area. The nourishment of the beach will not create any new structures that will be threatened by flooding, nor will it result in increased development or threats to human safety, health and welfare. Slowing coastal erosion through renourishment of the beach will provide a more stable beach, reduce the impacts of erosion on any dune, and assist in preventing damage to existing infrastructure behind dunes from storm events.

The project is in the base floodplain (100-year floodplain) and has been evaluated in accordance with Executive Order 11988. Relocation of the project outside the floodplain would not be responsive to the purpose and need of the study and was not considered further. The risk of inducement is normally associated with structural projects such as levels and floodwalls where vacant parcels are no long subject to frequent flooding, lowering the cost of potential development and providing economic incentive for the addition of inventory to the floodplain. Potential floodplain development as a result of implementing Alternative 2 would be negligible and not likely a factor in deciding to build or rebuild, especially since this would be a one-time nourishment, only provide benefits for up to 24 years, and would not protect against higher storm surge events. The 24-year period of analysis was based upon engineering and economics demonstrating that 24 years was the period over which benefits accrue and effects can be measured.

Beach nourishment would have temporary beneficial impacts to natural floodplain values by increasing the width of the beach and attenuating wave energies further from the development. No loss of natural and beneficial floodplain values is anticipated, and the project is not expected to measurably change the base floodplain.

6.1.3.4 Geomorphology

No Action

Under the No Action, current longshore sediment deficits would likely continue to increase at the observed rate resulting in associated shoreline loss similar to losses experienced over the last decade. Areas outside the project footprint where beach nourishment is ongoing is expected to continue similar to historic rates or that which has been approved through the regulatory permit issued to the Galveston Island Parks Board.

Sediments dredged from the Galveston Harbor and Channel (GHC) would be placed into an ODMDS beyond the depth of closure. As a result, approximately 530,000 cubic yards of sediment would be permanently removed from the sediment budget along the coast.

No changes to geology or soil is anticipated under the no action.

Alternative 2

Implementation of Alternative 2, would reintroduce sediments into the system through placement of dredged material directly on the beach and in the nearshore area. After placement, the sediments would behave as the existing substrate and would be seasonally transported on and off the beach as long as it remains in the littoral cell. A wider beach would increase the available sacrificial land which would allow for wave attenuation and a temporary reduction in erosion and shoreline loss. After all sacrificial lands have been removed (between year 8 and 10 post-construction), shoreline erosion and sediment movement would return to the existing condition of eroding at four to five feet per year.

Given the limited availability of naturally sourced sand, it is important to utilize any locally sourced (dredged) beach-quality borrow fill for nourishment purposes. Beneficially using the material retains the sediments in the sediment budget and over the long-term is more cost-effective than extracting sediments from an ODMDS and returning them to the system such as proposed under other projects (e.g., Coastal Texas Protection and Ecosystem Restoration Study).

No significant effect on the geology or soils in the region are anticipated. Sediments dredged from the Galveston Harbor and Channel have been tested for contaminants and to date there is no indication of concern.

Best management practices which apply to beach nourishment activities include:

- use of beach quality sand consistent in grain size, color, and composition as the existing beach and free of hazardous contaminants
- placement of a gradual slope to minimize scarping; and
- restoration of all project sites to pre-construction slope or contours and all ruts leveled.

6.1.4 Water Quality

No Action

Soils in the study area are highly susceptible to erosion leading to shoreline instability and excessive amounts of sediment inputs into the nearshore, which increases turbidity and can have an adverse effect aquatic life and fisheries and restrict light penetration necessary for photosynthesis by aquatic plants. The nearshore environment in the project area is subject to periodic increases in turbidity resulting from storms and wave activity and often exceeds the State water quality standards of 300 milligrams per liter of total suspended solids (TSS). As a result, the biological communities found in the nearshore are comprised of stress tolerant species. Turbidity levels in the project area are not expected to change under the No Action since most of the turbidity is related to wave activity and erosion of the shoreline.

Warmer temperatures would contribute to reduced dissolved oxygen and increased frequency of algal blooms, which can create toxic conditions for aquatic species. Summer droughts may amplify these effects, while periods of extreme rainfall can further degrade water quality through increased sedimentation, erosion, turbidity, nutrient loading and pollutant-laden run-off (EPA 2016).

Alternative 2

Changes to water quality parameters such as temperature, salinity, and dissolved oxygen from the proposed action are not expected to occur as a result of beach placement or pipeline installation or removal.

Construction activities may cause temporary increases in turbidity in the immediate vicinity of the discharge location. These conditions will cause temporary increases in TSS but is not expected to differ significantly from normal TSS levels in the surf zone during discharge and would return to baseline conditions after discharge at the site is complete. The USACE intends to request a waiver from the Texas Commission on Environmental Quality (TCEQ) standard threshold of dredged effluent having less than 300 milligrams per liter of TSS in areas where nourishment activities are ongoing.

In 2017, a contaminant assessment report was completed for the Galveston Harbor and Channel and the Houston Ship Channel for compliance with EPA Ocean Dumping Regulations (40 CFR Part 227 Subpart B). During the assessment it was noted that the elutriate exceeded the EPA acute Water Quality Criterion (Criterion Maximum Concentration [CMC] for ammonia. While the exceedance would not cause a water quality violation, the dilution required to meet the CMC was calculated at 1.44. The dilution curve indicated that the Suspended Particulate Phase (SPP) concentration fell below one percent by 150 minutes after discharge, which allows the ammonia CMC to be easily met within the four hours required by RIA. Based on the findings, the Limiting Permissible Concentration (LPC) for the liquid and suspended particulate phases are met, indicating no toxicity to sensitive marine water-column organisms is expected during placement and no special handling or management requirements during discharge.

Temporary pipeline routes would run near the highest point of the un-vegetated beach and/or be submerged offshore 1,000 to 2,000 feet parallel to the shoreline, then routed perpendicular to the beach with the effluent from the dredge discharge pipe directed toward the nourishment/containment area and relocated as each section of beach is finished. Placement of dredged material on the beach would occur inside of a temporary toe berm, where dredge slurry would be placed within the contained area. Dozers would be used to create dikes from existing material or the start of pumped material to control the discharge slurry and keep the flow within the template long enough for the material to fall out of suspension from the slurry. The dredged material delivery pipeline would be lowered into place from tugboats and would be held in place by its own weight. These BMPs significantly reduce the discharge of material outside the containment area and into adjacent waters.

6.1.5 Biological Communities

No Action

A barrier island, such as Galveston Island, is a dynamic feature that naturally undergoes erosion of the beach and dune from the seaward side and accretion on the back side of the island. In this way, the island essentially “moves” with changing sea states. It is this ability to adapt that allows these features to persist. However, development along the Reach 1-3 shoreline prevents this natural erosion/accretion cycle from occurring; therefore, sand will be progressively lost at approximately 4 to 5 feet per year and not replenished naturally. The No Action alternative would allow for continued erosion of the project area beaches and may result in progressive loss and possible elimination of the remaining beach and dune habitat and the invaluable ecological services these areas provide. Most notably, loss of beach would threaten foraging and nesting habitat for sea turtles, shorebirds and seabirds that frequent the project area.

Additionally, armoring measures, such as construction of seawalls, may be undertaken by property owners, the State, or the Federal government in the absence of nourishment, which would further reduce the available dune habitat and result in negative impacts to biological communities.

Alternative 2

The project area is located on eroding beachfront areas and does not impact existing dunes, dune vegetation, highly valued dune swale wetlands, other wetland areas, or special aquatic sites. Onshore placement and shaping activities to construct the proposed berm and anchoring of the pipelines would temporarily, adversely impact the biological communities that forage on and inhabit the beach, including benthos, infauna and shorebirds. After construction is complete adverse impacts would cease and recolonization would occur. Over the longer-term, beach nourishment would create a wider and more stable environment thus improving the suitability and productivity of available beach habitats. Relative to the No-Action Alternative, the benefits of beach

nourishment acting as a barrier against RSLC, dampening shoreline erosion, and improved habitat are expected to outweigh short-term construction impacts.

Benthic and Infaunal Community

Placement of dredged material onto the berm and the temporary anchoring of a pipeline in the nearshore environment would cause a temporary impact to the benthic and infaunal communities within the footprint of the pipeline and berm through direct burial, crushing by heavy equipment or anchoring activities, or removal of invertebrates. Larger and more mobile organisms are more likely to leave the area during construction, while the less mobile or sessile organisms would likely be buried by sand. Even some motile organisms or those able to burrow still have the potential to be buried by the overburden. Studies have documented that invertebrate fauna and prey species such as amphipods, polychaetes, and coquina clams recovered to pre-construction abundance following beach disturbance (National Research Council 1995, Greene 2002, Bolam et al. 2010). Additionally, both the nearshore and the backshore environment along the coast are dynamic and high energy environments which experience rapid sediment flux and recolonization in which the species that may be present are often accustomed to, which should allow for quicker recolonization. Given the abundance of this species assemblage along the coast, the temporary and minor impacts expected from the proposed action, and the recovery rate of these communities, effects of the proposed action on benthic invertebrates are expected to be less than significant.

Indirect effects of this temporary loss of intertidal community would also occur on marine and avian predators, including non-breeding shorebirds, for example due to temporary disruption to foraging patterns. Due to the size and nature of the proposed beach nourishment (i.e., up to 9,000 ft long by 300 ft base on the beach), a one-time placement, and the recovery rates of invertebrate population, this potential disruption to both the invertebrate community and their predators is expected to be less than significant.

Fisheries

Suspension/filter-feeding species, visual predators and other fishery and aquatic organisms could have short-term localized adverse indirect impacts caused by increased turbidity, total suspended sediments, and water temperatures and lower dissolved oxygen levels from placement of material. In general, it is anticipated that any tolerance beyond the existing dynamic and extreme conditions driven by sediment transport and fluctuating turbidity, would result in fish species avoiding the habitat and utilizing waters adjacent to the active construction zone. Any slower moving or less motile species (e.g., smaller or younger fish) unable to avoid the area may be buried by placement of material or crushed by heavy equipment shaping activities or anchoring of pipelines. Suspension/filter feeding organisms could be impacted due to clogging of the gills and feeding mechanisms which could either cause death or reduce growth and

reproduction. Visual predators would have a reduced success rate at catching prey due to lower visibility levels.

Following construction activities, turbidity and suspended sediment levels, water temperature, and dissolved oxygen levels are expected to return to pre-construction conditions. These temporary and localized impacts would be minimized and controlled by implementing the best available practical techniques and BMPs during construction.

Terrestrial Community

Alternative 2 would primarily affect shorebirds through habitat avoidance and temporary loss of food sources because of material placement and heavy equipment movement in their foraging habitat. It would be expected that shorebirds would seek out other foraging habitat that is available for several miles in either direction of the placement site. Some avian species may utilize the placed material as a food source depending on the invertebrates present in the dredged material. Temporary loss of the benthic community (a food source for shorebirds) is probable, although the level of impacts is expected to be minor and temporary (see discussion above).

Alternative 2 would not affect the status of invasive species, negatively or positively. The plans and specifications include requirements for the contractor to inspect equipment and clean equipment to prevent spread of existing invasive species.

Mitigation

The fundamental objective of compensatory mitigation is to offset environmental losses resulting from unavoidable and permanent impacts to waters of the United States. Because implementation of Alternative 2 is expected to induce temporary impacts to Waters of the US but not long-term or permanent adverse impacts, no compensatory mitigation is necessary.

6.1.5.1 Threatened and Endangered Species

No Action

Under the No Action, the conditions described for Habitats (section [Habitats-No Action]) would also apply to Federally listed species. As loss of coastal habitats throughout the country continues, it is likely that there will be an increase in species warranting conservation and protection over the planning horizon.

Alternative 2

The impacts described in Section [Alt 2 Habitats] would also apply to ESA-listed species. A BO was issued to the NFS by the USFWS on June 17, 2019, through Consultation No. 02ETTX00-2018-F-2491, for the Galveston Parks Board to perform beach nourishment on Galveston Island, Texas under the USACE permit SWG-2007-01025. The USACE permit authorized the NFS to perform beach nourishment activities

along beachfront on the west end of Galveston Island, beginning at the western terminus of the Galveston seawall and extending west to the eastern boundary of Galveston Island State Park, as well as the western edge of Jamaica Beach to the west end of Pointe West Subdivision at Salt Prairie Drive. The BO addressed the effects of the proposed permit action on the endangered Kemp's ridley sea turtle, threatened piping plover, and threatened red knot in accordance with Section 7 of the ESA of 1973, as amended (16 U.S.C. §1531 et seq.).

The USACE determined the permit action would have no effect on the threatened West Indian manatee, endangered Attwater's greater prairie chicken, and endangered leatherback sea turtle; thus, no coordination or contact with the USFWS was necessary for these species. The USFWS concurred with the USACE's effects determinations that the onshore actions of the permit action *may affect but are not likely to adversely affect* the endangered green sea turtle, endangered hawksbill sea turtle, and threatened loggerhead sea turtle, or adversely modify piping plover critical habitat unit TX-34. For additional species-specific related details, refer to the BO (Appendix C).

On September 30, 2022, the USACE requested the USFWS acknowledge and accept the use of the Galveston Parks Board permit and accompanying BO to meet the environmental requirements of the ESA. The Parks Board provided a concurrence letter to the USFWS on September 30, 2022, for the USACE to utilize the permit and BO as a means to expedite the environmental compliance requirements for this project. In a letter of agreement dated October 11, 2022, the USFWS accepted the USACE's request under the precedence that all conditions and conservation measures referenced in the permit and BO are adhered to during nourishment actions. The USFWS also provided additional comments about proposed critical habitat for Rufa red knot that may require a conference opinion during PED, or trigger reinitiating consultation, if critical habitat is designated prior to construction. The USACE is committed to abiding by all conservation measures and conditions outlined in the BO and permit (see Appendix C).

The USACE determined Alternative 2 would have *no effect* on the four NMFS protected species – oceanic whitetip shark, giant manta ray, sperm whale, and rice's whale – because the project occurs outside the known range of these species and no suitable habitat exists in the action area. A Memorandum for the Record (MFR) was written on September 14, 2022, to document compliance with the ESA consultation within the NMFS jurisdiction. NOAA Fisheries released a policy effective January 13, 2017, stating the agency "will not provide formal written responses to requests for concurrence with a federal action agency's determination that its action will not affect any ESA-listed species or designated critical habitat". The MFR can be reviewed in detail in Appendix C.

6.1.5.2 Migratory Birds

No Action

Many migratory birds are sensitive to environmental changes. Increasing temperatures, changing vegetation, loss of habitat, and extreme weather conditions lead to significant changes of the birds' preferred habitats. The ways in which migratory birds respond to

these environmental changes differ across species. In general, short- and middle-distance migrating birds can adapt to climate changes more easily, whereas long distance migrants struggle with readjustment to changing temperatures (e.g., changes in annual migration rhythm) or loss of critical stopover sites and breeding/wintering habitat. It is anticipated that some bird species will adapt while others will decline in abundance, shrink in distribution, or become extinct.

Specifically, in the project area, shoreline loss will contribute to a region-wide loss of shoreline habitat critical to many migratory birds as breeding, wintering, or stopover habitat.

Alternative 2

Placement of dredged material and shaping activities are the most likely actions that would create a localized disturbance during construction that will result in avian avoidance of the area and disruption to feeding, resting and nesting/mating behavior as a result of noise, vibrations, lighting, and presence of personnel and equipment. Use of adjacent quality shoreline is expected minimizing the potential for any measurable loss of population, diversity, or abundance. These impacts will be short-term and are expected to cease once nourishment is completed.

During construction, there is a potential for harm and/or harassment of nesting migratory birds. Attempts would be made to conduct all placement activities outside of the nesting season; however, this may not be possible, due to the timing of dredge availability and the extended length of the nesting season for some species. Prior to construction commencing, if during the nesting season, nest surveys should be completed. If nests are identified, all construction activities should observe a 1,000-foot buffer of any colonial-nesting waterbird colonies (e.g., egrets, herons, ibis, pelicans); a 1,300-foot buffer for any shorebird nesting colonies (e.g., terns, gulls, plovers, skimmers); and a 2,000-foot buffer for any brown pelican nesting colonies near the active construction site. Although unlikely in the project area due to lack of suitable nesting sites, if bald eagle nests are documented a buffer of at least 330 feet should be maintained between active construction and the nest and clearing of vegetation should be restricted within 660 feet of the nest site year-round (USFWS 2007). Coordination with USFWS should be completed prior to construction if nesting has been identified and USFWS guidelines should be followed to avoid adverse impacts to these species. By implementing these conservation measures there should be no adverse effects to migratory birds, including bald eagles.

6.1.5.3 Essential Fish Habitat

No Action

Climate-driven changes in the environment may affect the physiology, phenology, and behavior of marine fish and shellfish at any life-history stage and any of these effects may drive population level changes in distribution and abundance. Changes in ocean temperatures may shift population distribution causing predator-prey overlap, increasing

predation mortality or potentially altering post-recruit abundance. The extent of population-level changes may be mediated by the capacity for individual species/populations to adapt to changes in important abiotic and biotic factors through changes in the phenology of important life-history events (e.g., migration, spawning) or through changes in organismal physiology (e.g.,. thermal reaction norms) of key traits such as growth and or through acclimation. Life cycle dynamics will occur in concert with climate-induced expansion, contraction, and/or shifts in the quality and quantity of suitable habitat, and different life stages may be affected differently by changes in habitat characteristics. As a result, it is anticipated that in the future species' range, distribution, and abundance will be different than it is under the existing condition and additional species and habitats may be identified as warranting protection under the Magnuson-Stevens Fishery Conservation Management Act (MSFCMA).

Alternative 2

During onshore placement and shaping activities, anchoring of temporary pipelines in the nearshore environment and movement of vessels into and out of the project area, localized adverse impacts to water column EFH habitat and Federally managed species are anticipated. Direct and indirect impacts to managed species is dependent on the life stage of the species and their usage of the project area (i.e., eggs and larval fish will be affected to a greater extent than adults and juveniles because the older life stages have greater swimming abilities and will be able to move away from construction activities). Impacts to managed species would be similar to those described under Biological Communities for Alternative 2 and include: smothering, injury or entrainment; lowered feeding success due to turbidity, loss of benthic/prey organisms and less available foraging habitat; behavioral alterations due to sound, light, and structure; and changes to soft bottom bathymetry. However, adjacent similar habitat is available for prey and managed species to escape until construction ceases and baseline conditions return. Any loss of managed species would not be expected to affect populations of EFH species that inhabit the project area or the region.

Water quality concerns are of particular importance in the maintenance of the water column habitat. During placement, resuspended materials may interfere with the diversity and concentration of phytoplankton and zooplankton, and therefore could affect foraging success and patterns of schooling fishes and other grazers that comprise prey for managed species. Foraging patterns would be expected to return to normal at the end of placement and shaping activities.

As part of MSFCMA, any Federal agency that authorizes, funds or undertakes, or proposes to authorize, fund, or undertake an activity which could adversely affect EFH is subject to the consultation provisions of the Act and identifies consultation requirements (50 CFR Sections 600.805 - 600.930). This detailed project report and environmental assessment was prepared to serve as the EFH assessment. Since no significant adverse impacts are anticipated and the project as a whole is largely beneficial to EFH species, no mitigation was proposed.

6.1.5.4 Marine Mammals

No Action

Under changing future climate conditions, a shift in the distribution of common bottlenose dolphins is possible as temperatures and habitats change, accompanied by a shift in the distribution and abundance of prey species. There are also likely to be changes in the distribution of pathogens, so naïve populations may be exposed to new diseases. The impacts on populations will depend on their ability to adapt to change and on the continued availability of suitable resources and habitat available for the dolphins and their prey. It is assumed that any future dredging or in-water work would comply with the Marine Mammal Protection Act, which prohibits take of marine mammals and if adverse impacts are possible, mitigation would occur to minimize or compensate for the impacts.

Alternative 2

Impacts to marine mammals from implementation of Alternative 2 could arise during in-water activities occurring at the outer limits of the project area of the nearshore, such as set-up/take-down of dredged material transport pipes and operation of watercraft/vessels into and out of the project area. 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, pumps, or vessels. Many marine mammals are known to react to the movement or presence of vessels in response to the noise the vessels make or from a visual cue the animal receives and is highly dependent on the individual's reactionary behavior. Bottled nosed dolphins in the area are highly mobile and expected to easily avoid equipment. While the slow-moving West Indian manatee would be more susceptible to vessel strikes, this is highly unlikely since vessels would be moving at very slow speeds, the pipeline would be anchored to the sea floor, and implementation of the conservation measures listed below.

Marine mammals are highly vocal and dependent on sound for many aspects of life making them particularly susceptible to impacts from noise. Construction activities are expected to increase the ambient noise levels along the pipeline and at the placement site due to the presence of equipment and personnel, discharge of sediment, operation of booster pumps and other vessels at the construction site. Exposure to underwater noise, particularly continuous, low frequency sound, can be detected by marine mammals over considerable distances and could potentially impact or alter an individual's normal behavior, such as migration patterns, communication, foraging and breeding habits (Thomsen et al. 2009).

Additional conservation measures are being incorporated into the plan to avoid potential incidental harassment and "take" of marine mammals. The following mitigation measures would be implemented:

- Qualified biologists would monitor the presence of marine mammals during phases which involve open water areas capable of supporting marine mammals.
- Before activities occur in open water areas, a 50-foot radius of the work area should be delineated. If any marine mammal 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 siltation barriers are used, they will be made of material in which marine mammals cannot become entangled, should be properly secured, and regularly monitored to avoid mammal entrapment.

No long-term adverse impacts to marine mammals are anticipated, since the alternative does not involve measures that would reduce the food base, block or limit passage to or from biologically important areas, or permanently destroy habitat. The anticipated impacts are not expected to rise to the level of significant or result in the need for NOAA to issue an Incidental Take Authorization, especially with the incorporation of the conservation.

6.1.6 Cultural Resources

No Action

Under the No Action, there would be no change in cultural resources as compared to the existing condition. Cultural resources potentially present, but not yet identified, would continue to be subjected to erosional forces and fluctuating and rising sea levels.

Alternative 2

None of the four shipwreck sites would be affected by the current undertaking. Based on the absence of recorded historic properties within the project area and the dynamic nature of the shoreline, and the resultant erosion, the USACE has determined that there is no potential to affect historic properties and pursuant to 36 CFR 800.3 (a)(1), no further coordination is required.

6.1.7 Socioeconomics

No Action

Under the No Action, beaches in the project area would continue to be subjected to erosional forces resulting in narrower recreational beaches and less protection to adjacent private and public properties. Local economies could be impacted through loss of property and sales tax revenue and loss of revenue to local businesses from recreational beachgoers.

Alternative 2

Implementation of Alternative 2 is not expected to have any measurable adverse or beneficial impact on local economies around the project area given the relative density of residential structures and few commercial structures. Since this is only a one-time nourishment, any benefit of protecting property from loss and the subsequent loss of revenue would only be delayed, not eliminated or reduced.

No populations or communities in the study area meet the criteria for identification of minority or low-income populations under the CEQ Environmental Justice Guidance. Coupled with the overall benefits of restoration to the environment and nearby communities, implementation of the Action Alternative would not result in a disproportionately high or adverse impact on minority or low-income populations.

6.1.8 Noise, Aesthetics and Recreation

No Action

Under the No Action, erosion would continue to result in loss of recreational beaches creating a narrow beach that may at some point only become accessible during low tide and make it harder for beach goers to seek solitude away from other recreationists. The loss of dry beach may also be visually unappealing for private property owners or recreationists who often expect to see sandy beaches when they seek a coastal or ocean view.

Alternative 2

The proposed work would have a temporary adverse impact upon the aesthetics and recreational value of the site, caused by the presence of small machinery on-site and presence of booster pumps and work vessels. During construction, noise generated by the dredge and booster pumps would be offshore and should be of sufficient distance to not impact those living near or recreating on the beaches. Noise generated by equipment shaping the beach in the vicinity of the discharge pipe would be relatively localized (noise audible up to 800 feet from the active construction site), low level and of short duration resulting in a temporary reduction in aesthetics and potentially diminished recreational experience that would return to baseline conditions once construction is complete. Many visitors would seek adjacent beaches for quieter areas for fishing, swimming and sunbathing. Additionally, construction equipment would be properly maintained to minimize the effects of noise.

Hundreds of feet of dredged pipe lying on the beach or just offshore would have a negative visual impact on the aesthetics of the area, as well. This impact would be temporary and return to baseline conditions once the pipe is removed upon completion of the work. The negative visual impacts of the equipment and pipe would be offset to an extent by the natural curiosity of some individuals to see what is going on and how work is progressing. Once completed, the project would result in an overall improved aesthetic and recreation quality. Beach nourishment would restore the natural

appearance of a wider beach which is considered pleasing to observers and beachgoers.

During construction, use of the beach in the vicinity of the active construction zone would be temporarily restricted for public safety. As portions of the renourished beaches come available, use by the public could resume and are expected to return to pre-construction activity levels. The public would be more inclined to use the nourished beaches rather than by-passing them for others with more sand above the high tide line. Additionally, a nourished beach would increase suitable habitat for shorebirds and wading birds, thus increasing the bird watching opportunities in the project area.

6.1.9 Hazardous, Toxic and Radioactive Waste

No Action

Under the No Action, the existing condition is anticipated to remain the baseline condition through the planning horizon.

Alternative 2

Despite the lack of identified sites that could be reasonably expected to affect Alternative 2, there is always a possibility that previously unidentified HTRW could be uncovered, even when a proposed project is entirely within a preexisting project footprint. Care should be taken as the project progresses to identify and address HTRW concerns that may arise in a timely manner so as not to affect the proposed project.

The maintenance material from the Galveston Harbor and Channel is considered to be of acceptable quality and free of any of the prohibited materials listed in 40 CFR Part 227, Subparts B (227.5 (a-d) or 227.6 (a) (1-5)). Material from the channel has, to date, been evaluated several times using bioassay and bioaccumulation procedures. The results of historic chemical and grain size analyses, solid phase bioassays, and bioaccumulation assessments indicate no unacceptable adverse impacts will occur as a result of dredging and dredged material placement operations. While some constituents listed in the “constituents prohibited as other than trace contaminants,” such as organohalogens, carcinogens, mutagens, and teratogens, are not tested for nor are they historically known to be present in the Galveston Harbor and Channel.

7 Environmental Operating Principles

Systems Watershed Context

The TSP is integrated with other watershed purposes of recreation and continues to provide habitat for migratory birds, foraging seabirds, and nesting sea turtles while not impacting cultural resources.

Environmental Operating Principles

- Foster sustainability as a way of life throughout the organization.
- Proactively consider environmental consequences of all Corps activities and act accordingly.
- Create mutually supporting economic and environmentally sustainable solutions.
- Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps, which may impact human and natural environments.
- Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.
- Leverage scientific, economic and social knowledge to understand the environmental context and effects of Corps actions in a collaborative manner.
- Employ an open, transparent process that respects views of individuals and groups interested in Corps activities.

The TSP, Alternative 2, supports the USACE Environmental Operating Principles. The diverse disciplines of the project team including Non-Federal stakeholders complied with policy and statutory law in formulating the TSP. Science was employed to formulate economic, social, and environmentally sustainable solutions while using risk management considerations for the project life cycle. The TSP and its selection process was provided to the public for review.

8 Key Social and Environmental Factors and Mitigation Actions

8.1 Stakeholder Perspectives and Differences

In accordance with NEPA, 42 U.S.C. 4321 et seq., the draft DPR/EA was published July 2022 for a 30-day public comment period. The USACE accepted written public comments from July 15 to August 15, 2022. During the comment period, the USACE received 58 individual comments, including four industry letters and one city government letter with multiple signatories. Fifty-three comments expressed support for the project, identifying erosion risks to their communities, their failed attempts to combat erosion, and their concerns for future conditions without project implementation. Supportive comments raised concerns about housing loss and damages, damage or loss of evacuation routes, and beach loss. The comments supporting the proposed action referred to economic, ecologic, protection and safety benefits that could result if the TSP is implemented. One individual objected the project, indicating concerns with property ownership, the NFS, and tools used for erosion rates.

The four industry letters provided conditional support to the proposed action, citing existing concerns for risks to navigation. Specifically, industries expressed that the project, 1) should not impose or extend draft restrictions for the entrance channel; 2) should conduct market research for procurement and any costs above the Federal

Standard of disposal at the ODMDS be incurred by local and state sponsors; 3) ensure all regulatory, lands, easements, and rights of way are approved and secured prior to requesting dredging; 4) should secure an alternative sediment source if impacts to the costs and schedule of dredging is unavoidable in the entrance channel; and 5) be approved by the USACE Operations Division before proceeding.

The USACE analyzed all comments received during the public review period and considered them in preparation of this final DPR/EA. Detailed responses to public comments are included in Appendix F.

8.2 Agency Consultation and Coordination

The USACE consulted with other federal, state, and city agencies to gather input on the proposed project and to inform development of the alternatives described in this report. These consultations helped ensure environmental compliance and maximized information input and collaboration when developing the criteria and measures for evaluating the action alternatives. A list of agencies consulted for this project included USFWS, NMFS, TCEQ, GLO, Texas Parks and Wildlife Department, Galveston Parks Board of Trustees, and the City of Galveston. Agency coordination letters, including environmental consistency determinations, provided to the USACE during the public comment period are included in Appendix C.

The USACE coordinated with the Galveston Parks Board to expedite ESA compliance by requesting concurrence from the USFWS to operate under the NFS's BO to perform the proposed action. The USFWS accepted the USACE request, as such, the USACE will share responsibility with the NFS to adhere to all conditions and conservation measures referenced in the BO (Consultation No: 02ETTX00-2018-F-2491; Appendix C; section 6.1.5.1).

Compliance with Section 401 of the CWA has been achieved and no further coordination is warranted as indicated in a letter from TCEQ dated September 2, 2022 (see Appendix C).

8.3 Environmental Compliance

This DPR/EA has been prepared to satisfy the requirements of all applicable environmental laws and regulations and has been prepared using the Council on Environmental Quality (CEQ) 2020 NEPA regulations (40 CFR Part 1500–1508) and the USACE's regulation ER 200-2-2 – Environmental Quality: Policy and Procedures for Implementing NEPA, 33 CFR 230. In implementing Alternative 2, the USACE would follow provisions of all applicable laws, regulations, and policies related to the proposed actions (Table 9).

Table 9 - Environmental Compliance

Policies	Compliance Status	Notes
Public Laws		
Abandoned Shipwreck Act of 1988, as amended	Not Applicable	
Archeological and Historic Preservation Act of 1974, as amended	Not Applicable	
Bald and Golden Eagle Protection Act of 1940, as amended	Compliant	Section [Alt2 Migratory Birds]
Clean Air Act of 1970, as amended	Compliant	Section [Alt 2 Air]
Clean Water Act of 1972, as amended	Compliant	Appendix C
Coastal Barrier Resources Act of 1982, as amended	Not Applicable	
Coastal Zone Management Act of 1972, as amended	Compliant	Appendix C
Endangered Species Act of 1973, as amended	Compliant	Section [Alt 2 T&E], Appendix C
Farmland Protection Policy Act of 1981	Not Applicable	
Fish and Wildlife Coordination Act of 1934, as amended	Compliant	Appendix C
Magnuson-Stevens Fisheries Conservation and Management Act of 1976, as amended	Compliant	Section [Alt 2 EFH]
Marine Mammal Protection Act of 1972, as amended	Compliant	Section [Alt 2 Marine Mammals]
Marine Protection, Research, and Sanctuaries Act of 1972, as amended	Not Applicable	
Migratory Bird Treaty Act of 1918, as amended	Compliant	Section [Alt 2 Migratory Birds]
National Environmental Policy Act of 1969, as amended	Compliant	

Policies	Compliance Status	Notes
National Historic Preservation Act of 1966, as amended	Compliant	Section [Alt 2 Cultural]
Native American Graves Protection and Repatriation Act of 1990	Not Applicable	
Rivers and Harbors Act of 1899, as amended	Compliant	Section [Federal Navigation Project]
Wild and Scenic Rivers Act, as amended	Not Applicable	
Executive Orders		
Environmental Justice (E.O. 12898)	Compliant	Section [Alt 2 Socioeconomic]
Flood Plain Management (E.O. 11988)	Compliant	Section [Alt 2 Hydro]
Protection of Wetlands (E.O. 11990)	Compliant	Section [Alt 2 Habitats]
Protection of Children from Environmental Health Risks (E.O. 13045)	Compliant	Section [Alt 2 Socio]
Invasive Species (E.O. 13751)	Compliant	Section [Alt 2 Wildlife/Fisheries]
Migratory Birds (E.O. 13186)	Compliant	Section [Alt Migratory Birds]

9 Costs and Cost Sharing

9.1 Project Costs

Under Section 204 authority, the feasibility costs ($450,000) are a 100 percent Federal cost. The Federal per project cost limit is $10,000,000. Design and construction phase costs are cost-shared with the sponsor at rates based on the purpose of the beneficial use for coastal storm risk management and the benefits derived. Project costs were developed to meet the constraint of not increasing costs of schedule to existing O&M dredging contracts. Base plan costs ($7,548,000) were subtracted from the first costs of dredging and sand placement for beneficial use including lands and damages, engineering and design, and construction management ($22,011,000) determining the Section 204 project first cost of $14,427,000 as all protected properties and all identified benefits are to private lots developed for residential and small business use (Table 10). Federal and non-Federal costs were apportioned at a 65/35 rate (Table 11). The project first cost assigned to the beneficial use was used for computing the Section 204 project

costs, annual costs, and the benefit-cost analysis. The project cost estimate summaries are provided in Appendix B.

Table 10 – Project First Cost Summary

Account	Construction Item	Cost
01	Lands & Damages	$77
12	Navigation, Ports and Harbors	$18,912
	Subtotal	**$18,989**
30	Preconstruction Engineering & Design (PED)	$1,889
31	Construction Management (E&D, S&A)	$1,133
	FIRST COSTS	$22,011
Base Plan, FWOP		-$7,584
	INCREMENTAL FIRST COSTS	**$14,427**

October 2022 Price Levels, Price in $1,000s, 25% Contingency

9.2 Project Cost Sharing

Based upon total project costs, the Non-Federal share is $5,565,000; 37 percent of the $15,115,000 BUDM fully funded cost including an additional $275,000 since the Federal project expenditure limit is $10,000,000. Real estate costs are $77,000, of which sponsor's real estate cost is $47,000 and its cash share is $5,518,000 (Table 11).

Table 11 - CSRM Cost Share of Project First Costs

Item	Federal Cost	Non-Federal Cost	Totals
Real Estate	$33	$47	$77
Construction, ED, SA & Real Estate	$9,792	$5,243	$15,035
Federal Feasibility Cost	$450		
Federal Limit ($10,000,000)	**$10,000**		
Non-Federal Additional Cash Share Required (Total Non-Federal Cash Share)	$0	$275	$5,518
Total Non-Federal Share		**$5,565**	

October 2022 Price Levels, Price in $1,000s

10 Operations Maintenance, Repair, Rehabilitation and Replacement

Project will not require OMRR&R as work is done primarily on a single, one-time basis.

11 Real Estate Requirement

A Real Estate Plan is included as Appendix D. The report describes the interests required for project implementation and identifies the properties involved, their value, and ownership. Need for temporary access and staging for construction equipment and operations beyond what is publicly available will be determined during the design and implementation phase.

The project will be implemented on approximately 102 acres of “public beach.” The “public beach” includes both the state-owned wet beach and the areas of the dry beach seaward of the vegetation (Figure 18). Existing public recreation access is available and will be maintained for existing and expected future recreation activities. Galveston Island has six open and operating public beach access points along the shore within or directly adjacent to the proposed project footprints for Alternative 2 (Figure 18).

Figure 18 - Public Beach Access Points

The “public beach” area is subject to a public easement. Therefore, it is understood the State of Texas, managed by the GLO, owns the portion of the beach seaward of the vegetation. To facilitate construction, USACE will include secure an Authorization of Entry for Construction from the Texas GLO.

12 Project Implementation

As of May 3, 2022, the City of Galveston is the non-Federal sponsor (See Attachment 2) for project implementation and will enter into a Project Partnership Agreement (PPA) with The Department Of The Army. Texas General Land Office (GLO) will aid the City of Galveston and has actively participated in the feasibility study. GLO is to enter into a Project Cooperation Agreement (PCA) with the City of Galveston to provide access to public lands and for financial participation in the project construction. GLO through the State of Texas, is to protect the public easement (the wet and/or dry beach seaward of the vegetation) and its use from erosion or reduction caused by development or other activities on adjacent land including beach cleanup and maintenance.

12.1 Timeline

- Public Review: July 15 – August 15, 2022
- Feasibility Report Approval: 27 January 2023
- Execute Project Partnership Agreement: 6 April 2024
- Construction Award: 1st Quarter FY 2025

The above timeline considers that the results of the Galveston District market research determines that capable dredging equipment is available to execute the work (bid the contract) prior to requesting Section 204 project funding. The Galveston District's Operations Division initiates all contracts to dredge for operations and maintenance and emergency dredging. The Section 204 project funding must be secured in advance of the scheduled maintenance dredging and that awardable contractor bids are received as coordinated by Operations to not impose undue risk to costs and schedule of operations and maintenance or emergency dredging of the Galveston Entrance Channel.

12.2 Implementation Risks

Implementation of the selected plan may include risks that could result in adverse impacts to the existing Federal Navigation Projects.

a. Operations is partnering with the Texas GLO and the Galveston Park Board for BUDM at 61 St and west (~ +20 miles).

b. Under the current partnership between USACE, GLO and the Park Board, our hopper dredge contractors are achieving ~3.5 loads per day with disposal to the 61st street location.

c. The additional Section 204 project distance reduces productivity to ~2 to 2.5 loads per day, an increase in contract duration by ~20 percent.

d. This may increase the time to clear shoaling from the Houston / Galveston Entrance Channel. Draft restrictions during dredging could take 20 percent longer to clear.

e. Any draft restrictions during dredging would require project's BUDM to be delayed or reduced.

f. With increased sail distance, only four Contractor trailing suction hopper dredges are estimated to be capable of effectively executing the work (i.e., bid the contract).

g. Delay of BUDM placement to next O&M cycle could result in cost risk, which can result in not implementing the Section 204 project under this study and/or decrease erosion delay protection.

h. Choice of dredging method could increase the Section 204 project cost. The project sponsor has indicated its willingness and ability to pay the incremental project costs above the base plan costs that might exceed the Federal $10,000,000 expenditure limit.

i. The Federal limit of participation in the design and construction is $10,000,000.

j. The project must adhere to all relevant federal, state and local laws and regulations. Ex. No alternatives may intentionally adversely affect threatened or endangered species.

k. This Sec 204 project cannot increase costs or schedule to existing Federal Navigation Project's O&M dredging contracts; the Base Plan.

As determined through discussions with the Non-Federal Sponsors of the Federal Navigation projects and Industry, the Section 204 project will reduce the number of single hopper dredging plants that can perform the work, and/or cause the contractors to utilize two dredges to perform the work as to not increase the time associated with clearing critical shoaling from the navigation channel. This will inadvertently reduce competition for available hopper dredges and cause an increase in project costs. However, industry indicated that several hopper dredge plants are currently in production to be brought online over the next few years, and several more are in the design phase for the outer years. The addition of Hopper dredges could allow for later mitigation to the risks to the O&M of the Federal Navigation projects and the Section 204 project.

12.3 Federal Responsibilities

The Federal government will be responsible for preparation of plans and specifications and contract advertisement, award and supervision and inspection of the work. The Federal government will be responsible for project compliance with Federal environmental laws and regulations, including the NEPA, ESA, consistency with the Coastal Zone Management Act (CZMA), and the CWA.

12.4 Non-Federal Responsibilities

The NFS is responsible for all actions and costs as laid out in the USACE Project Partnership Agreement for CAP Section 204 Beneficial Use of Dredged Materials.

13 Recommendation

I recommend that the Coastal Storm Risk Management plan as generally describes in this Detailed Project Report and Integrated Environmental Assessment, be implemented under the authority of Section 204 of the Water Resources Development Act of 1992, as amended, Regional Sediment Management (Beneficial Use of Dredged Material), with such modifications as within the discretion of the appropriate authority may be deemed advisable. The incremental project first cost for benefit-cost analysis purposes is currently estimated to be $14,427,000.

Prior to the commencement of construction, local interests must agree to meet the requirements of Local Sponsor responsibilities as outlined in this report and future legal documents. The City of Galveston, Texas has demonstrated that they have the authority and financial capability to provide all Local Sponsor requirements for the implementation, operation and maintenance of the project. The recommendations contained herein reflect the information available at the time and current Department of the Army policies governing formulation, evaluation and development of individual projects under the US Army Corps of Engineers Continuing Authorities Program.

15 FEB 23

Date

Rhett A. Blackmon, P.E.
Colonel, U.S. Army
District Engineer

14 List of Preparers

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Attachment 1 – Sponsor's Letter of Study Request

GALVESTON
* ISLAND *
Park Board of Trustees

601 Tremont – P. O. Box 1080
Galveston Island, Texas 77550
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November 23, 2020

Colonel Timothy Vail
Galveston District, U.S. Army Corps of Engineers
2000 Fort Point Road
P.O. Box 1229
Galveston, TX 77550

Dear Colonel Vail:

The Park Board of Trustees of the City of Galveston (Park Board) is seeking opportunities for a system-based approach to managing sediment resources in our region. Galveston Island is a "sand limited" system, with a minimal supply of new sand. The area has no nearshore source of sand for nourishment projects, and therefore, is a good fit for beneficial use of dredged material projects using the sediment from the ongoing operations and maintenance of the nearby Houston-Galveston Ship Channel. In 2016, the Park Board worked with the Engineering, Research and Design Center (ERDC) of the Army Corps of Engineers through the Planning Assistance to States program to develop a 50 Year Sand Management Plan which highlighted the beneficial use of dredged material as a principal strategy.

The Park Board requests that the Army Corps of Engineers investigate the possibility of implementing this principal strategy under its Section 204(d) Water Resources Development Act of 1992, as amended Regional Sediment Management (Beneficial Uses of Dredged Material) Continuing Authorities Program to formulate a series restoration projects for the shoreline west of the Seawall along the Island's West End. The dredged material from the routine maintenance of the Houston-Galveston Entrance Channel is considered beach quality sand and should be used to consistently address the island's on-going erosion.

The requested project would have a significant public safety and storm protection benefits for the community. Results could have lasting impacts through future shoreline protection projects that would protect against loss of life and damage to improved property. The Galveston Seawall, built following the largest disaster in U.S. history, helps protect a significant portion of Galveston Island from coastal flooding and storm surge. Although the Seawall was designed to stand alone, it is susceptible to flanking. The presence of a wide beach seaward of the Seawall helps protect this infrastructure and preserve the residential, commercial, environmental, and other assets located behind the structure.

The Park Board is committed to serving as the local sponsor for the Section 204(d) Continuing Authorities Program and understands the cost-sharing requirements for the project moving forward after the determination of federal interest per EP 1105-2-58, Section 33, Paragraphs b.(2), (3) and (5), and Section Paragraph C. We are aware of public use and access requirements and are prepared to provide all Land, Easements, Rights-Of-Way, Relocation, and Disposal Areas (LERRDs) if needed (see

attached Tx Natural Resource Code). We look forward to executing a cost-sharing agreement for the study at the appropriate time in the process. Thank you for your assistance with this much needed effort. Please contact Kimberly Danesi at kdanesi@galvestonparkboard.org for further information or assistance.

Sincerely,

Kelly de Schaun
Chief Executive Officer

Encl.
Texas Natural Resources Code, Section 61.011, 61.016 and 61.017
Map of proposed project area

Attachment 2 – Letter of Non-Federal Sponsor Transfer

City of Galveston

OFFICE OF THE CITY MANAGER
PO Box 779 | Galveston, TX 77553-0779
citymanager@galvestontx.gov | 409-797-3520

May 3, 2022

Colonel Timothy Vail
Galveston District, U.S. Army Corps of Engineers
2000 Fort Point Road
P.O. Box 1229
Galveston, TX 77550

Dear Colonel Vail:

The City of Galveston is committed to growing and strengthening the relationship forged between the United States Army Corps of Engineers Galveston District and our community. In close coordination with the Galveston Park Board of Trustees we are beginning the next chapter of our communities' role in regional sediment management and resiliency efforts.

This letter is to notify you that the City of Galveston has assumed the role of non-federal sponsor for the Galveston BUDM Project under the Section 204(d) Continuing Authorities Program.

We appreciate the effort and organization that you and your staff have poured into this project and we commit to continuing to serve as engaged partners. We understand that stepping into this position may require additional financial contributions to aid in bringing the project into fruition. We along with our partners in the GLO remain willing and able to facilitate the funding of incremental cost which may arise through future approvals by our Industrial Development Corporation.

Please contact Brandon Hill at bhill@galvestontx.gov for further information or assistance.

Thank you

Brian Maxwell
Galveston City Manager

CC Kelly de Schaun, Chief Executive Officer, Galveston Park Board of Trustees